Biological Assessment for the Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona Consultation Codes: 02EAAZ00-2020-SLI-0104 and 02EAAZ00-2020-SLI-0553

For submittal to

U.S. Fish and Wildlife Service Arizona Ecological Services Field Office 9828 North 31st Avenue #C3 Phoenix, Arizona 85051-2517

Attn: Jeff Humphrey

Prepared by

#### SWCA Environmental Consultants 20 East Thomas Road, Suite 1700 Phoenix, Arizona 85012

On behalf of

U.S. Department of Agriculture Forest Service Tonto National Forest 2324 East McDowell Road Phoenix, Arizona 85006

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# CONTENTS

1	Introduction	1
2	Consultation History	
3	Description of the Proposed Action	6
	3.1 Project Location	
	3.2 Proposed Action	
	3.2.1 Project Components Analyzed in this Document and Exclusions	
	3.2.2 Overview of General Mine Facilities	
	3.2.3 Mine Phases: Construction, Operations, and Closure and Reclamation Activities	
	and Time Frames	
	3.2.4 Types of Impacts Anticipated from Mine Construction and Operations	
	3.2.5 Closure and Reclamation and Post-Mine Conditions	
	3.2.6 Clean Water Act Section 404 Permit	
4	Description of the Action Area	
	4.1 Water Sources Information within the Action Area	
	4.1.1 Surface Water Information	
	4.1.2 Groundwater	
	<ul> <li>4.2 Vegetation Communities</li> <li>4.2.1 Desert Ecosystems (includes Arizona Upland Sonoran Desertscrub and Lower</li> </ul>	12
	4.2.1 Desert Ecosystems (includes Arizona Upland Sonoran Desertscrub and Lower Colorado River Sonoran Desertscrub)	80
	4.2.2 Semi-Desert Grasslands	
	4.2.3 Interior Chaparral	
	4.2.4 Pinyon-Juniper Woodland	
	4.2.5 Ponderosa Pine-Evergreen Oak	
	4.2.6 Xeric Riparian	
	4.2.7 Riparian	81
	4.2.8 Existing Land Disturbance	81
	4.2.9 Mitigation Lands	82
5	Conservation Measures	82
	5.1 Arizona Hedgehog Cactus Conservation Measures	82
	5.2 Gila Chub Conservation Measures	83
	5.3 Southwestern Willow Flycatcher and Yellow-billed Cuckoo Conservation Measures	84
6	Status of Listed Species/Critical Habitat	85
	6.1 Arizona Hedgehog Cactus	
	6.1.1 Species Status in Action Area	
	6.1.2 Analysis of Effects	
	6.1.3 Determination of Effects	120
	6.2 Gila Chub	
	6.2.1 Species Status in Action Area	
	6.2.2 Analysis of Effects	
	6.2.3 Determination of Effects	
	6.3 Gila Chub Designated Critical Habitat	
	6.3.1 Status in Action Area	
	6.3.2 Analysis of Effects	
	6.3.3 Determination of Effects	
	6.4 Southwestern Willow Flycatcher	137

	6.4.1	Species Status in Action Area	137
	6.4.2	Analysis of Effects	142
	6.4.3	Determination of Effects	155
6	5.5 Yello	ow-billed Cuckoo	
	6.5.1	Species Status in Action Area	
	6.5.2	Analysis of Effects	
	6.5.3	Determination of Effects	173
6	5.6 Yello	ow-billed Cuckoo Proposed Critical Habitat	173
	6.6.1	Status in Action Area	
	6.6.2	Analysis of Effects	174
	6.6.3	Determination of Effects	177
6	5.7 South	hwestern Willow Flycatcher Designated Critical Habitat	178
	6.7.1	Status in Action Area	178
	6.7.2	Analysis of Effects	178
	6.7.3	Determination of Effects	179
6	5.8 North	hern Mexican Gartersnake	179
	6.8.1	Species Status in Action Area	179
	6.8.2	Analysis of Effects	180
	6.8.3	Determination of Effects	180
6	5.9 Other	r Species	180
7 I	Literature	Cited	182

# Tables

2
6
9
19
26
37
72
81
88
97
•

# Figures

Figure 1. Resolution Copper Project vicinity map	8
Figure 2. Proposed action components	17
Figure 3. Overview of the mining process at full operation	18
Figure 4. Predicted mining subsidence areas and the East Plant Site area	21
Figure 5. Cross section and aerial photograph simulations of the predicted subsidence areas	22
Figure 6. Proposed action tailings storage facility	25
Figure 7. Graphical display of pipeline arrangements used in tailings conveyance corridor design	29
Figure 8. Proposed upgraded and new SRP transmission lines	38

Figure 9-1. Queen Creek CWA Compensatory Mitigation Parcel Mitigation Activity Areas	. 51
Figure 9-2. H&E Ranch CWA Compensatory Mitigation Parcel Mitigation Activity Areas	. 52
Figure 10. Resolution Copper Project action area	. 54
Figure 11-1. Topography with land ownership (1 of 6)	. 55
Figure 11-2. Topography with land ownership (2 of 6)	. 56
Figure 11-3. Topography with land ownership (3 of 6)	. 57
Figure 11-4. Topography with land ownership (4 of 6)	. 58
Figure 11-5. Topography with land ownership (5 of 6)	
Figure 11-6. Topography with land ownership (6 of 6)	. 60
Figure 12-1. Suface water features in action area (1 of 6)	. 62
Figure 12-2. Suface water features in action area (2 of 6)	. 63
Figure 12-3. Suface water features in action area (3 of 6)	. 64
Figure 12-4. Suface water features in action area (4 of 6)	. 65
Figure 12-5. Suface water features in action area (5 of 6)	. 66
Figure 12-6. Suface water features in action area (6 of 6)	. 67
Figure 13-1. Vegetation communities in the action area (1 of 3)	. 76
Figure 13-2. Vegetation communities in the action area (2 of 3)	. 77
Figure 13-3. Vegetation communities in the action area (3 of 3)	. 78
Figure 14. Existing habitat fragmentation map	
Figure 15-1. Critical habitat in project vicinity (1 of 2)	. 86
Figure 15-2. Critical habitat in project vicinity (2 of 2)	. 87
Figure 16-1. Arizona hedgehog cactus surveys	100
Figure 16-2. Arizona hedgehog cactus locations	101
Figure 16-3. Arizona hedgehog cactus downslope from project features	102
Figure 16-4. Arizona hedgehog cactus downslope from project features	103
Figure 17-1. Gila chub surveys in the action area and vicinity (1 of 2)	130
Figure 17-2. Gila chub surveys in the action area and vicinity (2 of 2)	131
Figure 18. Southwestern willow flycatcher surveys in the project and action areas	141
Figure 19. Yellow-billed cuckoo surveys in the action area and vicinity	160

# Appendices

- Appendix A List of Acronyms
- Appendix B Official IPaC Species List
- Appendix C Consultation, Coordination, and Meeting Information
- Appendix D Additional Conservation Measures
- Appendix E Arizona Hedgehog Cactus Salvage Protocol
- Appendix F Arizona's Online Environmental Review Tool Results
- Appendix G AGFD Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects

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# **1** INTRODUCTION

This Biological Assessment (BA) has been prepared to analyze the potential effects on species listed under the Endangered Species Act (ESA) from the proposed Resolution Copper Project and Land Exchange (herein called the Resolution Copper Project or the project). In November 2013, Resolution Copper Mining, LLC (Resolution Copper), submitted a General Plan of Operations (GPO) for the Resolution Copper Project to the Tonto National Forest (TNF).

Resolution Copper proposes developing an underground copper mine on unpatented mining claims on National Forest System (NFS) lands near Superior, Arizona. To access the copper deposit, located primarily on NFS lands, Resolution Copper pursued a land exchange. In December 2014, Congress authorized a land exchange pending completion of an environmental impact statement (EIS), as outlined in Section 3003 of the Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015 (NDAA). The exchange parcel to be conveyed to Resolution Copper includes not only the NFS lands above which the copper deposit is located but also the Oak Flat Withdrawal Area. This collective 2,422-acre tract of land is known as the "Oak Flat Federal Parcel." Resolution Copper would, in turn, exchange eight parcels located throughout Arizona (5,376 acres of private land) to the Federal Government. On behalf of the Secretary of Agriculture, the TNF is responsible for preparing a single EIS to: approve a mining GPO submitted by Resolution Copper (2016c); and facilitate a land exchange of the Oak Flat Federal Parcel (2,422 acres of NFS land) for eight parcels located throughout Arizona (5,376 acres of private land) currently owned by Resolution Copper) as directed by Section 3003 of the NDAA for 2015.

Since the project as proposed would discharge fill materials into waters of the U.S., particularly at the tailings storage facility, Resolution Copper has requested authorization from the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA). As the NDAA directed that a single EIS should support all Federal decisions related to the proposed mine, the National Environmental Policy Act (NEPA) process undertaken by the U.S. Department of Agriculture Forest Service (Forest Service) must be sufficient to support both the Forest Service and the USACE decision processes. Similarly, the consultation under Section 7 of the ESA has been requested in order to support both the Forest Service and USACE decisions.

A Notice of Intent to prepare an EIS was published in the Federal Register in March 2016, initiating the review process under NEPA. The Draft EIS was published in August 2019, analyzing the actions proposed under the GPO, alternatives to the proposed action developed by the TNF, as well as the effects of the land exchange. In the Draft EIS, the TNF identified Alternative 6, Skunk Camp, as the agency preferred alternative.

Note that although Congress mandated analysis of effects of the land exchange in the EIS, the TNF has no decision to make on the congressionally mandated land exchange, only on the GPO submitted by Resolution Copper. Therefore, the actions analyzed in this BA focus on the impacts anticipated from the preferred alternative on species listed under the ESA in Pinal and Gila Counties, but not the land exchange itself.<sup>1</sup>

Additional details on the background of this project can be found on the project's website at https://www.resolutionmineeis.us/project-overview. A list of acronyms can be found in appendix A.

<sup>&</sup>lt;sup>1</sup> Note that terms such as "mitigation lands" or "compensatory mitigation parcel" are used in this document. These terms do not refer to the parcels being considered as part of the land exchange. Rather, these terms refer to areas that would be disturbed by various mitigation activities associated with the project, including those brought forward as off-site compensatory mitigation under Section 404 of the CWA.

This BA analyzes the potential effects from the proposed project on 24 species listed under the ESA in Pinal and Gila Counties. The effect determinations concluded during the analysis and the requested consultation action are presented in table 1. Gray wolf (*Canis lupus*) and Mexican gray wolf (*C. l. baileyi*) are treated together in table 1. Table 1 groups species by effect determination.

Species Common Name (Scientific Name)	No Effect	May Affect and Is Likely to Adversely Affect	May Affect, but Is Not Likely to Adversely Affect	Requested Consultation Action
Arizona hedgehog cactus (Echinocereus triglochidiatus var. arizonicus)		Х		Formal Section 7 Consultation
Gila chub ( <i>Gila intermedia</i> )			Х	Informal Consultation
Gila chub designated critical habitat			Х	Informal Consultation
Northern Mexican gartersnake ( <i>Thamnophis eques megalops</i> )			Х	Informal Consultation
Southwestern willow flycatcher (Empidonax traillii extimus)			Х	Informal Consultation
Southwestern willow flycatcher designated critical habitat			Х	Informal Consultation
Yellow-billed cuckoo (Western DPS) (Coccyzus americanus)			Х	Informal Consultation
Yellow-billed cuckoo (Western DPS) proposed critical habitat			Х	Conference Opinion
Acuña cactus (Echinomastus erectocentrus var. acunensis)	Х			No Review
Acuña cactus designated critical habitat	Х			No Review
Apache trout (Oncorhynchus apache)	Х			No Review
Chiricahua leopard frog ( <i>Rana chiricahuensis</i> )	Х			No Review
Chiricahua leopard frog designated critical habitat	Х			No Review
Colorado pikeminnow ( <i>Ptychocheilus lucius</i> )	Х			No Review
Colorado pikeminnow designated critical habitat	Х			No Review
Desert pupfish (Cyprinodon macularius)	Х			No Review
Desert pupfish designated critical habitat	Х			No Review
Gila topminnow (Poeciliopsis occidentalis)	Х			No Review
Gila trout (Oncorhynchus gilae)	Х			No Review
Little Colorado spinedace ( <i>Lepidomeda vittata</i> )	Х			No Review
Little Colorado spinedace designated critical habitat	Х			No Review

#### Table 1. Summary of effect determinations and requested consultation action

Species Common Name (Scientific Name)	No Effect	May Affect and Is Likely to Adversely Affect	May Affect, but Is Not Likely to Adversely Affect	Requested Consultation Action
Loach minnow ( <i>Tiaroga cobitis</i> )	Х			No Review
Loach minnow designated critical habitat	Х			No Review
Gray wolf ( <i>Canis lupus</i> ): Mexican gray wolf ( <i>Canis lupus baileyi</i> ) population	Х			No Review
Mexican spotted owl (Strix occidentalis lucida)	Х			No Review
Mexican spotted owl designated critical habitat	Х			No Review
Nichol's Turk's head cactus (Echinocactus horizonthalonius var. nicholii)	Х			No Review
Northern Mexican gartersnake proposed critical habitat	х			No Review
Ocelot (Leopardus pardalis)	Х			No Review
Razorback sucker ( <i>Xyrauchen texanus</i> )	Х			No Review
Razorback sucker designated critical habitat	Х			No Review
Sonoran pronghorn (Antilocapra americana sonoriensis)	Х			No Review
Spikedace ( <i>Meda fulgida</i> )	Х			No Review
Spikedace designated critical habitat	Х			No Review
Woundfin ( <i>Plagopterus argentissimus</i> )	Х			No Review
Woundfin designated critical habitat	Х			No Review
Yuma clapper/Ridgway's rail ( <i>Rallus longirostris yumanensis</i> )	Х			No Review

# 2 CONSULTATION HISTORY

The following lists the coordination efforts between the TNF, the USFWS, and SWCA for this Section 7 consultation process regarding the project thus far:

• 2016–present: The USFWS is on the EIS mailing list and receives all notices such as scoping (March 2016), extended scoping and additional public meeting (May 2016), Apache Leap Special Management Area (SMA) environmental assessment (EA) scoping (October 2016), Apache Leap SMA draft EA release (March 2017), Apache Leap SMA draft Decision Notice availability (August 2017), EIS Alternatives Evaluation Report release (November 2017), Apache Leap SMA final Decision Notice (January 2018), Resolution Copper Draft EIS (August 2019), Resolution Copper Project and Land Exchange Draft EIS release and public comment hearings (September and October 2019), and additional public hearing meetings for the Draft EIS (September 2019).

- May 24, 2016: TNF inquired whether the USFWS would like to be a cooperating agency. The USFWS declined and indicated that it would only be involved in the Section 7 consultation process for the project. (Follow-up communication about this point also occurred on August 19, 2016; January 26, 2017; and May 4, 2017.)
- August 9, 2019: The Draft EIS was published and the comment period was opened. The USFWS was notified of the opportunity to comment.
- October 30, 2019: SWCA emailed USFWS using the incomingazcorr@fws.gov email address to let the agency know that SWCA, as the third-party NEPA contractor for the TNF, is preparing the BA and inquire who at the USFWS Arizona Ecological Services Field Office would be the lead contact for consultation so that early coordination on items could also be done. In addition, SWCA inquired whether a formal Information for Planning and Consultation (IPaC) system data inquiry had already been completed to generate the official consultation number.
- October 31, 2019: Greg Beatty at USFWS replied to SWCA's email and stated that he and Kathy Robertson would be the contacts for consultation. He also indicated that when submitting the BA it should be addressed to Jeff Humphrey, Field Supervisor, and submitted to incomingazcorr@fws.gov.
- November 1, 2019: Kathy Robertson replied to the USFWS/SWCA email chain to state that an official IPaC search had not been completed yet and that SWCA could complete the official request to get the consultation number; she also noted that USFWS needed a letter from the TNF designating SWCA as a non-Federal representative (50 Code of Federal Regulations 402.08) for this project.
- November 5, 2019: SWCA completed an official IPaC data request using the online system and obtained the official species list and consultation code of 02EAAZ00-2020-SLI-0104. Later, a new search was required due to proposed action shapefile changes. The system would not allow edits to the original shapefile; thus, a new official species list was obtained through IPaC on March 13, 2020, with a consultation code of 02EAAZ00-2020-SLI-0553 (appendix B).
- November 5, 2019: SWCA replied to the USFWS/SWCA email chain to inquire whether the USFWS had reviewed the Draft EIS and whether the agency had any comments. Ms. Robertson replied that she had completed a brief review mainly focusing on water impacts but that the agency did not have time to respond with comments. She also asked for clarification regarding whether the TNF was also consulting on impacts on lands that are not under TNF jurisdiction or the offered lands.
- November 7, 2019: The Draft EIS comment period closed; however, no comments from the USFWS were received.
- December 2, 2019: SWCA replied to the USFWS/SWCA email chain to address Ms. Robertson's questions with the following: "The BA is addressing the proposed action on TNF, ASLD, and private lands. The BA will clearly outline why and what consultation is needed and as to how the land exchange is being handled."
- December 18, 2019: Mary C. Rasmussen submitted a letter to the USFWS to incomingazcorr@fws.gov\_designating SWCA as TNF's non-Federal agency representative regarding ESA Section 7 consultation for the Resolution Copper Project, a mining proposal under Federal review by the TNF.
- January 10, 2020: SWCA emailed Ryan Gordon, USFWS Gila chub species lead, and copied Kathy Robertson and Gregg Beatty, to inquire about the recovery goals for the Mineral Creek designated critical habitat and also about the USFWS's plans to handle the recent taxonomy

changes for the species. Mr. Gordon replied that "the goal is to protect all extant populations of Gila chub (*Gila intermedia*) and repatriate them into new streams. Although the population in mineral creek has not been seen for many years we still considered it occupied with CH. The Arizona Game and Fish has completed multiple surveys in the stream without detecting Gila chub but their survey efforts have not been extensive enough to consider the population extirpated so at this time we estimate the population to be low in numbers. Related to your taxonomic question. In our withdrawal of the proposed rule we state that we will conduct a Species Status Assessment (SSA) of the newly recognized roundtail chub. We are working on a rangewide database with the States (AZ, NM, CO, UT, WY) that will be used in our SSA. That effort is almost complete so we could be initiating the SSA within the next year or so. As far as Gila chub goes we are waiting to finish the rangewide SSA before we make any decisions or revisions to Gila chub listing status. Therefore, Gila chub will remain protected until that effort is complete."

- On January 24, 2020, an initial Section 7 meeting was held to introduce the project to USFWS and discuss the BA and consultation. Notes from that meeting are included in appendix C.
- On February 27, 2020, the USFWS published a revision to the proposed rule on proposed critical habitat for the yellow-billed cuckoo (*Coccyzus americanus*). This revision included a new proposed critical habitat along Mineral Creek in the action area; thus, it was determined that an analysis for yellow-billed cuckoo proposed critical habitat would be required for this BA. Subsequently on March 3, 2020, Kathy Robertson emailed the TNF and SWCA to notify us of this revision; SWCA responded that we were aware of it and planned to address it in the BA.
- On April 28, 2020, the USFWS published a revision to the proposed rule on proposed critical habitat for the northern Mexican gartersnake (*Thamnophis eques megalops*). The revision removed proposed critical habitat for the species within the action area; thus, an analysis on proposed critical habitat for the species is not required for the BA (USFWS 2020d).
- On May 6, 2020, SWCA, as the designated federal representative for the TNF, submitted the BA and cover letter from TNF requesting initiation of Section 7 consultation via the incomingazcorr@fws.gov email address. A copy of the cover letter is included in appendix C.
- On May 20, 2020, a Resolution Copper Section 7 Kick Off Meeting the USFWS, TNF, and SWCA held and attended. Notes from that meeting are included in appendix C.
- On June 2, 2020, the TNF received an application from Resolution Copper requesting applicant status for the Section 7 process in order to participate in discussions between the lead agency and USFWS associated with the Section 7 process. A copy of that request is included in appendix C.
- On June 2, 2020, a Resolution Copper Section 7 Status Check discussion occurred that the USFWS, TNF, and SWCA held and attended. Notes from the meeting are included in appendix C.
- On June 4, 2020, the TNF approved the request from Resolution Copper granting their requested applicant status for the project's Section 7 process. A copy of this letter is included in appendix C.
- On June 8, 2020, the USFWS indicated to TNF that it would be unable to initial formal consultation owing to uncertainties associated with powerline and pipeline routes and lack of specific project implementations information for USACE mitigation actions. A copy of that letter is included in appendix C.
- On June 9, 2020, the Resolution Section 7 Mitigation discussion meeting was held and attended by USFWS, USACE, TNF, SWCA, Resolution, and subcontractors. Notes from that meeting are included in appendix C.

• In addition, throughout the months of May and June, multiple emails and phone conversations, in which comments, questions, data exchanges, etc., occurred between the USFWS, TNF, and SWCA.

# **3 DESCRIPTION OF THE PROPOSED ACTION**

# 3.1 **Project Location**

This section provides information on the proposed project location—i.e., project area or project footprint—which should not be confused with the action area—i.e., a larger area to encompass all direct and indirect impacts outside the project area, including mitigation lands. The action area is described and discussed in section 4 of this BA (Description of the Action Area). The proposed Resolution Copper Project is located primarily in northeast Pinal County, with a portion of one project component in southwest Gila County in central Arizona. Parcels associated with off-site CWA compensatory mitigation would also occur in other areas of Pinal and Gila Counties. The proposed project is within the Mesa and Globe Ranger Districts in the southern portion of the TNF near Superior, about 60 miles east of Phoenix (figure 1). Additional information on the project location is discussed in section 4 of this BA.

Table 2 lists the Township (T), Range (R), and Sections for each project component for the proposed project.

Project Component	Township	Range	Sections
Access Roads	1 South	12 East	25, 34-36
	1 South	13 East	21, 27-30, 32, 34
	2 South	14 East	7, 17-20
East Plant Site	1 South	13 East	29, 31, 32
Filter plant/Loadout Facility Disturbance	3 South	9 East	2, 3
Magma Arizona Railroad Company (MARRCO) corridor	1 South	11 East	32–35
	2 South	9 East	36
	2 South	10 East	1, 11, 12, 14, 15, 20-22, 29-31
	2 South	11 East	1-3, 5,6
	2 South	12 East	4-6
	3 South	8 East	24-26, 35
	3 South	9 East	1-3, 9, 10, 16, 17, 19, 20
Pipeline	1 South	13 East	21, 28, 36
	2 South	14 East	17, 18
Pipeline and Transmission Line Collocated	1 South	13 East	27, 28, 34-36
	2 South	13 East	1-4, 12
	2 South	14 East	7,8, 17,18, 20, 28, 29
Pipeline Devils Canyon Span	1 South	13 East	27

#### Table 2. Location information for the proposed project

Project Component	Township	Range	Sections
Pipeline North Tunnel	1 South	12 East	23, 24, 26
	1 South	13 East	19, 20
Pipeline Northern Span	1 South	13 East	20, 21
Pipeline Trenchless	2 South	14 East	17, 18, 20
Silver King Road realignment	1 South	12 East	34
	2 South	12 East	4
Subsidence area (excluding East Plant Site disturbance)	1 South	13 East	31–33
	2 South	13 East	1, 5–7
Tailings Fence	2 South	14 East	28, 29, 32–36
	3 South	14 East	1–5, 8, 9, 11–17, 22–24
Tailings Storage Facility	2 South	14 East	33–35
	3 South	14 East	1–4, 9–12, 14–16
Transmission line 115 -kilovolt (kV) Corridor	1 South	12 East	25, 26, 35
	1 South	13 East	30-32
Transmission line 115-230 kilovolt (kV) Corridor	1 South	13 East	15, 16, 21, 28, 29, 32
Transmission line 115-kV Mineral Creek Crossing	2 South	14 East	18-20
West Plant Site	1 South	12 East	26, 27, 34, 35
	2 South	12 East	3, 4
Off-Site CWA Compensatory Mitigation Parcel – Granite Reef Area	6 South	20 East	28, 29, 32, 33
Off-Site CWA Compensatory Mitigation Parcel – H&E Parcels Area	7 South	16 East	35, 36
	8 South	16 East	1, 2, 12
Off-Site CWA Compensatory Mitigation Parcel – Queen Creek Area	2 South	12 East	3, 4,
Off-Site CWA Compensatory Mitigation Parcel – MAR-5 Wetland/Olberg Road Restoration Areas	4 South	6 East	8–14
	4 South	7 East	18

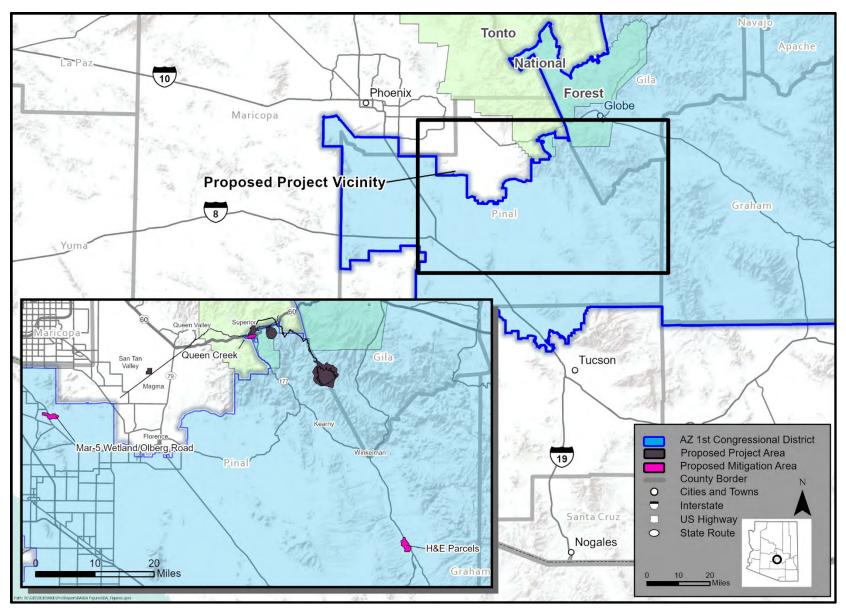


Figure 1. Resolution Copper Project vicinity map

# 3.2 **Proposed Action**

# 3.2.1 Project Components Analyzed in this Document and Exclusions

The TNF published the Draft EIS for the Resolution Copper Project in August 2019. The TNF preferred alternative identified in the Draft EIS is referred to as Alternative 6 – Skunk Camp North Tailings Corridor Option. Alternative 6 – Skunk Camp North Tailings Corridor Option would include approximately 13,477 acres of disturbance, of which 2,465 acres is NFS land, 7,319 acres is managed by the Arizona State Land Department (ASLD), and 3,693 acres is private land. The lands associated with CWA mitigation for the project would include another 925 acres of disturbance, of which 16 acres is NFS land, 5 acres is managed by ASLD, 146 acres is managed by the Bureau of Indian Affairs–Gila River Indian Community, 3 acres are U.S. Department of the Interior Bureau of Land Management (BLM) land, and 755 acres are private. Table 3 provides the ownership and acreage of each proposed action component.

Project Component	Land Ownership	Acreage
Access Roads	NFS	1.9
	Private	1.6
	ASLD	0.6
East Plant Site	NFS	89.1
	Private	99.7
Filter Plant/Loadout Facility Disturbance	Private	550.8
	ASLD	1.8
Magma Arizona Railroad Company (MARRCO) corridor	NFS	233.7
	Private	284.5
	ASLD	167.0
Pipeline	NFS	57.7
Pipeline and Transmission Line Collocated	NFS	323.1
	Private	61.6
	ASLD	448.5
Pipeline Devil's Canyon Span	NFS	5.4
Pipeline North Tunnel	NFS	199.3
	Private	3.4
Pipeline Northern Span	NFS	3.2
Pipeline Trenchless	NFS	32.9
	Private	0.7
	ASLD	27.4
Silver King Road realignment	NFS	10.6
	Private	2.4

#### Table 3. Land Ownership and Acreage by Project Component

Project Component	Land Ownership	Acreage
Subsidence area (excluding East Plant Site disturbance)	NFS	1,455.3
-	Private	67.4
-	ASLD	149.7
Tailings Fence	Private	56.8
-	ASLD	4,077.2
Tailings Storage Facility	Private	1,564.7
-	ASLD	2,437.4
Transmission Line 115 kilovolt (kV) Corridor	Private	42.5
Transmission Line 115-230 kilovolt (kV) Corridor	NFS	52.9
-	Private	8.1
Transmission Mineral Creek Crossing	Private	8.3
-	ASLD	9.3
West Plant Site	NFS	<0.1
-	Private	940.0
Off-Site CWA Compensatory Mitigation Parcel – H&E Parcels Area	Private	592.2
	ASLD	0.3
-	BLM	1.0
Off-Site CWA Compensatory Mitigation Parcel – Granite Reef Area	BLM	2.4
-	NFS	16.0
-	Private	79.4
-	ASLD	4.5
Off-Site CWA Compensatory Mitigation Parcel – Queen Creek Area	Private	83.6
Off-Site CWA Compensatory Mitigation Parcel – MAR-5 Wetland/ Olberg Road	Bureau of Indian Affairs	145.5
Total		14,401.4

The proposed action analyzed during the NEPA process consists of three main components: (1) the Southeast Arizona Land Exchange, a congressionally mandated exchange of land between Resolution Copper and the United States; (2) approval of the GPO for any operations on NFS land associated with the Resolution Copper Project; and (3) amendments to the Tonto National Forest Land and Resource Management Plan (forest plan).

Congress dictated that the land exchange becomes effective 60 days after publication of the Final EIS. As noted in the introduction, although Congress mandated that the Forest Service analyze the effects of the land exchange in an EIS, Federal agencies make no decision on the congressionally mandated land exchange, only on the GPO submitted by Resolution Copper. Therefore, the land exchange itself is not an action considered explicitly in this BA. The lands coming into Federal ownership will be integrated into existing resource management plans, either BLM or Forest Service.

In addition to the main proposed action, i.e., proposed copper mining, this BA also addresses the associated CWA Section 404 permit activities, including impacts to waters of the U.S. and compensatory

mitigation. The compensatory mitigation for this project includes off-site mitigation parcels, which are near and distant from the main proposed action.

The amendments to the existing 1985 forest plan analyzed during the NEPA process address necessary changes to relevant standards and guidelines for managing visual quality and recreation opportunities. These changes are administrative in nature, and neither result in physical disturbance that could impact species nor fundamentally change how wildlife resources are managed on the TNF. Similar to the land exchange, the forest plan amendment is not considered explicitly in this BA.

The proposed action analyzed in this BA includes the following aspects of the project:

- 1. The construction or expansion of the mine's main facilities (existing and new).
- 2. The mining processes and activities that would occur during operations of the mine.
- 3. The closure and reclamation processes that would occur.
- 4. The disturbance of land as part of mitigation measures associated with the project.<sup>2</sup>
- 5. The CWA Section 404 permit activities and off-site compensatory mitigation lands.

Much of the proposed action is detailed in the GPO;<sup>3</sup> however, a number of changes in the GPO were analyzed during the NEPA alternatives development. The proposed action analyzed in this BA reflects the anticipated activities that would take place under the preferred alternative, not the original GPO. Similarly, the impacts in this BA reflect the entire body of analysis conducted to support the NEPA process (2016–present), not solely the effects disclosed in the GPO (2015). In addition to changes in the GPO that occurred during the alternatives development process, certain other post–Draft EIS changes have also been incorporated into the proposed action for this BA. These include:

- Relocation of a process water pond to fit within the boundaries of the West Plant Site, instead of on TNF land. This relocation was identified in the Draft EIS as an option, but not part of the preferred alternative;
- Post–Draft EIS changes in the alignment of the pipeline corridor to further avoid sensitive resources;
- Post–Draft EIS changes in the alignment of the power line corridor to further avoid sensitive resources;
- Post–Draft EIS changes in the closure plans for the Skunk Camp tailings storage facility; and
- Impacts or disturbance associated with lands used for off-site mitigation activities brought forth during the NEPA process and compensatory mitigation required by the CWA Section 404 permitting process.

# 3.2.2 Overview of General Mine Facilities

The proposed action is composed of new mining facilities, existing mining facilities, and existing facilities that are proposed for expansion. The main project components can be summarized as the following, as shown in figure 2:

<sup>&</sup>lt;sup>2</sup> A number of mitigation measures associated with the project—primarily related to recreation—may also result in land disturbance. Three of these are under consideration and may be brought into consultation using a supplemental document: Recreation Users Group trail plan; the Inconceivables climbing access road; and the Castleberry campground (which is located within the boundaries of the Queen Creek compensatory mitigation parcel).

<sup>&</sup>lt;sup>3</sup> Available at: http://www.resolutionmineeis.us/documents/resolution-copper-gpo.

- East Plant Site, which includes the underground mining operations, reroute of access road and associated surface subsidence;
- West Plant Site, which includes mine facilities and reroute of Forest Service and private access roads;
- The Skunk Camp tailings storage facility, including the pipeline corridor needed to convey tailings to the facility and the power line corridor needed to convey power to the facility;
- Filter plant and loadout facility;
- Underground ore conveyor/infrastructure corridor;
- Existing upgraded and new power line corridors to convey power to the East Plant Site and West Plant Site;
- The Magma Arizona Railroad Company (MARRCO) corridor, an existing right-of-way that will contain pipelines to convey copper concentrate to the filter plant and loadout facility, rail lines to convey copper concentrate to market, and will be the location of water supply wells, and other water and power lines.

# 3.2.3 Mine Phases: Construction, Operations, and Closure and Reclamation Activities and Time Frames

The estimated overall life of the mine would be 51 to 56 years and would consist of three phases: (1) construction, (2) operations, and (3) closure and reclamation.

## CONSTRUCTION

- Mine years<sup>4</sup> 1 through 9
- Specific activities would include:
  - Construction of new facilities at the East Plant Site, including new shafts, new roads, new substations, the refrigeration plant, and underground workings. Underground construction at the East Plant Site should be considered to be ongoing throughout the mine life.
  - Construction of new facilities at the West Plant Site, including the concentrator complex, process water pond, water treatment plant, substations, and new or rerouted roads. Ore processing facilities would be complete by mine year 6 and would begin processing ore.
  - Construction of the filter plant and loadout facility, completed by mine year 2.
  - Construction of power lines and pipelines within the various utility corridors, including new infrastructure within the MARRCO corridor.
  - Construction at the Skunk Camp tailings storage facility, including new roads, administrative facilities, and soil or growth media stockpiling. Note that construction at the tailings storage facility should be considered to be ongoing throughout the mine life, as the facility is continually increasing in both height and area.

Construction elements have the potential to affect sedimentation in the watershed. A gravel access road would be constructed generally adjacent to pipelines, running along the same corridor except in those

<sup>&</sup>lt;sup>4</sup> The term "mine year" was coined for the Draft EIS to allow consistency in descriptions for different activities. Mine year 1 is assumed to start with the approval of the record of decision. Note that before disturbance can occur on any NFS land, a final authorization that incorporates all requirements of the Forest Service decision must be obtained; in practice this final authorization could be either a final mine plan or a special use permit.

areas with limited access, such as tunnel, bridge, and water crossing segments. The access road would run the full length of the pipeline at the same grade and would be designed to allow all-weather access and to prevent scouring and erosion. Overhead power lines would be constructed in the same vicinity generally parallel to the pipeline corridor. Pipe bridges would be constructed where required to cross major drainages or washes. Slope stabilization measures would be implemented to mitigate unstable slope hazards, including horizontal drains and/or toe buttressing. In addition, erosion protection measures would be implemented, particularly at toe areas of watercourse crossings. A 15-ft wide by 15-ft tall horseshoe shaped tunnel would be constructed in the Kings Crown Peak in order to maintain acceptable pipeline slope. Facilities along the pipeline will also include an emergency flushing tank and event pond, used for extreme circumstances to prevent pipeline plugging and potentially mitigate a leak event.

Channels and culverts would be constructed to allow passage of stormwater to maintain existing upland runoff and major drainage paths that cross the corridor. These would be designed to 100-year discharge rates. Where it is not practical to install a culvert along the alignment of an existing stream (e.g., where the corridor is in a cut), or where the discharges are small, runoff will be collected in the up gradient diversion channel and conveyed parallel to the corridor for conveyance through culverts placed at desired locations.

# OPERATIONS

- Mine years 6 through 46
- Specific activities would include (see figure 3 for process schematic):
  - Production of 132,000 to 165,000 tons per day of ore from the East Plant Site. Operations would be 24 hours a day, 365 days a year. Ore would be partially crushed underground and then transported underground to the West Plant Site for processing.
  - Ore would be processed into copper and molybdenum concentrate at the West Plant Site. Copper concentrate would be pumped along a pipeline in the MARRCO corridor to the filter plant and loadout facility. Molybdenum concentrate would be trucked directly from the West Plant Site.
  - Further dewatering of the copper concentrate occurs at the filter plant and loadout facility, then copper concentrate is loaded and transported by rail to market. The final smelter destination is unknown at this time.
  - Processing would also create 1.4 billion tons of tailings as waste material. Tailings would be piped to the Skunk Camp tailings storage facility. The tailings storage facility would continually expand over time and tailings would remain in the storage facility in perpetuity.

Operation and maintenance activities would occur on a regular basis and would involve physical activity along the pipeline corridor. Throughout the life of the project, regular patrols would be used to assess all areas of the pipeline route. The patrol route would be conducted at least 26 times each calendar year at intervals not exceeding 3 weeks and serve to inspect the surface conditions on or adjacent to each pipeline right-of-way and the condition of crossings under navigable waterways. Methods of patrol would include walking, driving, flying or other appropriate means of traversing the right-of-way. A comprehensive aboveground coating evaluation would be conducted on the mainline pipelines within 18 months but no sooner than 6 months following backfill. Intelligent pigs would be used to periodically assess pipeline condition.

The pipeline would be designed with control measures in accordance with relevant standards and guidelines, some of which would require maintenance activities along the pipeline corridor during operation. Corrosion control elements such as external corrosion resistant coating and an impressed current cathodic protection system will be installed. The external corrosion resistant coating would

require occasional monitoring. The cathodic protection system generally requires monthly checks to inspect exposed system components in order to ensure equipment is intact as well as to identify and repair any potential damage to test stations, junction boxes, rectifier, or connections. In addition, detailed yearly inspections would be required for the cathodic protection system. Slope instability represents a geohazard that could adversely affect safe operation of the pipeline. For all locations that are identified as having low to moderate potential for slope instability, site inspections would be performed and measurements with geotechnical instrumentations would be taken regularly to monitor slope performance. Some areas along the pipeline corridor have been identified as having "moderate to high" potential for ground subsidence due to their proximity to the underground mine subsidence and would be regularly monitored through aerial patrols and ground inspections. Flow and pressure monitoring would include regular inspections of the complete pipeline system, system components (tunnel, bridge, etc.) and right-of-way.

# Typical Vegetation Management Activities below Powerlines

The following measures are typical of the types of vegetation management activities that occur below po\*werlines on USFS and BLM lands in Arizona. The examples are from Arizona Public Service and the Salt River Project. These measures are not specifically prescribed for the proposed action; however, they show the types of vegetation management that might occur under the powerlines associated with the proposed action.

Information from the Maintenance of Utility Corridors on the Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests within Arizona Public Service (APS) rights-of-way (ROWs). March 4, 2019 document includes:

- Manual and mechanical vegetation treatments in form of hazard vegetation maintenance and routine vegetation maintenance
  - Hazard vegetation includes plants or portions thereof that could come into close proximity or contact with electrical lines, structures, or equipment, and plants that exhibit a structural defect that increases its chances of failing and contacting utility infrastructure.
  - Manual treatment consists of crews removing or pruning trees and brush using chainsaws and hand tools such as hand or pole saws. Crews usually cut or fell vegetation from the ground, although workers may climb trees and prune or remove the tree by dropping it in pieces. Bucket trucks may also be used to access upper portions of trees where access allows.
  - Mechanical vegetation treatment involves the use of a cutting device mounted on a vehicle with rubber tires or tracks that cuts and masticates or pulverizes vegetation. The use of mechanical vegetation treatment may be limited due to archaeological sites, sensitive plant and wildlife species, public use areas, target vegetation species and density, terrain, and access. All vegetation the mower masticates will remain in the ROW with depth not exceeding four inches.
  - Defensible Space Around Poles treatments used for all wooden utility poles and areas around poles at risk of fire ignition from spark-emitting electrical equipment. Treatment results in a 20-ft diameter of combustible-free space around the base of each pole. Combustible debris is moved outside the diameter using leaf rakes, string trimmers, handsaws, and herbicides.
  - Pole clearing around towers and poles where Defensible Space Around Poles treatments are
    not implemented. Crews remove shrubs and trees within the appropriate radius (40-ft from
    pole or tower on 115, 230, 345, and 500 kV lines; 10 feet for distribution and 69kV lines) to
    reduce/clear fuels and allow space for vehicles to access the pole or tower. Vegetation
    maintenance ranges from complete removal of all woody vegetation (areas of high fire risk or
    high vegetation density) to only thinning out existing vegetation to the extent that only
    grasses, forbs, and small growing shrubs remain.

- The schedule of vegetation maintenance can range from 1 to 7 years.
- Following manual clearing, crews could employ four different herbicide application methods: foliar, cut stump, basal, and pre-emergence. Herbicide would be applied using a hand-held sprayer.
  - Foliar application would be used when incompatible vegetation is very dense throughout the ROW. First application would occur one to two years after manual or mechanical vegetation maintenance, and the second treatment would occur one to two years after the initial application. After that, routine treatments would occur cyclically every 8 years based on incompatible vegetation growth.
  - Cut-stump technique would be used for small-scale localized treatment of small groups of trees and is most successful when applied immediately after cutting the tree trunk/bole (typically within 15 minutes). Frequency of application would be consistent with manual and mechanical vegetation maintenance.
  - Basal application is most effective on trees less than six inches in diameter and treatment can occur any time of year, though it is most effective during the growing season.
  - Pre-emergence application would be used within Defensible Space Around Poles treatment areas. Pre-emergence treatment is typically used where there is predictable rainfall within 30 to 60 days of application.
- Vegetation will be disposed to minimize effects to plant and animal species while mitigating fire risk. Limbs and logs <9in dbh may be lopped and scattered or chipped. Logs >9in dbh remain where felled and cut in sections to lay flush with the ground.

Information from the APS/SRP treatment/maintenance of vegetation within authorized power line ROWs located within the Bureau of Land Management's (BLM) Hassayampa, Kingman, Lake Havasu, Lower Sonoran, Tucson, Safford, and Yuma Field Offices in Arizona (AZ). September 6, 2017 document includes:

- Vegetation maintenance is generally the same as listed above for FS, although with some small adjustments, listed below.
- Routine vegetation maintenance would occur on a schedule ranging from 1-5 years.
- Foliar technique treatments would occur cyclically every 5-8 years based on incompatible vegetation growth.

Information from the Integrated Vegetation Management (IVM) program, the Parker-Davis Transmission System (Parker-Davis System), in portions of Cochise, Mohave, Maricopa, Pinal, Pima, and Yavapai Counties, Arizona. August 10, 2015 includes:

- Two step-approach to vegetation management: 1) initial treatment, and 2) long-term maintenance of ROW vegetation
- Initial treatment
  - All vegetation except grasses, forbs, and some small shrubs would be removed from within the ROW
  - Danger trees outside the ROW would be removed, and include trees located within or adjacent to the ROW that present a hazard to employees, the public, or power system facilities, as well as trees that may bend, grow, swing in, or fall towards the power lines.

- Long-term maintenance
  - Maintain required clearance, which ranges from 20 ft for 69-kV lines to 29 ft for 500 kV lines
  - Manual control methods include cutting, pruning, and trimming with hand tools or power saws or installation of synthetic or natural barriers to manage vegetative growth.
  - Mechanical control methods include use of self-propelled machine platforms with various interchangeable treatment-head attachments.
  - Slash would be chipped and scattered (if using a mechanical chipper); lopped and scattered; or burned in piles.
  - Herbicide use would follow measures outlined in *Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service*

## **CLOSURE AND RECLAMATION**

- Mine years 46 through 51 to 56. Note that some reclamation activities occur during construction and operation phases. Examples include revegetation and stabilization along utility corridors and temporary construction areas, and concurrent reclamation on portions of the tailings storage facility embankment.
- Specific activities include:
  - Decommissioning, removing, and closing facilities.
  - Recontouring and regrading disturbed surfaces.
  - Replacing growth media, which could be stockpiled soils or other material such as Gila conglomerate.
  - Revegetating surfaces.
  - Closure of the tailings storage facility. The sequence and timing of closure of the tailings storage facility depends primarily on water management. Closure activities could last decades and could require ongoing active water treatment.

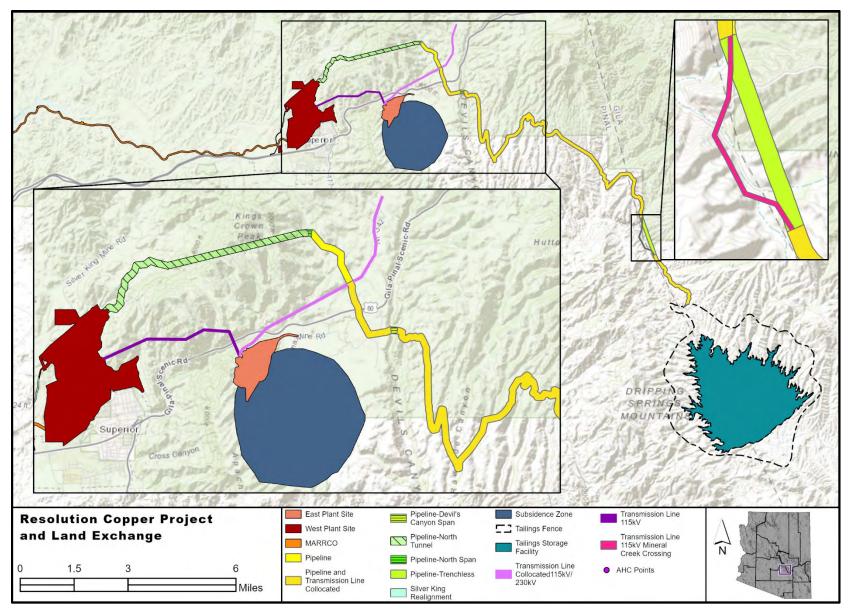


Figure 2. Proposed action components

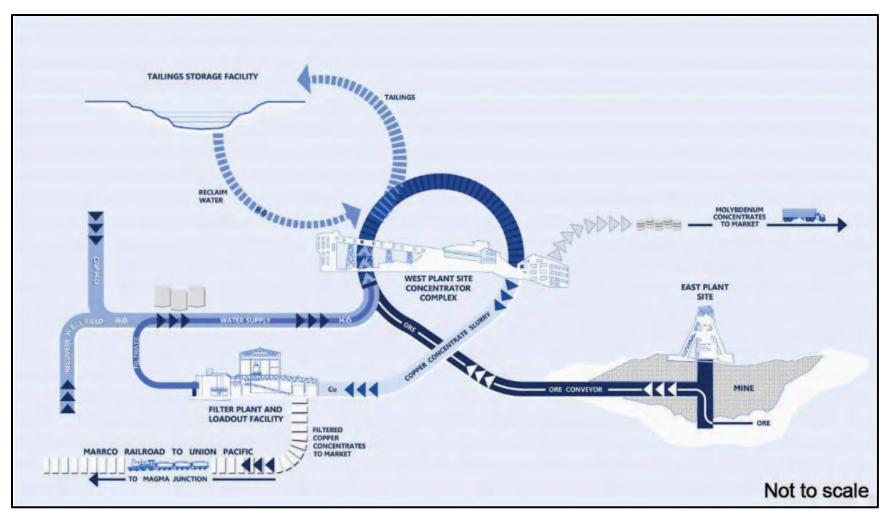


Figure 3. Overview of the mining process at full operation

# 3.2.4 Types of Impacts Anticipated from Mine Construction and Operations

# UNDERGROUND MINING AND SUBSIDENCE

The type of copper deposit that would be mined at the East Plant Site is a porphyry deposit located between approximately 4,500 and 7,000 feet below the area known as Oak Flat. Resolution Copper proposes to mine the copper deposit using a method known as panel caving, a type of block caving that is commonly used as a large-scale mining method. The copper deposit that Resolution Copper proposes to mine averages 1.54 percent copper (i.e., every ton of ore would on average contain 31 pounds of copper).

The panel caving mining system divides the ore into large sections or panels and depends on gravity and internal geological stresses to extract ore from underneath the ore body. After accessing the area below the copper deposit through the construction of vertical shafts, a network of tunnels is excavated under the copper deposit. The tunnels would be created by standard underground techniques, including drilling, blasting, and removing the blasted rock. Once the tunnels are built below the copper deposit, the ore above is blasted in order to fracture it. The ore then collapses downward, is removed, and is crushed. Once crushed, the ore would be conveyed to a production shaft where it would be hoisted approximately halfway to the surface (approximately 3,500 feet below surface) and sent to the West Plant Site via an inclined underground-to-surface conveyor system. All of these steps occur underground.

The continued process of collapsing and excavating the ore would be repeated until the copper deposit is exhausted or the grade of the collapsed ore is no longer economically viable. Over the 40-year operations phase, this process would be applied at six panels adjacent to one another (figure 4). The mining sequence would begin away from Apache Leap in Panel 2; subsequently mined panels would be Panels 3, 1, 4, 5, and 6, as shown in figure 4. Under the proposed action, mining would not occur within some sections of the 1 percent copper deposit shell nearest Apache Leap to minimize risk of subsidence at Apache Leap.

As the panel caving process is repeated, the volume of ore extracted from the underground mine is expected to cause the ground surface above the ore body to collapse or subside. The size and depth of the land surface depression are primarily affected by the depth and footprint of the ore body. Resolution Copper has conducted simulations and modeling to predict the potential area that would subside, beginning at the surface in about the sixth year of active mining. The overall subsidence would consist of three areas: (1) the crater limit, (2) the fracture limit, and (3) the continuous subsidence limit. Table 4 identifies the characteristics of each of the three subsidence areas, as well as the acreages of each area that are predicted to occur under the proposed action. Figure 4 shows a map of the predicted mining subsidence areas, and figure 5 shows a cross section and aerial views of the predicted subsidence areas.

Subsidence Subarea	Characteristics	Predicted Acreage of Each Area
Crater limit	Large, visible crater with cave angles of 70 to 78 degrees and with a depth between approximately 800 and 1,115 feet at the end of mine life	1,341.7
Fracture limit	Visible deformation in a conical form between the surface and cave zone; characterized by rotational failures, tension and dislocation cracks, benching, fractured surfaces, and toppling	256.4
Subsidence limit	Extremely small rock deformations that can only be detected by high- resolution monitoring equipment (would not be visible in the soil or on the ground)	159.0
Total Area of Subsidence		1,757

Source: Garza-Cruz and Pierce (2017)

Dewatering of the deep groundwater system below the East Plant Site has taken place since 2009, in order to allow for building of infrastructure. This dewatering would continue throughout the life of the mine. Currently, the deep groundwater system is isolated, but as the fractured zone of rock above the ore body extends to the surface, the fractures intersect the overlying Apache Leap Tuff aquifer and partially dewater this aquifer as well. Both the deep groundwater system and the Apache Leap Tuff aquifer supply water to springs or perennial streams, which could be impacted by water loss.

Types of impacts anticipated from underground mining and subsidence include:

- Physical impact caused by the subsidence area (1,598.1 acres, defined by the fracture limit);
- Potential dewatering effects from loss of groundwater to springs or streams (see later Anticipated Groundwater and Surface Water Effects section); and
- Potential reduction in stormwater flows in Queen Creek and Devil's Canyon, caused by loss of part of the watershed from the subsidence area (see later Anticipated Groundwater and Surface Water Effects section).

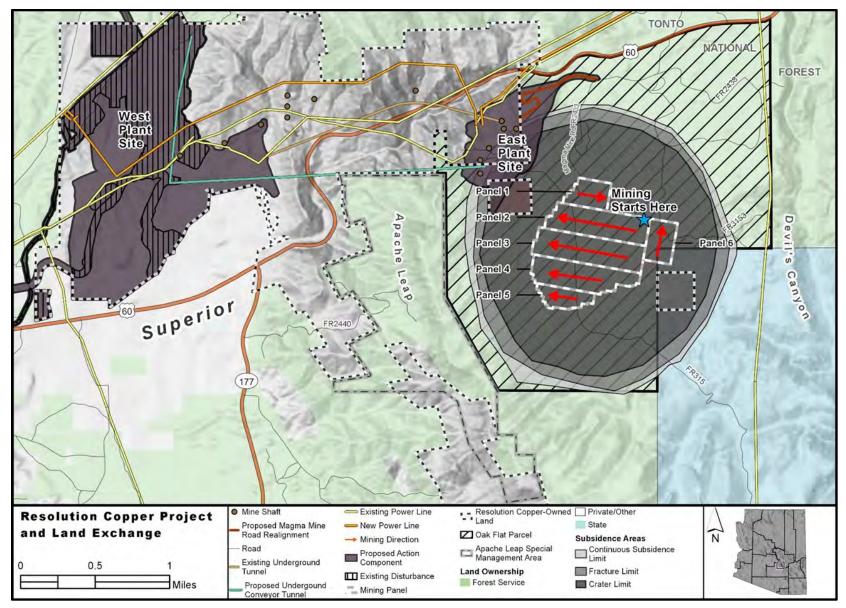


Figure 4. Predicted mining subsidence areas and the East Plant Site area

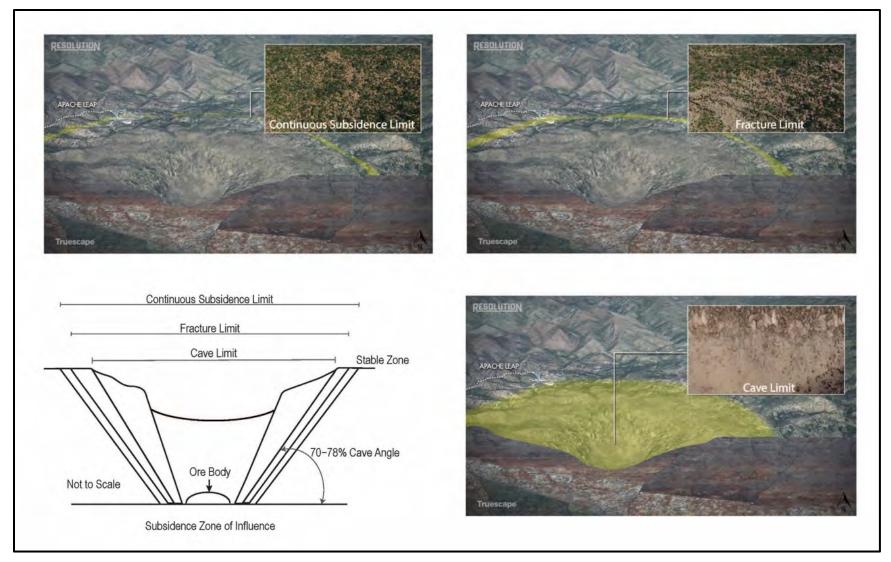


Figure 5. Cross section and aerial photograph simulations of the predicted subsidence areas

## EAST PLANT SITE

The East Plant Site includes the surface support facilities for underground mining activities, such as the access shafts, refrigeration, ventilation, and surface support buildings. Portions of the East Plant Site are currently disturbed. Access to the East Plant Site would occur via Magma Mine Road, which would likely be rerouted in the future due to anticipated subsidence impacts.

Types of impacts anticipated at the East Plant Site include:

- Physical footprint of facilities
  - o 188.8 acres total, or 105 acres if areas overlapping the subsidence area are excluded
  - o 15 acres for reroute of Magma Mine Road
- Potential for light, noise, and vibration during construction and operations
- Traffic along Magma Mine Road
  - During construction peak hour: 438 employee trips, 22 material/equipment trips
  - o During operations peak hour: 332 employee trips, 22 material/equipment trips

## ORE CONVEYOR/INFRASTRUCTURE CORRIDOR

The underground conveyance system would be composed of an underground tunnel with two conveyors that are inclined at approximately 10 degrees for more than 2.5 miles. Surface disturbance from the inclined underground to surface conveyor system would be limited generally to the shafts above the conveyor feed at the East Plant Site, an exhaust raise (and ventilation fans) along the conveyor tunnel alignment for ventilation, the tunnel portal at the West Plant Site, and the overland portion of the conveyor at the West Plant Site, all of which would be located on private land owned by Resolution Copper.

Types of impacts anticipated for the ore conveyance/infrastructure corridor include:

- Minimal physical disturbance at the surface from exhaust raise
- Potential for noise and vibration during construction and operations

### WEST PLANT SITE

The West Plant Site consists of three main facilities: (1) the stockpile, which includes the development rock and intermediate rock stockpiles; (2) the concentrator complex, which includes the process water pond, ore stockpile facility, tailings thickeners, copper molybdenum and copper concentrator thickeners (thickeners), and the molybdenum plant; and (3) the auxiliary facilities, which include the administration building, contractor and warehouse laydown yards, and construction and employee parking.

The footprint of the West Plant Site would be on private lands owned by Resolution Copper, portions of which are currently disturbed. The GPO had described a process pond on NFS land north of the West Plant Site, but it was determined that moving the process pond onto Resolution Copper private property would reduce impacts on NFS resources; this change is incorporated as part of the proposed action in the BA.

Access to the West Plant Site would be via Silver King Mine Road (NFS Road 229), which is on both private and NFS lands. Portions of NFS Road 229 across private land would be reconstructed to Mine Safety and Health Administration (MSHA) specifications and maintained by Resolution Copper. This

road would be used as an alternate road to transport mine personnel, equipment, supplies, and molybdenum and other mine products, to and/or from the West Plant Site.

Types of impacts anticipated for the West Plant Site include:

- Physical footprint of facilities
  - o 940 acres
- Potential for light and noise during construction and operations
- Traffic to and from the West Plant Site
  - o During construction peak hour: 1,038 employee trips, 22 material/equipment trips
  - o During operations peak hour: 336 employee trips, 22 material/equipment trips

# SKUNK CAMP TAILINGS STORAGE FACILITY

Approximately 1.4 billion tons of tailings produced by the mining operation would need to be stored in perpetuity. Ore processing at the West Plant Site results in two separate streams of tailings: potentially acid generating (PAG) tailings, representing about 16 percent of the tailings, and non-potentially acid generating (NPAG) tailings, representing about 84 percent of the tailings. These two tailings streams are handled differently once they reach the tailings storage facility, but both would be pumped to the tailings storage facility as a slurry. The tailings would be 50 to 70 percent solids when placed into the facility.

The Skunk Camp alternative tailings facility location is currently on a mixture of ASLD-administered and private land, which would eventually be purchased by Resolution Copper, that would occupy the upper portion of Dripping Spring Valley, the northeastern slopes and foothills of the Dripping Spring Mountains, and the southwestern foothills of the Pinal Mountains, including a 4-mile reach of Dripping Spring Wash, a 3.5-mile reach of Stone Cabin Wash, and a 4.8-mile reach of Skunk Camp Wash. All of these are ephemeral washes characterized by xeroriparian vegetation and habitat. The proposed site lies approximately 2 miles due east of the existing ASARCO Ray Mine and approximately 13 miles north of the point where Dripping Spring Wash drains into the Gila River.

The Skunk Camp tailings storage facility would comprise two physically separate starter facilities (PAG and NPAG) that would later merge. Once delivered as a slurry to the Skunk Camp site, NPAG tailings would be cycloned to separate the coarser particles for use as embankment fill, with the cyclone overflow (i.e., finer particles) being thickened at the tailings storage facility site before discharge into the impoundment. PAG tailings would be deposited into two separate cells, operated sequentially behind a separate cycloned sand embankment, to the north (upstream) end of the facility until they are encapsulated by the NPAG tailings (figure 6). Having separate facilities for the NPAG and PAG tailings is necessary; PAG tailings are deposited subaqueously, and the PAG cell is designed to have a perpetual water cap in order to avoid free oxygen interacting with pyrite minerals in the tailings. The Skunk Camp tailings facility design uses two smaller PAG cells in order to minimize the area required for the recycled water pond, reducing evaporation and potential wildlife exposure.

The PAG and NPAG cells would be impounded by separate cross-valley starter embankments initially constructed of borrow material from within the ultimate tailings facility footprint. The impoundments would then periodically be raised in elevation during operations with compacted cycloned sand fill. The NPAG cell would use a "centerline" embankment construction approach, while the PAG cells would be constructed as "downstream" embankments.

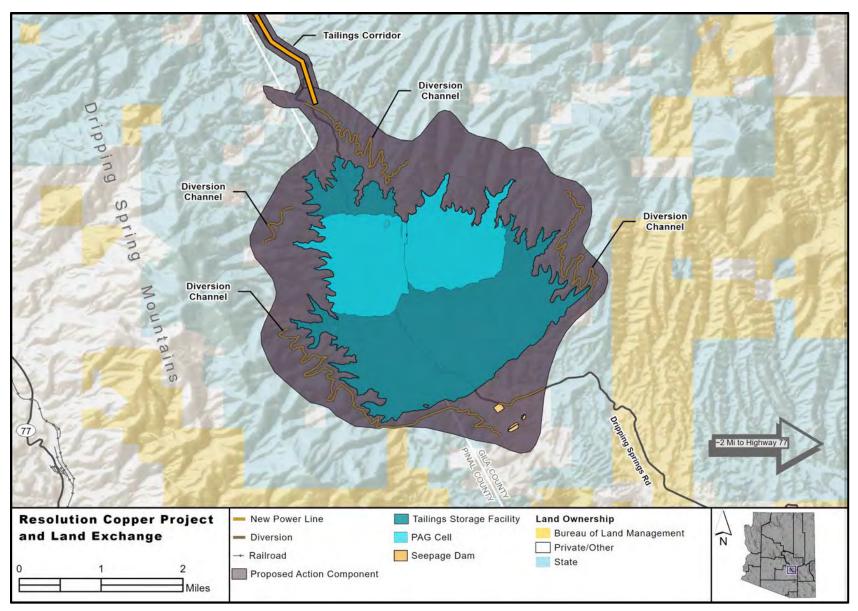


Figure 6. Proposed action tailings storage facility

The NPAG embankment would contain an underdrain system comprising sand and gravel blanket and finger drains (primarily along main drainages, with some extended beneath the NPAG beach) to maintain a low saturated surface in the tailings embankment and to intercept and direct seepage from the impoundment to the downstream seepage collection system ponds. Additional seepage controls (grout cutoff wall, seepage collection pond, pumpback wells) would be placed downstream of the tailings storage facility to collect seepage entering the environment. At full buildout, the embankment containing the NPAG tailings would be approximately 490 feet in height. The PAG cell embankment would be behind (upstream) and ultimately contained within the larger NPAG tailings deposit.

Five diversion dams, five diversion channels, and two non-contact water surface-water pipelines would be constructed along the east and west sides of the tailings storage facility to intercept and route the upstream catchments around the facility. Collection ditches would be constructed along the embankment toe and at underdrain discharges to convey contact water to the seepage collection pond. Additional facilities at the Skunk Camp site would include the cyclone processing system (building to house the hydrocyclone(s), slurry dilution tanks, storage tanks, and associated equipment); an electrical substation and electrical distribution lines; a vehicle maintenance and fuel shop; equipment storage warehouse; administration and locker room facilities; and parking areas. Traffic would access the tailings storage facility along Dripping Springs Road. Table 5 summarizes the components of the Skunk Camp tailings storage facility.

Tailings Storage Facility	Description
Location	In Dripping Spring Wash approximately 13 miles north of confluence with the Gila River
Land ownership	ASLD, private
Distance from West Plant Site	15 miles
Tailings type and disposal	Thickened slurry tailings placed subaqueously for PAG tailings from barge in one of two cells, NPAG placed hydraulically from perimeter.
	At disposal—PAG tailings would be 50% solids content; thickened cyclone overflow (NPAG) would be 60% solids content; and thickened NPAG stream sent directly from the mill would be 60% solids content.
Tailings embankment	Earthen starter dams raised with compacted cyclone sand. The NPAG facility would be a centerline construction approach with a 3H:1V slope and the PAG cells would be a downstream construction approach with a 2.5H:1V slope.
Lining and other seepage controls	Engineered, low-permeability layers would be installed on PAG cell foundation and the upstream slope of the embankment.
Approximate size at fence line of tailings storage facility	8,136 acres within fence line; 4,002 acres within footprint of disturbance
Approximate embankment height	490 feet
Pipelines/conveyance	Thickened slurry pumped in two streams (PAG and NPAG) to the tailings storage facility and recycled water pipeline to return water to processing loop at West Plant Site North Option: 22.20 miles of corridor from West Plant Site to tailings storage facility
Auxiliary facilities	Surface water diversions would be large due to the steep surrounding terrain and need to surround the tailings facility on northern, eastern, and western sides with extensive stormwater diversion structures.
Closure and reclamation	Reclamation of the NPAG tailings embankment face would begin as soon as the slope reaches its final extent starting at approximately mine year 10–15. The top of the tailings storage facility would not be reclaimed until after mining is complete.
	Closure of the tailings recycled water pond is estimated to take up to 5 years after closure. Until that time, excess seepage in seepage ponds would be pumped back to the recycled water pond, and reclamation would take place on the embankment and tailings beaches. After the recycled water pond is closed, seepage ponds would be used to evaporate seepage, and the remaining reclamation of the tailings surface would occur.

#### Table 5. Summary of Skunk Camp tailings storage facility

Types of impacts anticipated for the Skunk Camp tailings storage facility include:

- Physical footprint of facilities
  - 8,136 acres within fence line
  - 4,002 acres of disturbance within the fence line
- Potential for light and noise during construction and operations
- Traffic to and from the tailings storage facility
  - During construction peak hour: 42 employee trips, 22 material/equipment trips
  - During operations peak hour: 24 employee trips, 22 material/equipment trips

## TAILINGS PIPELINE CORRIDOR

The tailings pipeline corridor would include multiple pipelines, an access road, and power and communication lines, and have been designed to follow existing roads or disturbance where possible. Pipeline installation, spill containment necessary based on pipeline installation method, and access and bypass roads necessary would vary by topography and alternative routing option selected. The installation designs would vary based on topography throughout each corridor segment and general design configurations are shown in figure 7.

The entire 500-foot width of the corridor is assumed to be disturbed by project activities for the purposes of the BA; however, the entire width would not be disturbed during construction. Based on initial conceptual designs, the right-of-way for the pipeline is likely to be 150 feet wide with only a portion of that disturbed during construction. Additionally, the Forest Service has indicated that the eventual special use permit would not allow or approve disturbance of the entire 500-foot width. Disturbance would consist of excavation, stockpiles, laydown areas, vegetation clearing, and structures. Permanent disturbance would primarily be associated with an access road that overlaps these rights-of-way and infrastructure like tower footings. Other disturbed areas would be reclaimed and revegetated after construction.

The pipeline corridor included as part of the proposed action in this BA differs from the pipeline corridor analyzed in the Draft EIS. The corridor has been modified to reduce resource impacts. The most important change is moving the corridor to avoid much of Mineral Creek and portions of the Government Springs Ranch; in the original configuration included in the Draft EIS, the pipeline paralleled Gila chub habitat in Mineral Creek for several miles.

There are three specific stream crossings that would take place along the corridor: Queen Creek, Devil's Canyon, and Mineral Creek.

- The Queen Creek and Devil's Canyon crossings would take place at locations that do not have perennial flow and would utilize a pipe bridge of similar structure to span Queen Creek and Devil's Canyon. No disturbance would take place to the streambed or habitat along the streams in these locations.
- The Mineral Creek crossing would take place upstream of Government Springs Ranch. The crossing has been designed to minimize impacts, as this location consists of Proposed Critical Habitat for yellow-billed cuckoo. Specific design measures implemented to minimize potential effects at this crossing would include:
  - The pipelines would use a trenchless crossing (underground boring) to go beneath both Mineral Creek and critical habitat and would not involve disturbance of the stream or nearby riparian vegetation.

- Power poles would all be located outside of the ordinary high water mark of Mineral Creek and critical habitat, though the lines themselves would pass overhead.
- Construction crews would utilize the existing road and no new access road would be built at the crossing location. Pole locations requiring access through critical habitat would be accessed on foot.

Types of impacts anticipated for the tailings pipeline corridor include:

- Physical placement of the pipeline only:
  - 57.7 acres in the corridor between the end of the North Tunnel and the start of the collocated pipeline and 115-kV transmission line; the acreage of physical disturbance would be less
- Physical placement of the collocated tailings pipeline and 115-kV transmission line:
  - 833.1 acres in the collocated pipeline and 115-kV transmission line from the pipeline only area to the Skunk Camp tailings storage facility fence lines; the acreage of physical disturbance would be substantially less
- Potential for light and noise during construction, and monitoring/maintenance traffic during operations

The areas where the corridor would cross Queen Creek, Devil's Canyon and Mineral Creek would have no additional ground disturbance, but the acres are included as part of the project area. These acres are given below:

- 3.2 acres within the corridor with no ground disturbance where the pipeline would cross Queen Creek
- 5.4 acres within the corridor with no ground disturbance where the pipeline would cross Devil's Canyon
- 60.9 acres for the trenchless crossing with no ground disturbance within the ordinary high water mark of Mineral Creek or within critical habitat.

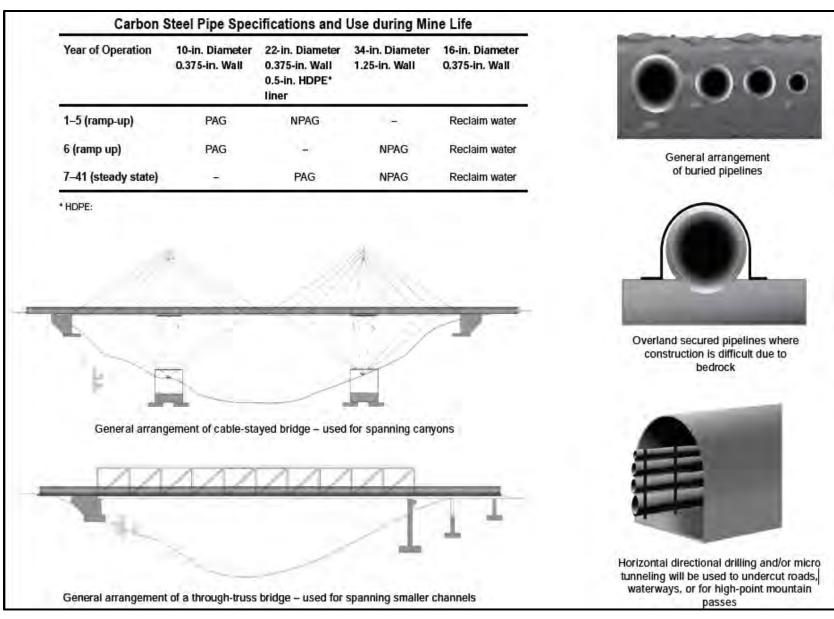


Figure 7. Graphical display of pipeline arrangements used in tailings conveyance corridor design

## MARRCO CORRIDOR

The 30-mile-long MARRCO corridor is an existing railroad and utility corridor running roughly east-west from Superior to Magma Junction. Hewitt Canyon Road (NFS Road 357) provides access to the MARRCO corridor, which crosses private lands as well as lands administered by the TNF and ASLD. Resolution Copper currently owns the MARRCO corridor right-of-way. The corridor generally is 200 feet wide, and private parcels along the MARRCO corridor have been developed, particularly east of Queen Station and near Magma Junction.

The corridor currently contains multiple utility lines and water pipelines and infrastructure, including a buried fiber-optic line, an overhead transmission line and telephone line, buried natural gas pipelines, Arizona Water Supply pipelines and infrastructure providing water supply to the town of Superior, and an 18-inch dewatering line transporting water being dewatered from the East Plant Site to the New Magma Irrigation and Drainage District (NMIDD). New corridor facilities would include additional water pipelines, water pumps and recovery wells, and copper concentrate pipelines to transport ore concentrate to the filter plant and loadout facility. South of the filter plant and loadout facility, the rail lines would also be upgraded to allow use of freight car transport of concentrate to the main line to market. Existing rail lines are anticipated to stay in place between the West Plant Site and the filter plant and loadout facility.

While well pumping would occur in the MARRCO corridor, the depth to water in the East Salt River valley is hundreds of feet below ground surface; no impacts to springs, streams, wetlands, or other sensitive habitat is anticipated from this pumping.

Types of impacts anticipated for the MARRCO corridor include:

- Physical footprint of right-of-way
  - o 685 acres
- Potential for light and noise during construction, and monitoring/maintenance traffic during operations
- Rail traffic from the filter plant and loadout facility to the main rail line
  - Up to 300 "train sets" per year; each train set is 100 cars
  - Equivalent to less than one train set per day

## FILTER PLANT AND LOADOUT FACILITY

The filter plant's primary function would be to filter the copper concentrate to a state that is ready for transportation. The loadout facility's primary function would be to remove water from the copper concentrate to prepare the concentrate for delivery to an off-site smelter and recycle water to be reused in the mine process. The filter plant and loadout facility would be located on 553 acres of previously disturbed private lands controlled by Resolution Copper near San Tan Valley.

Types of impacts anticipated for the filter plant and loadout facility include:

- Physical footprint of facilities
  - o 553 acres
- Potential for light and noise during construction and operations
- Traffic to and from the filter plant/loadout facility on surface streets

- During construction peak hour: 60 employee trips, 16 material/equipment trips
- During operations peak hour: 18 employee trips, 0 material/equipment trips

## ELECTRICITY SUPPLY AND TRANSMISSION LINES

Electricity is currently supplied to the East Plant Site by an existing 115-kilovolt (kV) Salt River Project (SRP) transmission line and to the West Plant Site by an existing 115-kV and 230-kV SRP transmission line to existing facility substations. Construction and operation of the proposed mine would require electrical transmission lines between these main facilities to accommodate greater power needs, as well as new transmission lines to power the tailings storage facility and the filter plant and loadout facility. Substations also would need to be upgraded and/or new 230-kV substations would need to be constructed to accommodate electricity from the upgraded lines and distribute the electricity throughout the site. Figure 8 shows the proposed upgraded and new SRP transmission lines that would supply the main facilities with electricity. Table 6 identifies the main transmission lines that would provide power to each mining facility.

Easements for the transmission lines would vary between 75 and 130 feet, depending on the size of the line and the requirements for construction, maintenance, and electrical clearances. Transmission lines would be either lattice steel towers or tubular steel poles. The foundations for the transmission line structures would be auger-drilled reinforced concrete piers. A lattice tower typically has four legs, each attached to a concrete foundation set into the ground. Steel pole structure footings are typically composed of a steel-reinforced concrete foundation referred to as an "anchor-bolt foundation," onto which the steel pole is bolted.

Wherever possible, existing roads would be used to construct the transmission facilities. In some areas, access roads would be cleared on an as-required basis to ensure adequate access for construction and maintenance activities. Staging areas immediately surrounding line structures would be necessary and would occur within the proposed ROWs, depending on specific site access. Permanent access roads would be constructed along the transmission line alignments that are located in drivable terrain.

The entire 500-foot width of the corridor is assumed to be disturbed for the purposes of the BA; however, it is unlikely that the entire width would be disturbed during construction. Based on initial conceptual designs, the power line right-of-way would vary from 75 to 130 feet wide, with only a portion disturbed during construction. Disturbance would consist of excavation, stockpiles, laydown areas, vegetation clearing, and structures. Permanent disturbance would primarily be associated with an access road that overlaps these rights-of-way and infrastructure like tower footings. Other disturbed areas would be reclaimed and revegetated after construction.

The power line corridors included as part of the proposed action in this BA differ from the power line corridor analyzed in the Draft EIS. The corridor has been modified to reduce resource impacts, particularly with respect to Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*).

Types of impacts anticipated for the power lines include:

- Physical footprint of facilities. Note that construction would take place in accordance with SRP procedures, some of which have been determined through previous consultation with USFWS (see appendix D). For purposes of this document, a 500-foot wide corridor of disturbance was assumed; the acreage of physical disturbance would be substantially less, and the ability to microsite around individual cactus in accordance with conservation measures would reduce impacts further.
  - Transmission line 115-kV only: 3.0 acres within the corridor

- Transmission line 115-kV/tailings pipeline collocated corridor: 294.9 acres within the 500foot corridor
- o Transmission lines collocated: 57.3 acres within the 500-foot corridor
- Potential for light and noise during construction, and monitoring/maintenance traffic during operations
- Operations and maintenance activities, including vegetation management, which would take place in accordance with SRP procedures, some of which have been determined through previous consultation with the USFWS.

## Vegetation Management Below Powerlines

It is anticipated that acceptable vegetation management below the powerline, and particularly where it crosses critical habitat, would be determined during consultation and specified in the Biological Opinion. Vegetation management of similar powerlines was reviewed from a number of recent Biological Opinions in Arizona, including:

- Maintenance of Utility Corridors on the Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests within Arizona Public Service (APS) rights-of-way (ROW). March 4, 2019.
- Continued implementation of the Phase II utility (Salt River Project and Arizona Public Service) maintenance project on newly listed species and their proposed critical habitat. May 24, 2018.
- APS/SRP treatment/maintenance of vegetation within authorized power line ROWs located within the Bureau of Land Management's (BLM) Hassayampa, Kingman, Lake Havasu, Lower Sonoran, Tucson, Safford, and Yuma Field Offices in Arizona (AZ). September 6, 2017.
- Integrated Vegetation Management (IVM) program, the Parker-Davis Transmission System (Parker-Davis System), in portions of Cochise, Mohave, Maricopa, Pinal, Pima, and Yavapai Counties, Arizona. August 10, 2015.
- Emergency Hazard Vegetation Treatment in Utility Corridors on Arizona Forests located in the Apache-Sitgreaves (ASNF), Coconino (CNF), Kaibab (KNF), Prescott (PNF), and Tonto National Forests (TNF), Arizona. December 5, 2008.
- Phase I Hazard Vegetation Removal in Utility Corridors on Arizona Forests located in Apache-Sitgreaves (ASNF), Coconino (CNF), Kaibab (KNF), Prescott (PNF), and Tonto National Forests (TNF), Arizona. July 5, 2007.
- 500-3 500 kV APS and SRP vegetation clearance project on the Pleasant Valley Ranger District of the Tonto National Forest (TNF) located in Gila County, Arizona. January 10, 2007.
- Arizona Electric Power Cooperative, Inc. (AEPCO) vegetation clearing, roadways, and tree trimming at two Gila River transmission line crossings located in Graham County, Arizona. June 5, 2000.

Pertinent aspects of three of the most recent Biological Opinions are summarized below, focusing on conservation measures, reasonable and prudent measures, or conservation recommendations for any of the species considered in the BA with presence near the powerline corridor: Arizona hedgehog cactus, Gila chub, southwestern willow flycatcher, or yellow-billed cuckoo. Note that northern Mexican gartersnake does not occur in the vicinity of the powerlines.

Biological Opinion for APS Maintenance, Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests, March 4, 2019

#### Conservation Measures, Southwestern Willow Flycatcher (p. 15)

- 1. Implement Riparian Area Conservation Measures and Design Features found in Appendices E and F of the BA within occupied and suitable southwestern willow flycatcher habitat.
- 2. Do not drive All Terrain Vehicles (ATVs) within 50 meters (164 feet) of southwestern willow flycatcher habitat (riparian vegetation) during the nesting season (May 1 to August 31) except on existing roads that are open to the public.
- 3. Avoid herbicide application during the nesting season from May 1 to August 31 whenever possible. If herbicide application is necessary during the nesting season, ensure that crews use the least number of trips in and out, and that workers walk only in the ROW and open areas and not in dense thickets of vegetation where suitable nesting habitat may occur.
- 4. Avoid non-hazardous groundwork disturbance in the floodplain containing occupied breeding habitat or suitable breeding habitat if occupancy is unknown between May 1 and August 31.
- 5. For LiDAR flights do not land for refueling or stage the helicopter within 0.25 mile of southwestern willow flycatcher occupied habitat during the breeding season.

#### Conservation Measures, Yellow-billed Cuckoo (p. 15)

- 1. Implement Riparian Area Conservation Measures and Design Features found in Appendices E and F of the BA within occupied and suitable yellow-billed cuckoo habitat.
- 2. Do not drive ATVs within 50 meters (164 feet) of yellow-billed cuckoo suitable breeding habitat during the breeding season from May 1 to September 30 except on existing roads that are open to the public.
- 3. Avoid herbicide application during critical times of the nesting season from May 1 to September 30 whenever possible. If herbicide application is necessary during the nesting season, ensure that crews use the least number of trips in and out, and that workers walk only in the ROW and open areas and not in dense thickets of vegetation.
- 4. For non-hazardous groundwork, avoid groundwork disturbance in the floodplain containing occupied breeding habitat between May 1 and September 30.
- 5. For LiDAR flights, APS would not land the helicopter for refueling within 0.25 mile of yellow-billed cuckoo occupied habitat during the breeding season.

#### Reasonable and Prudent Measures

There was no take anticipated for these species, so no reasonable and prudent measures were included in the BO.

#### Conservation Recommendations, Southwestern Willow Flycatcher (p. 79)

1. We recommend that the Forest Service and APS continue to monitor changing habitat conditions, rules and regulations, and the status of the flycatcher and fund or conduct protocol surveys in appropriate areas within the action area to determine the presence and status of flycatchers, especially in areas adjacent to ROWs.

2. We recommend the Forest Service and APS implement conservation strategies and recovery actions identified in the Recovery Plan to improve the distribution and abundance of breeding southwestern willow flycatchers.

#### Conservation Recommendations, Yellow-Billed Cuckoo (p. 79)

- 1. We recommend that the Forest Service and APS continue to monitor changing habitat conditions, rules and regulations, and status of the cuckoo and fund or conduct protocol surveys in appropriate areas within the action area to determine the presence and status of yellow-billed cuckoos, especially in areas adjacent to ROWs.
- 2. We recommend that the Forest Service and APS continue to cooperate with the Service and other partners to conduct research to understand vital yellow-billed cuckoo habitat requirements, response to changing habitat conditions, home range, foraging strategies, and other important life history information that would contribute to the management and recovery of their habitat and analysis of potential effects from proposed projects.

Biological Opinion for APS/SRP treatment/maintenance of vegetation, BLM Hassayampa, Kingman, Lake Havasu, Lower Sonoran, Tucson, Safford, and Yuma Field Offices, September 6, 2017

#### General Riparian Area Conservation Measures (p. 13)

- 1. Do not operate a mechanical mower within riparian vegetation. Riparian vegetation shall be removed or pruned using manual methods.
- 2. Within riparian areas, wetlands, and aquatic habitats, conduct herbicide treatments only with herbicides that are approved for use in those areas.
- 3. Within or near riparian areas, avoid using glyphosate formulations that include R-11, and either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available.
- 4. Within or near riparian areas, special care should be followed when transporting and applying 2,4-D, bromacil, clopyralid, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, tebuthiuron, and triclopyr.
- 5. When working in riparian areas, wetlands, and near other aquatic habitats. Access work site only on existing roads, and restrict all travel on roads when damage to the road surface would result or is occurring.
- 6. Outside of riparian areas, driving off established roads is allowed only on slopes  $\leq 20\%$ .

#### Conservation Measures, Southwestern Willow Flycatcher (p. 14)

- 1. Implement Riparian Area Conservation Measures found in Error! Reference source not found [sic]. Appendix D within occupied and suitable southwestern willow flycatcher habitat.
- 2. Do not conduct manual vegetation maintenance activities within suitable habitat for southwestern willow flycatchers during the breeding season from May 1 to August
- 3. Within southwestern willow flycatcher suitable, occupied or suitable habitat, apply glyphosate, hexazinone, and triclopyr at the typical rather than the maximum application rate.
- 4. Do not apply 2,4-D within southwestern willow flycatcher habitats.

- 5. The following buffers shall be implemented for occupied or suitable habitat:
  - a. Herbicide of O and 1 toxicity in the small avian toxicity group may be applied with no buffer (includes all proposed herbicides except dicamba).
  - b. Do not apply herbicides of Class 2 in the small avian toxicity group within 10 feet of the edge of the species' habitat (includes dicamba).
  - c. Do not apply herbicides of Class 3 in the small avian toxicity group within 20 feet of the edge of the species' habitat (no class 3 toxicity herbicides in the small avian toxicity group are proposed at this time).
- 6. For APS lines, do not drive **ATVs** within 50 m of southwestern willow flycatcher habitat (riparian vegetation) during the nesting season (May 1 to August 31) except on existing roads that are open to the public.
- 7. For APS lines, avoid herbicide application during the nesting season from May 1 to August 31 whenever possible. If herbicide application is necessary during the nesting season, ensure work is conducted with the least number of trips in and out and workers walk only in the ROW and open areas and not in dense thickets of vegetation.

#### Conservation Measures, Yellow-billed Cuckoo (p. 14)

- 1. Implement Riparian Area Conservation Measures within occupied and suitable yellow-billed cuckoo habitat.
- 2. Do not conduct manual vegetation maintenance activities within suitable habitat for yellow-billed cuckoo during the breeding season from May 15 to September 30.
- 3. Within western yellow-billed cuckoo occupied or suitable habitat, apply glyphosate, hexazinone, and triclopyr at the typical rather than the maximum application rate.
- 4. Do not apply 2,4-D within yellow-billed cuckoo habitats.
- 5. The following buffers shall be implemented for occupied and/or suitable habitat:
  - a. Herbicide of O and 1 toxicity in the small avian toxicity group may be applied with no buffer (includes all proposed herbicides except dicamba).
  - b. Do not apply herbicides of Class 2 in the small avian toxicity group within 10 feet of the edge of the species habitat (includes dicamba).
  - c. Do not apply herbicides of Class 3 in the small avian toxicity group within 20 feet of the edge of the species habitat (no class 3 toxicity herbicides in the small avian toxicity group are proposed at this time).
- 6. For APS lines, do not drive ATVs within 50 meters of yellow-billed cuckoo habitat (riparian vegetation) during the nesting season (May 15 to September 30) except on existing roads that are open to the public.
- 7. For APS lines, avoid herbicide application during critical times of the nesting season from June 1 to September 30 whenever possible. If herbicide application is necessary during the nesting season, ensure work is conducted with the least number of trips in and out and workers walk only in the ROW and open areas and not in dense thickets of vegetation.

#### Reasonable and Prudent Measures

There was no take anticipated for these species, so no reasonable and prudent measures were included in the BO.

#### Conservation Recommendations, Yellow-billed cuckoo (p. 44)

- 1. We recommend that BLM, APS, and SRP continue to monitor changing habitat conditions, rules/regulations, and status of the cuckoo and fund or conduct protocol surveys in appropriate areas within the action area to determine the presence/status of yellow-billed cuckoos.
- 2. We recommend that BLM, APS, and SRP continue to cooperate with agencies to conduct research to understand vital yellow-billed cuckoo habitat requirements, response to changing habitat conditions, home range, foraging strategies, and other important life history information that would contribute to the management and recovery of their habitat and analysis of potential effects from proposed projects.

#### *Conservation Recommendations, Southwestern willow flycatcher (p. 45)*

- 1. We recommend that BLM, APS, and SRP continue to monitor changing habitat conditions, rules/regulations, and status of the flycatcher and fund or conduct protocol surveys in appropriate areas within the action area to determine the presence/status of flycatchers.
- 2. We recommend BLM, APS, and SRP implement conservation strategies and recovery actions identified in the Recovery Plan to improve the distribution and abundance of breeding southwestern willow flycatchers.

#### <u>Biological Opinion for Integrated Vegetation Management (IVM) program, the Parker-Davis</u> <u>Transmission System, August 10, 2015</u>

#### Conservation Measures, Southwestern Willow Flycatcher (p. 7)

- From May 15 to August 25, any noisy O&M or IVM ground activities in suitable habitat that require equipment other than hand tools and pickup trucks will be prohibited or a qualified biologist will conduct protocol surveys prior to these activities using methods described in Sogge et al. 2010. If resident birds are detected, the U.S. Fish and Wildlife Service (FWS) will be contacted for guidance.
- Prior to site mobilization, Western will provide notification of the activity to the appropriate Federal land manager, land owner, or agency.

#### Conservation Measures, Yellow-billed Cuckoo (p. 7)

• From June 1 to August 15, any noisy O&M and IVM activities in suitable habitat that require equipment other than hand tools and pickup trucks will be prohibited or a qualified biologist will conduct presence/absence surveys prior to these activities using currently accepted survey methods. If cuckoos are detected, FWS will be contacted for guidance.

#### Reasonable and Prudent Measures

There was no take anticipated for these species, so no reasonable and prudent measures were included in the BO.

#### Conservation Recommendations, Southwestern Willow Flycatcher (p. 22)

We recommend that Western work with us and AGFD to implement recovery actions for the flycatcher.

Conservation Recommendations, Western Yellow-billed Cuckoo (p. 22)

We recommend that Western work with us and AGFD to participate in recovery planning and implementation of conservation actions for the cuckoo.

Facility	Transmission Line Route	New Alignment or Upgrade	Approximate Length
East Plant Site	115-kV line collocated with the 230-kV line from Silver King substation to Oak Flat substation	New	3.2 miles
West Plant Site	115-kV line from West Plant Site substation to East Plant Site	New	3.3 miles
Skunk Camp tailings storage facility	115-kV line from the 115-kV /230-kV collocated line to the Skunk Camp tailings storage facility. It is collocated with the tailings pipeline corridor for a majority of this alignment.	New	14.2 miles

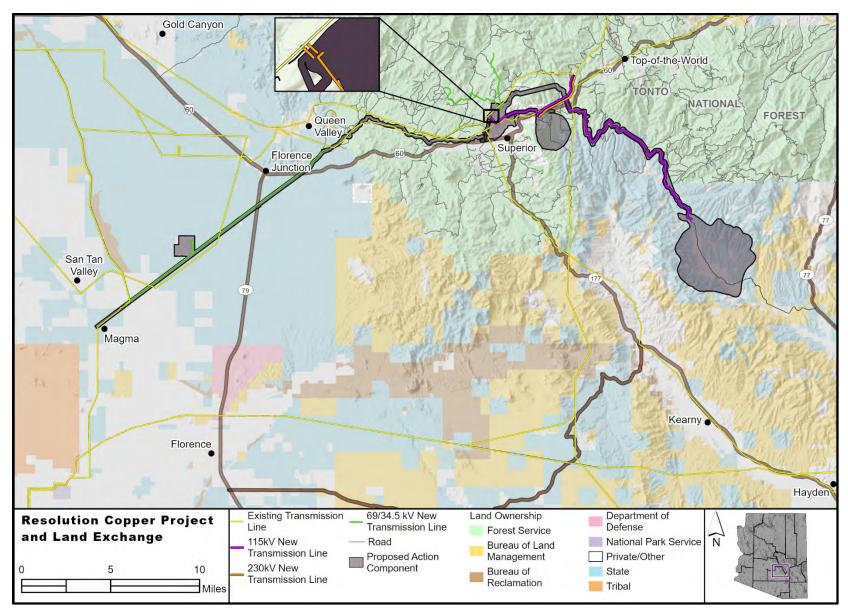


Figure 8. Proposed upgraded and new SRP transmission lines

# ANTICIPATED GROUNDWATER AND SURFACE WATER EFFECTS

## **Dewatering Impacts and Proposed Mitigation**

## Springs

The Draft EIS analysis focuses on the potential for mine dewatering to affect groundwater-dependent ecosystems (GDEs). GDEs include seeps and springs, as well as perennial or intermittent streams like Devil's Canyon, Mineral Creek, Queen Creek, Arnett Creek, the Gila River, and Telegraph Canyon.

The dewatering of the deep groundwater system is anticipated to take place regardless of the construction of the proposed mine, as Resolution Copper has the legal right to continue to pump to protect the existing mine infrastructure on private land. Groundwater modeling anticipates that six GDEs (all of them springs) would be impacted from this ongoing dewatering, regardless of mine construction. These GDEs that would be impacted include Bitter Spring, Bored Spring, Hidden Spring, McGinnel Mine Spring, McGinnel Spring, and Walker Spring. When the panel caving occurs during mining, groundwater impacts would expand from the deep groundwater system to overlying aquifers, and two additional GDEs (also springs) are anticipated to be impacted (Kane Spring and DC-6.6W). Two additional springs (Rancho Rio and Grotto Springs) are also anticipated to be impacted from direct disturbance within the subsidence area.

## Detailed Assessment of Potential Groundwater Impacts to Devil's Canyon

Resolution Copper has been drilling, sampling, and monitoring wells at the project site since 2009, including wells in the deep groundwater system, the Apache Leap Tuff aquifer, and the shallow perched/fractured system (see section 4.1.2 for more detail on these three aquifer systems). The results of this monitoring, including water levels, flow observations, water chemistry, and isotope sampling, has allowed detailed characterization of the groundwater in these three aquifer systems.

Over the same time period, Resolution Copper has been monitoring and sampling springs and streams in the project area. By comparing the various chemical characteristics of spring discharges or baseflow in perennial streams to the different types of groundwater, the Forest Service was able to ascertain the most likely source of groundwater feeding the springs and streams in the project area.

Fourteen separate sampling points along Devil's Canyon were analyzed in this way, extending from the headwaters to the confluence with Mineral Creek. Four of these locations were discrete springs discharging along the banks or close to Devil's Canyon (DC-8.2W, DC-6.6W, DC-6.1E, and DC-4.1E), and the remaining 10 locations represented surface water in the channel itself<sup>5</sup>. A "weight-of-evidence" approach was used to assess the water source for each of these locations, which included diagnostic lines of evidence that can clearly show water sources (carbon-14, tritium, and Piper plots), physical constraints like the elevation of the spring compared to known aquifer water levels, and analysis of other less-diagnostic water quality characteristics. The results are described for each location in Garrett 2018.

The upper reaches of Devil's Canyon, from the headwaters (roughly kilometer 15.5) downstream to roughly kilometer 9.0, were determined to be disconnected from the regional aquifer, based on multiple and consistent lines of evidence. The lower part of this reach has persistent flow (from about locations DC-10.9 to DC-10.5), but the various lines of evidence suggest that this persistent flow is supported by

<sup>&</sup>lt;sup>5</sup> The sampling locations described along Devil's Canyon or Mineral Creek all reference the distance upstream of the Devil's Canyon/Mineral Creek confluence, as measured in kilometers. For instance, spring "DC-8.2W" is located 8.2 km upstream of the mouth of Devil's Canyon, on the west side of the drainage.

snowmelt and/or floodwaters that have entered streambank storage before slowly draining into the main channel, not regional groundwater.

All other samples along middle and lower Devil's Canyon (from kilometer 9.0 to kilometer 0.0 at the confluence with Mineral Creek) have strong or mixed evidence that they are at least partially supported by groundwater associated with the Apache Leap Tuff aquifer. This includes at least two reaches with persistent water and large pools (a 1-mile long stretch from kilometer 9.0 to 7.4, and a 0.5-mile long stretch from kilometer 6.1 to 5.3).

Because middle and lower Devil's Canyon are at least partially supported by regional groundwater, the potential exists for them to be impacted by mine dewatering. The Forest Service undertook an extensive groundwater modeling process to determine the likelihood of these impacts occurring.

While there is only a single modeling run that is considered the best-calibrated run, an additional 87 sensitivity runs were conducted to explore other possible outcomes. The results of all 88 modeling runs were used in the assessment of impacts in the DEIS. See "Analysis Uncertainties" section below for more details on how the Forest Service chose to interpret and disclose the model output, including the drawdown threshold used.

In middle and lower Devil's Canyon, the baseflow in the stream itself is not anticipated to be impacted based on the results of the best-calibrated groundwater modeling run, and 86 of 87 sensitivity runs. Only one sensitivity run shows drawdown impacting middle Devil's Canyon above the quantitative threshold of the groundwater model.

One spring along middle Devil's Canyon is anticipated to be impacted by dewatering (DC-6.6W). This spring supplies water to Devil's Canyon; based on available monitoring, the contribution of spring DC-6.6W ranges from zero to 5 percent of flows in Devil's Canyon (Newell and Garrett 2018).

## Detailed Assessment of Potential Groundwater Impacts to Mineral Creek

As with Devil's Canyon, a number of surface water and spring locations along Mineral Creek have been assessed by Resolution Copper, and the likely groundwater sources supporting these locations were determined through multiple lines of evidence.

Six separate sampling points along Mineral Creek were analyzed in this way, extending from the headwaters to the confluence with Devil's Canyon. Three of these locations were discrete springs discharging along the banks or close to Mineral Creek (Government Springs, MC-8.4C, and MC-3.4W [also known as Wet Leg Spring]), and the remaining three locations represented surface water in the channel itself.

All samples along Mineral Creek have strong or mixed evidence that they are at least partially supported by groundwater associated with the Apache Leap Tuff aquifer. This includes a 2.9-mile long reach with persistent water (from kilometer 6.4 to 1.7) as well as at least three distinct riparian galleries.

As with Devil's Canyon, because flows in Mineral Creek are at least partially supported by regional groundwater, the potential exists for them to be impacted by mine dewatering and therefore the Forest Service evaluated them as part of the groundwater modeling process. Based on the best-calibrated model run, as well as all 87 sensitivity runs, no impacts are anticipated to baseflow in Mineral Creek or to any of the discrete springs along Mineral Creek.

#### Effects of Mitigation and Monitoring Measures

The above losses are anticipated based on the modeling analysis conducted for the NEPA process, which has a high level of uncertainty (see Analysis Uncertainties section below). Regardless of anticipated impacts, if and when real-world water impacts occur, Resolution Copper intends to replace any lost water. In April 2019, the Forest Service received from Resolution Copper a document titled Monitoring and Mitigation Plan for Groundwater Dependent Ecosystems and Water Wells (Montgomery and Associates Inc. 2019). This document outlines a monitoring plan to assess potential impacts on each GDE, identifies triggers and associated actions to be taken by Resolution Copper to ensure that GDEs are preserved, and suggests mitigation measures for each GDE if it is shown to be impacted by future mine dewatering. The stated goal of the plan is "to ensure that groundwater supported flow that is lost due to mining activity is replaced and continues to be available to the ecosystem."

The plan identifies 16 springs that would be monitored, as well as surface water flows in 10 locations along Queen Creek, Arnett Creek, Telegraph Canyon, Devil's Canyon, and Mineral Creek. A variety of potential actions are identified that could be used to replace water sources if monitoring reaches a specified trigger. These include drilling new wells to supply water, installing spring boxes, installing guzzlers, or installing surface water capture systems such as check dams, alluvial capture, recharge wells, or surface water diversions. All of these can be used to supplement diminished groundwater flow at GDEs by retaining precipitation in the form of runoff or snowmelt, making it available for ecosystem requirements. One further method for replacing flow would be to provide alternative water supplies from a non-local source (such as groundwater from the Desert Wellfield or Arizona Water Company, both located in a different groundwater basin).

The Draft EIS notes that for GDEs, the effectiveness of these mitigation measures would depend on the specific approach. Engineered replacements like pipelines, guzzlers, or spring boxes would be effective at maintaining a water source and maintaining a riparian ecosystem, but the exact type, location, and extent of riparian vegetation could change to adapt to the new discharge location and frequency of the new water source. Changes in water quality are unlikely to be an issue, since new water sources would likely derive from the same source as natural spring flow (i.e., the Apache Leap Tuff aquifer, or stored precipitation).

## Surface Water Impacts

In addition to groundwater impacts, there would be a reduction in stormwater runoff due to the subsidence area capturing precipitation. Losses in average annual volume are estimated as 3.5 percent at the mouth of Devil's Canyon and estimated to range from 19 percent (in Superior) to 3.5 percent (at Whitlow Ranch Dam) in Queen Creek.

The Skunk Camp tailings storage facility also would result in a reduction of stormwater runoff, due to the need to control "contact" stormwater that interacts with tailings. Losses in average annual volume are estimated as 0.5 percent in the Gila River, downstream from the confluence with Dripping Spring Wash, and 0.3 percent in the Gila River at Donnelly Wash. These reductions would eventually be less after closure, once tailings are reclaimed and stormwater is allowed to return to the watershed rather than be collected as contact stormwater.

## Summary of all Groundwater and Surface Water Impacts

To summarize the anticipated impacts to any perennial waters, whether from groundwater drawdown or reduction of watershed runoff:

• Upper Devil's Canyon:

- No changes anticipated to baseflow from groundwater drawdown
- o No changes anticipated from reduction of runoff
- Middle and lower Devil's Canyon:
  - No impacts to baseflow anticipated due to groundwater drawdown
  - Anticipated impacts to adjacent spring DC-6.6W could reduce flow up to 5 percent immediately downstream of the spring.
  - Reduction of runoff could reduce total volume of storm flows from 5.6 percent (middle Devil's Canyon) to 3.5 percent (mouth of Devil's Canyon).
- Mineral Creek:
  - o No changes anticipated to baseflow from groundwater drawdown
  - o No changes anticipated to any adjacent springs from groundwater drawdown
  - No changes anticipated from reduction of runoff

## Potential for Subsidence Lake

The general conditions exist for the eventual creation of a surface lake on Oak Flat after closure of the mine. During the mine life, the subsidence area would develop. Subsidence modeling indicates the subsidence area would be about 800 to 1,100 feet deep. Meanwhile, after dewatering is curtailed after closure of the mine, groundwater levels would rebound and rise as the aquifer recovers and equilibrates. At the same time, the panel caving would have created a hydraulic connection from the ground surface to the deep groundwater system and eliminated any intervening layers like the Whitetail Conglomerate that formerly were able to prevent or slow vertical groundwater flow.

Based on the best available information, the Forest Service ultimately determined that the possibility of a subsidence lake developing was remote and speculative. While the processes described above could theoretically result in a subsidence lake, the best-calibrated groundwater model indicates that even after 1,000 years, groundwater levels are still at least 200 feet below the bottom of the subsidence area or other exposure route to the environment. For this reason, the potential for a subsidence lake has not been analyzed for any resulting impacts to wildlife. Similarly, the standard under the ESA is "reasonably certain to occur" and thus, the creation of a lake would not be reasonably certain to occur and subsequently is not considered for the BA analysis.

## **Potential for Sedimentation Impacts**

#### Construction

Construction of the pipelines, access road, and pole locations would necessarily involve ground disturbance within the watershed of Mineral Creek. No direct ground disturbance during construction would take place within the Mineral Creek ordinary high water mark or within the bounds of critical habitat. Where the corridor crosses Mineral Creek upstream from Government Springs Ranch:

- The pipelines will use a trenchless crossing (underground boring) to go beneath both Mineral Creek outside of the ordinary high water mark and critical habitat and will not involve disturbance of the stream or nearby riparian vegetation.
- Power poles will be located outside of Mineral Creek and critical habitat, though the lines themselves will pass overhead.

• Construction crews will utilize the existing road and no new access road would be built at the crossing location. Access to other poles will be via walking only with no new ground disturbance.

Ground disturbance elsewhere within the watershed could still contribute sediment to Mineral Creek during storm events. Erosion and sedimentation would be prevented through implementation of a Stormwater Pollution Prevention Plan (SWPPP) as required under the Arizona Pollutant Discharge Elimination System (AZPDES) permitting framework. The SWPPP will identify best management practices (BMPs) to prevent erosion and sedimentation, which will include both structure controls (e.g., straw wattles, silt fences, water bars) and good housekeeping practices (e.g., secondary containment around chemical storage, protocols for equipment maintenance). These will be temporary controls active during construction, and the SWPPP will include monitoring protocols to ensure that erosion controls remain functional. The SWPPP will also include permanent stabilization requirements for postconstruction, such as reseeding and recontouring, to ensure long-term minimization of erosion and sedimentation.

## **Operations and Maintenance**

Few ground-disturbing activities would take place along the pipeline/powerline corridor during operations. The most common and frequent activity would be to access the pipeline by inspectors, using the access road. In most cases these vehicles would be normal passenger vehicles and not heavy equipment and would be unlikely to cause unusual disturbance to roads, even during wet conditions. Primary concerns caused by use of the access roads would be crossing of washes and Mineral Creek during stormwater runoff events, which would occur infrequently and would have similar levels and types of impacts as the current motorized use of the roads in the area. Where new roads would be constructed, they would incorporate controls to minimize long-term erosion in high risk areas (e.g., water bars, berms, slope controls).Analysis Uncertainties

Three aspects of the analysis directly related to potential impacts to threatened and endangered species were based on modeling:

- The anticipated development of the subsidence area, including the ultimate size and depth, was analyzed using a three-dimensional, numerical finite-difference subsidence model (FLAC3D);
- Groundwater impacts caused by pumping to dewater the mine infrastructure were analyzed using a three-dimensional, numerical finite-difference groundwater model (MODFLOW-SURFACT);
- The estimated loss of annual stormwater flow was analyzed using a catchment water balance model known as the Australian Water Balance Model (AWBM).

All modeling has some element of uncertainty, particularly with large stresses that are difficult to replicate with small-scale tests (for instance, a 24-hour aquifer test does not adequately replicate the dewatering of a mine over a 50-year mine life). The Forest Service used a number of strategies to ensure that uncertainties were appropriately understood and controlled to the extent possible.

## **Subsidence Model Uncertainties**

The Forest Service recognized that not only was there uncertainty with the subsidence model itself due to the need to estimate parameters and make assumptions, but that uncertainty also exists with the underlying conceptual geologic framework. Three specific strategies were implemented to manage modeling uncertainties:

1. The Forest Service convened a Geology and Subsidence workgroup, composed of experts from the Forest Service, the NEPA team, and Resolution Copper and their subcontractors. The purpose of the

workgroup was to review Resolution Copper's procedures, data, and geologic and geotechnical baseline documents in order to:

- a. Determine whether the methods employed by Resolution Copper in collecting and documenting geologic data were appropriate, adequate, and according to industry standards.
- b. Determine whether Resolution Copper's interpretations of geologic structures, faults, geotechnical data, rock properties, and assumptions are reasonable.
- c. Identify any significant data gaps.
- d. Identify uncertainty with the interpretations, with consideration of data gaps.
- e. Determine whether there are cases where Resolution Copper's interpretations are not considered reasonable and, if so, provide alternative interpretations and supporting rationale.

The workgroup conducted two field visits (November 2016 and May 2017) and seven workgroup meetings (September 2017 to August 2018). Workgroup conclusions were captured in a memorandum cited in the Draft EIS. Overall, the workgroup concluded that: "...RCM's interpretations are reasonable, and that the geologic data and modeling results represent the best available science for determining and disclosing subsidence impacts" (BGC Engineering USA Inc. [BGC] 2018a).

- 2. As part of the analysis, the workgroup requested that Resolution Copper run a number of sensitivity analyses to evaluate how different assumptions for input parameters would change the modeling results. In total, 10 separate model runs were conducted. Under these runs:
  - a. Breakthrough of the subsidence fracturing at the surface did not substantially differ, varying between 6 and 7 years.
  - b. The depth of the subsidence area varied between about 800 and 1,100 feet.
  - c. The disturbed area, as defined by the fracture limit, varied between roughly 1,200 and 1,800 acres.
  - d. No scenarios resulted in anticipated damage to Apache Leap, Devil's Canyon, or U.S. Route (U.S.) 60.

These largely similar results reflect the fact that the angle and extent of subsidence are primarily dictated by the depth and shape of the ore body.

3. A subsidence monitoring plan would be implemented, with triggers, to ensure that unexpected subsidence effects occurring once mining started do not result in undesirable outcomes, such as damage to Devil's Canyon or Apache Leap.

## **Groundwater Model Uncertainties**

As with the subsidence modeling, early in the NEPA process the Forest Service recognized the difficulties associated with modeling the complex hydrology and geology at the mine site, especially considering the extremely long time frames involved in the recovery of groundwater (hundreds or thousands of years), and the fact that the panel caving would fundamentally alter the hydrogeologic framework. Five specific strategies were implemented to manage modeling uncertainties:

1. The Forest Service convened a Groundwater Modeling Workgroup, composed of experts from the Forest Service, the NEPA team, Resolution Copper and their subcontractors, and cooperating agencies and other stakeholders. The purpose of the workgroup was to review Resolution Copper's groundwater modeling, using a collaborative and iterative process. The workgroup met 11 times from September 2017 to September 2018; cross-pollination with the Geology and Subsidence workgroup also ensured that the geologic framework underlying the groundwater model was appropriate.

Workgroup conclusions were captured in a memorandum cited in the Draft EIS. Overall the workgroup concluded: "...that the results of the predictive groundwater model appear reasonable and are based on best available science and understanding of the hydrogeology and project at the time the groundwater model was created" (BGC 2018b).

- 2. As part of the analysis, the workgroup requested that Resolution Copper run a number of sensitivity analyses to evaluate how different assumptions for input parameters would change the modeling results. In total, 88 separate model runs were conducted. In order to deal with uncertainty, the Forest Service used all the sensitivity runs—not just the base case run—to assess impacts to GDEs.
- 3. The Forest Service recognized that the presentation of the modeling results would affect the public's perception of how certain they were. For instance, a result of "1.2 feet of drawdown" suggests that we can trust any model to accurately predict inches of change, which is not the case. Based on input from the modeling workgroup, the Forest Service decided to use 10 feet as a threshold for quantitatively using modeling results. Results less than 10 feet were not considered reasonable to rely upon for quantitative impact analysis.
- 4. Similarly, the Forest Service recognized that presenting modeling predictions many hundreds of years in the future could lead the public to perceive that these were reliable results. Based on input from the modeling workgroup, the Forest Service decided to use 200 years as the limit of quantitative modeling results. However, longer-term trends were still analyzed, as many of the peak impacts have not occurred by that time.
- 5. Recognizing the inherent uncertainty in modeling, Resolution Copper has proposed a monitoring plan to evaluate the real-world hydrologic changes, regardless of whether modeling predicted a GDE would be impacted or not. The monitoring is tied to mitigation measures to replace lost water.

## Surface Water Model Uncertainties

The surface water model is much simpler than the subsidence and groundwater models, relying on water balance equations and relatively well-understood parameters like precipitation and evaporation. The model used to estimate the impacts from the Resolution Copper Project was calibrated against flow data obtained for Pinto Creek, and a variety of calibration statistics were evaluated. All of these calibration statistics fell within the "very good" range for accuracy (BGC 2018c). The performance of such models also has been documented in literature; Boughton and Chiew (2003) evaluated the AWBM on 221 catchments and determined that 80 percent of the catchments had model calibrations that also would be considered "very good."<sup>6</sup>

There is unavoidable uncertainty in the surface water modeling due to estimating input parameters and estimating changes in the watershed; however, the model results overall can be considered reliable and relatively certain.

# 3.2.5 Closure and Reclamation and Post-Mine Conditions

The closure and reclamation phase would occur after the 40-year operations phase and would have a duration of approximately 5 to 10 years, longer for the tailings storage facility. Concurrent reclamation could also be completed during operations on the outer slopes of the tailings storage facility, where practicable.

<sup>&</sup>lt;sup>6</sup> Specifically, "very good" is indicated by a coefficient of efficiency greater than 0.75 (Moriasi et al. 2007).

The primary goals of reclamation are to:

- stabilize areas of surface disturbance,
- prepare those areas for a post-mining land use that is compatible with surrounding uses, and
- ensure long-term protection of the surrounding land, water, and air resources.

The general steps to be used in reclaiming disturbed areas are:

- decommissioning facilities,
- removing and/or closing structures and facilities,
- recontouring and regrading,
- replacing growth media, and
- seeding and/or direct seedling plantings where appropriate.

## EAST PLANT SITE CLOSURE AND RECLAMATION

Reclamation at the East Plant Site would consist of salvaging and demolishing all buildings, except for the headframes and hoists, which would be used for post-closure groundwater monitoring. All salvageable and non-salvageable materials would be disposed of off-site. All disturbed surfaces except those needed for long-term monitoring, including paved and graveled areas, would be regraded and reseeded with appropriate local seed mixes. Contact water basins would be closed in accordance with Aquifer Protection Permit (APP) requirements. Shaft collars and subcollars would be permanently sealed by an engineered seal.

Reclamation activities would not occur within the subsidence area. There would be a berm and/or fence constructed around the perimeter of the continuous subsidence area. To the extent practicable, surface water diversions would be constructed to divert stormwater away from the subsidence area and into natural drainages.

## WEST PLANT SITE CLOSURE AND RECLAMATION

The West Plant Site facilities would be decommissioned, and the land surfaces would be contoured and graded as necessary to blend into the surrounding topography and terrain and reseeded with appropriate local species seed mixes. The West Diversion Channel, the East Stormwater Channel, and an on-site channel would remain in place to route flow through a new diversion channel to the Apex Tunnel to existing drainages (e.g., Silver King Wash). Non-contact water basins would be graded to drain, and the process water pond and contact water basins would be closed in accordance with APP requirements.

Roads that are necessary to support the reclamation and closure efforts would remain to provide access to monitoring stations and remediation areas. All other roads would be reclaimed. All buildings would be salvaged or demolished, and all materials would be disposed of off-site. All portals, ventilation shafts, and tunnel entrances would be decommissioned, capped, and reclaimed at the surface.

## SKUNK CAMP TAILINGS STORAGE FACILITY CLOSURE AND RECLAMATION

At the end of operations, the remaining area of PAG tailings would be covered with a minimum 10-foot layer of NPAG tailings. The surfaces of both the NPAG and PAG facilities would be shaped to prevent standing water and divert runoff into channels leading to the downstream collection pond, and both NPAG and PAG areas would be covered by a 1- to 2-foot layer of low-permeability, erosion-resistant soil

(e.g., Gila conglomerate or equivalent soil, sand, and gravel mix) and revegetated. The timing of reclamation is dependent on the surface being dry enough to allow equipment access for reclamation.

The original plan for closing the Skunk Camp facility involved grading of the final landform drainage to the north and cutting a closure channel into the ridge between the tailings storage facility and the Mineral Creek drainage. This was modified after the Draft EIS to keep all drainage in the Dripping Spring Wash watershed.

A perimeter fence or berm would be constructed around the tailings storage facility to prevent access. Some surface water diversion structures would be revegetated to control water and wind erosion, while others would be reconfigured to carry water along topography through and off the site. The diversion structures that would stay in perpetuity would be reconstructed with riprap to minimize erosion. All buildings, including foundations, at the tailings storage facility would be salvaged or demolished, and all salvage materials and demolition debris would be disposed of properly off-site. Roads that would not be required for closure and reclamation activities would be decommissioned, recontoured, and revegetated.

Estimated seepage rates suggest active closure would be required up to 20 years after the end of operations. Up to 5 years after closure, the recycled water pond on top of the facility is still present and therefore all engineered seepage controls could remain operational and pump collected seepage back to the recycled water pond. After 5 years, the recycled water pond is no longer present, after the PAG cell is covered with NPAG tailings and closed. At this time seepage collection ponds would be expanded to maximize evaporation in order to passively evaporate all incoming seepage (estimated at 20 years). If necessary, other active water control measures may be needed such as spray evaporators or active treatment and release downstream. The seepage ponds would be closed only after seepage was determined to meet standards acceptable for release downstream. Once closed, the sludge containing concentrated metals and salts from evaporation would likely require cleanup and handling as a solid or hazardous waste.

# FILTER PLANT AND LOADOUT FACILITY CLOSURE AND RECLAMATION

All buildings, including building foundations, at the filter plant and loadout facility would be salvaged or demolished, and the salvaged material and demolition debris would be disposed of properly off-site. Tanks and ponds would be closed and reclaimed in accordance with APP and Arizona Pollutant Discharge Elimination System (AZPDES) permit requirements. All disturbed areas would be regraded with the exception of the diversion channel on the north side of the facility that routes surface water flows around the site to existing drainages.

# MARRCO CORRIDOR CLOSURE AND RECLAMATION

The closure and reclamation of the MARRCO line is undetermined because the intended post-closure use of the railroad and utility lines is not known. Resolution Copper does not foresee a use of the railroad or utility lines for project reclamation or post-closure use, but another entity might buy the facilities and continue use. The concentrate lines, however, would be removed from the MARRCO corridor, and direct surface disturbance areas would be recontoured and revegetated to the extent possible with adjacent utilities. Bridge structures would be assessed and either removed or upgraded.

# WATER SUPPLY FACILITIES AND PIPELINES CLOSURE AND RECLAMATION

Facilities associated with fresh water supply and distribution, such as pipelines, pump stations, and water tanks, may have a post-mining use and may be transferred to a third-party utility or community to provide

water transport to the Superior Basin. No closure or reclamation activities would occur at these facilities if they were to be transferred to a third party.

Facilities that would not have a post-mining use include the tailings slurry lines, concentrate pipelines, and associated pump station with electrical power. These facilities would all be decommissioned and removed. Buried and aboveground pipelines would be removed and scrapped or salvaged. All disturbed areas would be recontoured and reseeded.

## POWER TRANSMISSION FACILITIES CLOSURE AND RECLAMATION

Power transmission facilities, which include electrical substations, transmission lines, and power centers, may be removed as part of the reclamation program, unless a post-mining use is identified. The SRP would continue to own the power lines and may have a post-mining use for ongoing power transmission in the area.

# 3.2.6 Clean Water Act Section 404 Permit

All potential impacts to waters of the U.S. are associated with the Skunk Camp tailings storage facility or the pipeline/power line corridor between the West Plant Site and the tailings storage facility. Resolution Copper anticipates the direct fill and permanent loss of approximately 124 acres of ephemeral drainages located within the tailings storage facility footprint, including appurtenant features like stormwater diversion channels. Indirect impacts downstream from the tailings storage facility, due to hydrologic changes, are also anticipated but have not been estimated by the USACE; however, the Forest Service has estimated that there would be downstream reductions in stormwater runoff due to a reduction in the overall area of the upstream watershed. No wetlands or other special aquatic sites, springs, seeps, intermittent waters, or perennial waters that would be considered potentially jurisdictional under the CWA are present in the proposed footprint of the tailings storage facility and appurtenant features. Note that two springs, Haley Spring and Looney Spring, are discussed later in this document. These springs falls outside the footprint of physical disturbance at the tailings storage facility, but within the fence line excluding access. For the purposes of the BA, Haley Spring and Looney Spring, and the limited hydroriparian vegetation associated with them, are considered to be impacted.

Impacts associated with the pipeline construction are anticipated to be largely temporary impacts. It is currently estimated that the development of the pipeline would result in mostly temporary impacts to approximately 6 acres of potential waters of the U.S. within the pipeline footprint. The pipeline would be designed to avoid impacts to the perennial or intermittent portions of Devil's Canyon and Mineral Creek and any wetlands adjacent to those features. All of the other surface water features crossed by the pipeline corridor are ephemeral features.

Permitting under Section 404 of the CWA will require some level of compensatory mitigation to offset direct and indirect impacts to waters of the U.S. The compensatory mitigation package proposed by Resolution Copper is under consideration at this time; note that the specific actions to be undertaken are still being developed as part of the USACE permitting process. The following anticipated suite of off-site mitigation is considered part of the proposed project analyzed in this BA.

MAR-5 Wetland/Olberg Road. The Gila River Indian Community has undertaken pilot studies to evaluate the effectiveness of recharging a portion of the Gila River Indian Community allotment of Central Arizona Project water into the Gila River, on Gila River Indian Community lands. Resolution Copper already has involvement with the MAR-5 site pilot study; the Olberg Road site is not yet started and is located just upstream of MAR-5. The conceptual mitigation strategy consists of exotic tree species (principally tamarisk) removal and control, combined with native plant species reseeding, to allow for the establishment and maintenance of a riparian habitat dominated by native tree species. Tamarisk (*Tamarix* spp.) removal and seeding for native species at the upstream Olberg Road site would remove the major seed source for invasive tamarisk for the adjacent, downstream

MAR-5 discharge area. The MAR-5 project is a 5-year pilot study to evaluate the effectiveness of recharging a portion of the Gila River Indian Community (GRIC) allotment of Central Arizona Project (CAP) water into the Gila River on the Community's lands. The site is located along an ephemeral reach of the Gila River. Prior to the project, vegetation consisted of a sparge collection of upland woody shrubs with desert forbs and Bermudagrass (Cynodon dactylon) as well as the nonnative, invasive tamarisk. A 123-acre wetted area was created in 2015 by instream discharge of CAP water into the Gila River. The MAR-5 site experiences a dry-up of soils annually when the Salt River Project temporarily stops flows to the delivery canal. A survey in 2017 showed total vegetation volume and herbaceous cover had increased from before the project, including species such as cattails (Typha spp.) and Goodding's willow (Salix gooddingii). Tamarisk density increased as well. Within the floodplain terrace and surrounding uplands, vegetation is similar to pre-discharge vegetation structure and composition. The GRIC Department of Environmental Quality recently conducted limited tamarisk removal and native plant reseeding at the site and identified a large tamarisk thicket directly upstream. This thicket is likely a major seed source contributing to tamarisk colonization at the MAR-5 site and has been identified as the 23-acre Olberg Road Restoration Site.

Proposed mitigation activities for the GRIC MAR-5 site include continued scheduled CAP water discharges, limited tamarisk removal and control, and seeding of native plant species. Mitigation activities at the ORRS consist of tamarisk removal and control within the entire 23-acre site, followed by seeding of native plant species. Exotic tree species removal and control, combined with seeding of native plant species, at both sites would allow for the establishment and maintenance of a riparian habitat dominated by native tree species and would eliminate a large, local source of exotic tree species seed from that section of the Gila River. At both mitigation sites, exotic species removal would occur outside of the yellow-billed cuckoo and southwestern willow flycatcher breeding season (May 15 through September 30). No critical habitat is located on the site.

• Queen Creek. A 1.2-mile segment of Queen Creek has been identified as a potential Clean Water Act (CWA) Section 404 mitigation site. The site is composed of Resolution Copper and BHP Mineral Resources, Inc. parcels and is approximately 79 acres. The Queen Creek site is intersected by an ephemeral reach of Queen Creek and is a medium to large, well-defined, single to multi-threaded, low-gradient drainage system. Due to a range of available moisture, stream flow characteristics, and depth to groundwater, three different vegetation communities are present within the Queen Creek site. Dense acacia-mesquite shrublands occur streamside of the drainage, with mature, medium-stature catclaw acacia and velvet mesquite (*Prosopis velutina*) dominating the vegetation community, creating an approximately 95-percent canopy cover. Within the floodplain terraces are moderately dense mesquite shrublands, dominated by medium-stature mesquites that create approximately 65-percent canopy cover. In the uplands are creosote (*Larrea tridentata*) shrublands. Several yellow-billed cuckoo and southwestern willow flycatcher surveys have been done in the area, although none were detected. The site does not include critical habitat, but it could be used during migration.

Proposed mitigation activities for the Queen Creek site have been planned for three separate areas (Areas A, B, and C) (figure 9-1) and would include ecological improvements to the riparian habitat. Within the xeroriparian corridor (Area A), limited removal of sparsely populated tamarisk and other invasive species would occur, followed by planting and seeding of native plant species. In portions of the site where there are anthropogenic disturbances (Area B), selective debris would be removed while avoiding disturbance to existing mature woody vegetation; seeding of

native plant species would follow. The remaining portions of the mitigation site (Area C) would be preserved, providing protection to riparian and wildlife habitat. Exotic species and debris removal would occur outside of the yellow-billed cuckoo and southwestern willow flycatcher breeding seasons (May 1 through September 30).

• H&E Ranch. The H&E Ranch is a 590-acre property owned by the Nature Conservancy and has been used for agriculture and cattle since at least the 50s. The parcel is intersected by an intermittent reach of the San Pedro River. The drainage system is large, well-defined, low-gradient, and braided within a broad, comparatively level floodplain. The active channel at the parcel consists of narrow dense stands of mesoriparian and xeroriparian trees and shrubs. Species include large-statured mesquite and tamarisk, along with a few individual cottonwoods and patches of singlewhorl burro brush. The floodplain terraces contain moderately dense medium to large statured mesquite and tamarisk. Within the historic agricultural fields, located on the eastern terrace of the parcel, are sparsely populated small to medium-statured mesquite and graythorn (*Ziziphus obtusifolia*).

The parcel has been separated into three areas with specific planned mitigation activities – Area A, Area B, and Area C (figure 9-2). Mitigation activities proposed for Area A include earthwork to reconnect historic tributaries. The earthwork is proposed to reestablish the San Pedro River's access to its river right floodplain and terrace and enhance the wetland features present in the area. The soils across the site on the terraces are compacted and causing earth fissures and sink holes on the parcel which will continue if no intervention occurs. Grading toward the south end of the parcel as alluvial fans has been proposed to provide for tree growth that would be similar to the other side of the San Pedro River off-parcel. Planting and seeding native species is planned for Areas A and B to restore a more native vegetation community along the bank of the river, and is intended to mirror previous mitigation strategies implemented by the Nature Conservancy as well as ongoing mitigation at the Arizona Game and Fish Department Lower San Pedro Wildlife Area that is contiguous to the western and northern boundaries of the H&E Farm parcel. Area C has a goal of preservation and does not have any proposed work activities. Mitigation activities would occur outside of the yellow-billed cuckoo and southwestern willow flycatcher breeding seasons (May 15 - September 30). Yellow-billed cuckoo critical habitat is present within Areas B and C, where no earthwork or vegetation removal is planned.

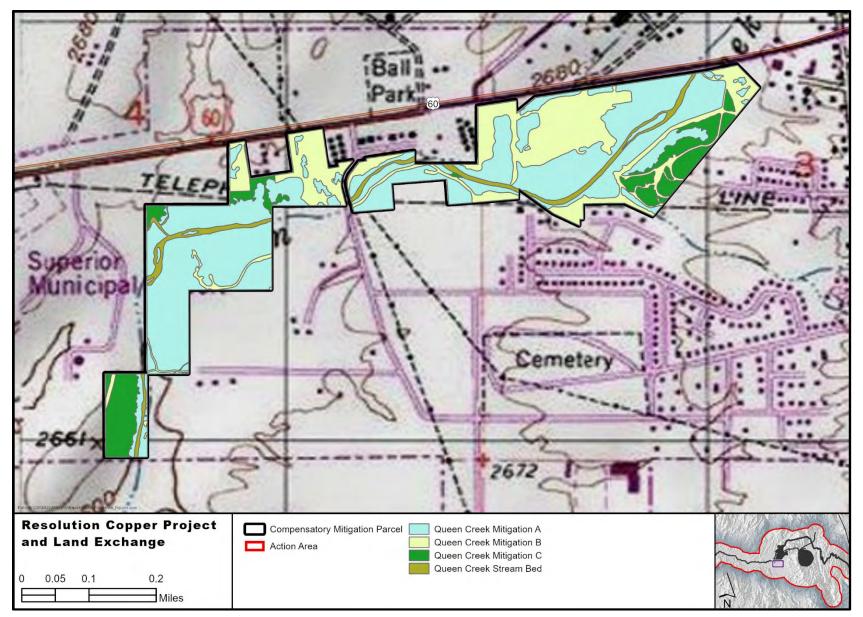


Figure 9-1. Queen Creek CWA Compensatory Mitigation Parcel Mitigation Activity Areas

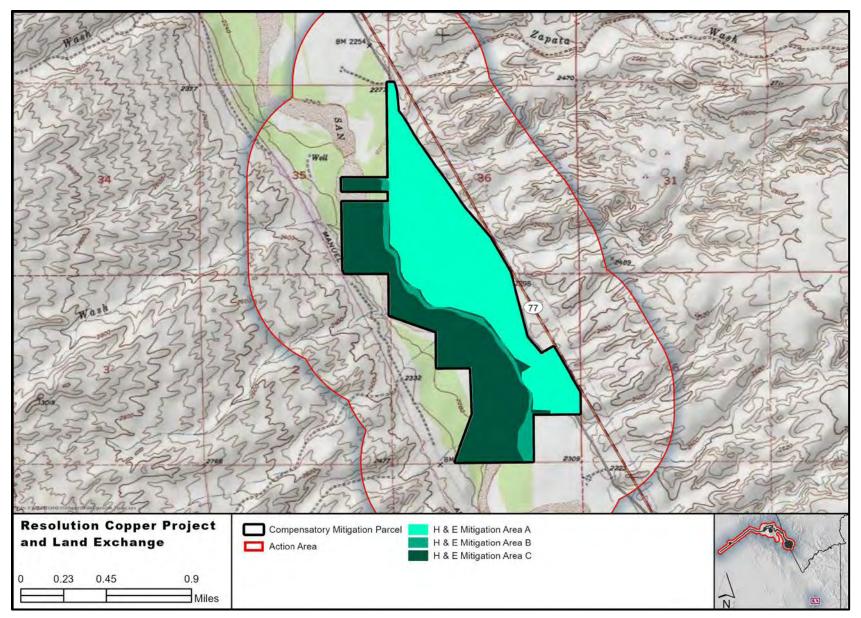


Figure 9-2. H&E Ranch CWA Compensatory Mitigation Parcel Mitigation Activity Areas

# 4 DESCRIPTION OF THE ACTION AREA

The action area covers the project footprint, i.e., project area, plus a buffer to account for all direct and indirect impacts (figure 10). Much of the impact on species and habitat is caused by direct disturbance of the land and vegetation. The buffer area around the main proposed action, i.e., the proposed action mining activities, was determined by using the areas where the NEPA noise analyses, hydrological analyses (i.e., groundwater and surface water quantity/quality analyses and sedimentation), fugitive dust distance affecting air quality, and noxious weed introduction and spread (Foxcroft et al. 2007) indicate the potential for impacts. The buffer for the mitigation parcels was set at 0.25 mile to account for all direct and indirect impacts for the proposed activities;

According to the NEPA air quality analysis, ambient air quality standards would be achieved at the project footprint boundaries; therefore, any potential air quality impacts are encompassed within the buffer of the main proposed action. The noise modeling shows that noise levels at 1 mile would be at or below the level of normal human conversation; as such, the 1-mile buffer is sufficient to address potential impacts from noise-producing activities. Light associated with project construction and facilities is expected to increase night-sky brightness from 1 to 9 percent (Dark Sky Partners LLC 2018). Light impacts would occur across the landscape, but available research suggests any substantial impacts would occur within the buffer (Newell 2018). Details regarding air, noise, and hydrological analyses that were used to determine the action area are included in the Draft EIS.

The regional climate is characterized as semiarid; there are often long periods with little or no precipitation (Western Regional Climate Center 2018). Precipitation falls in a bimodal pattern: most of the annual rainfall within the region occurs during the winter and summer months, with dry periods mainly in the spring and fall. In general, the total average annual precipitation varies between 15.7 inches and 18.8 inches, with 52 percent of the precipitation falling between November and April. However, climate variables may change based on the elevation of specific areas. For example, the average total annual precipitation in a lower elevation location near to the MARRCO Corridor (Station Florence, Arizona, for 1981–2010) is 9.72 inches, whereas the average total precipitation in a higher elevation location is 23.91 inches (Station Superior 2 ENE, Arizona, 1981–2010) (Western Regional Climate Center 2020). Although there may be snow at higher elevations, it does not typically accumulate in the region. Precipitation usually occurs with steady, longer-duration frontal storm events during the winter months (December through March). Rain events during the summer months (July to early September) are typically of shorter duration with more intensity associated with thunderstorms.

Landowners/land managers within the action area include: TNF; ASLD State Trust lands; and private landowners. Landowners/land managers adjacent to the action area include: TNF; BLM; ASLD State Trust lands; Bureau of Indian Affairs; and private landowners (figures 11-1 through 11-6).

The action area has both bedrock-controlled soils (alluvium and colluvium up to 5 feet in thickness) (Klohn Crippen Berger Ltd. 2017) and deeper soils formed in alluvial fans (more than 60 inches deep) (Natural Resources Conservation Service 2017). These soils have low organic matter (approximately 1 percent) and slightly acidic to slightly alkaline pH conditions that support annual rangeland productivity ranging from 600 to 800 lb biomass/acre/year (Natural Resources Conservation Service 2017).

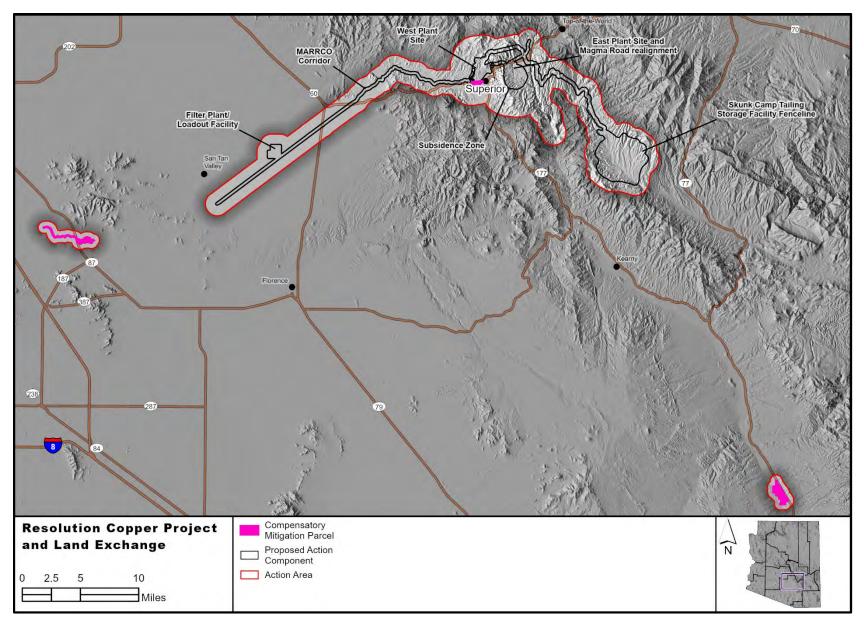


Figure 10. Resolution Copper Project action area

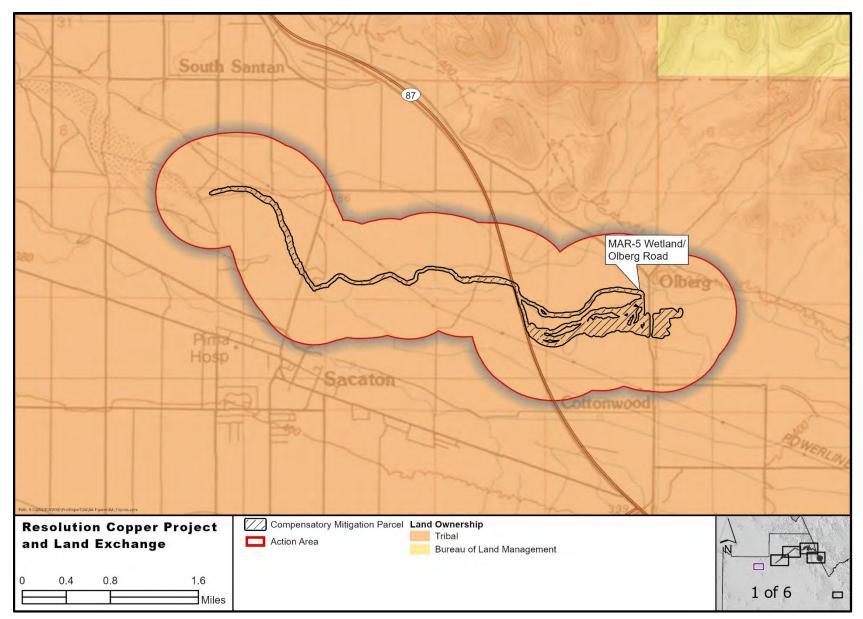


Figure 11-1. Topography with land ownership (1 of 6)

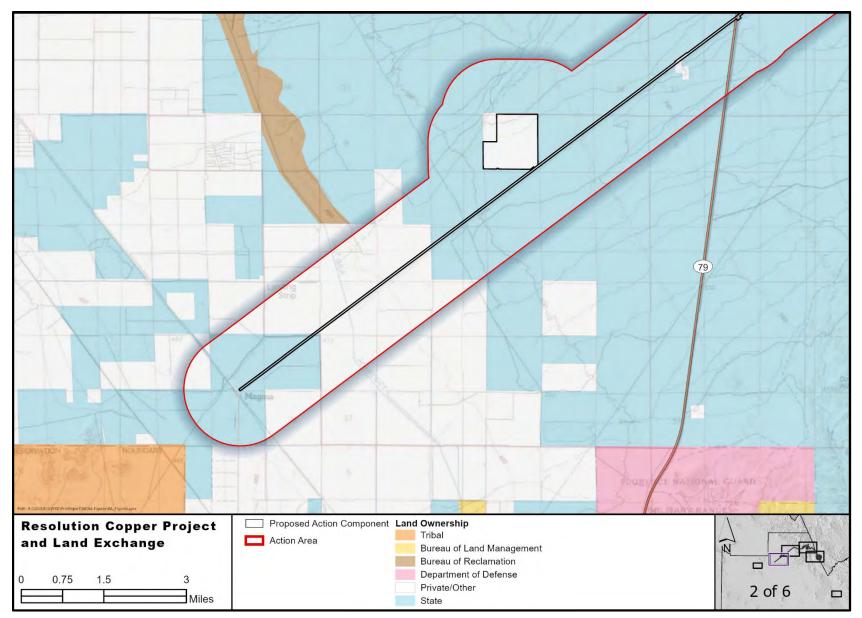


Figure 11-2. Topography with land ownership (2 of 6)

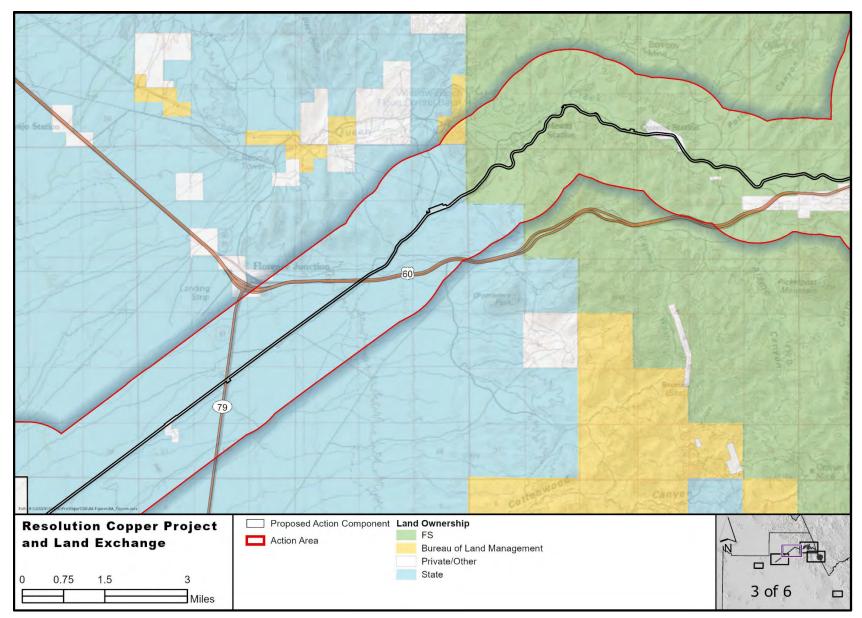


Figure 11-3. Topography with land ownership (3 of 6)

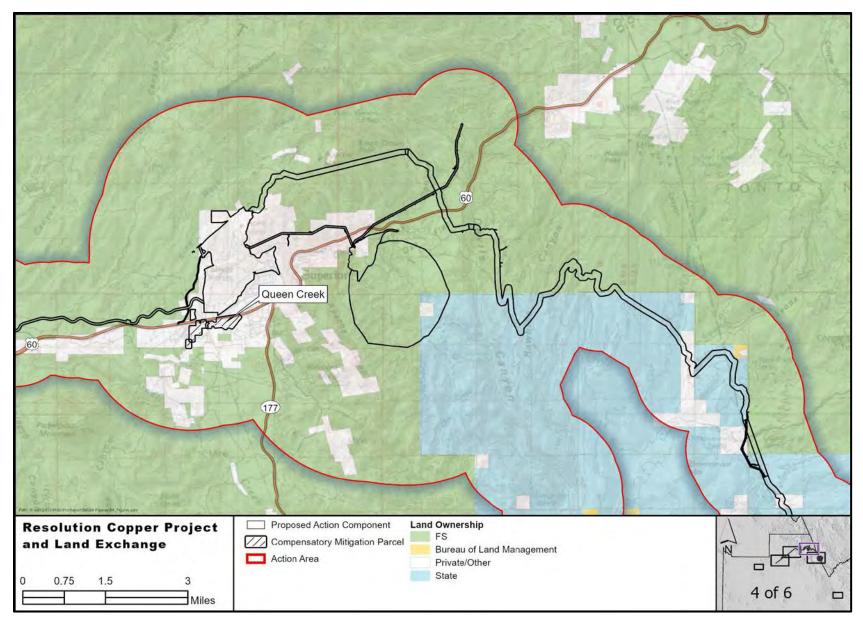


Figure 11-4. Topography with land ownership (4 of 6)

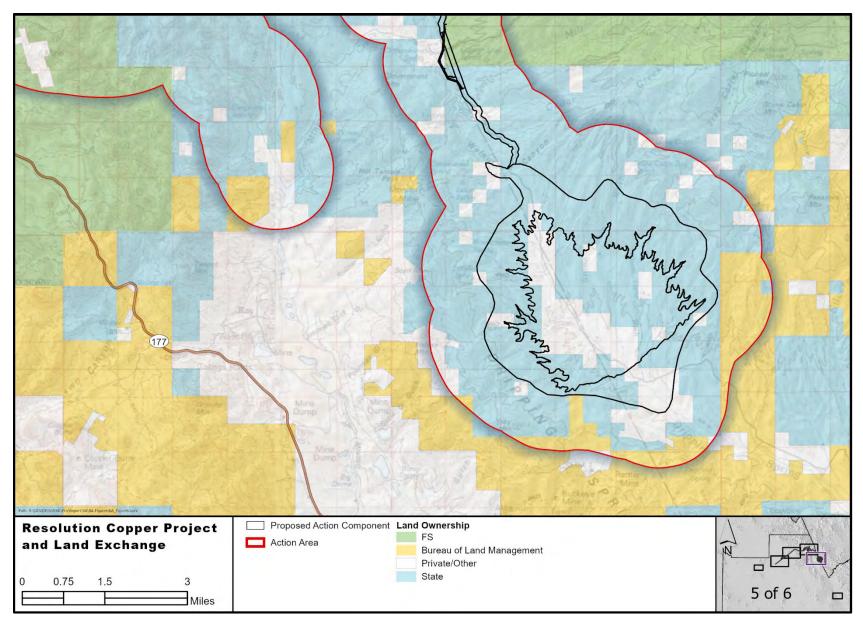


Figure 11-5. Topography with land ownership (5 of 6)

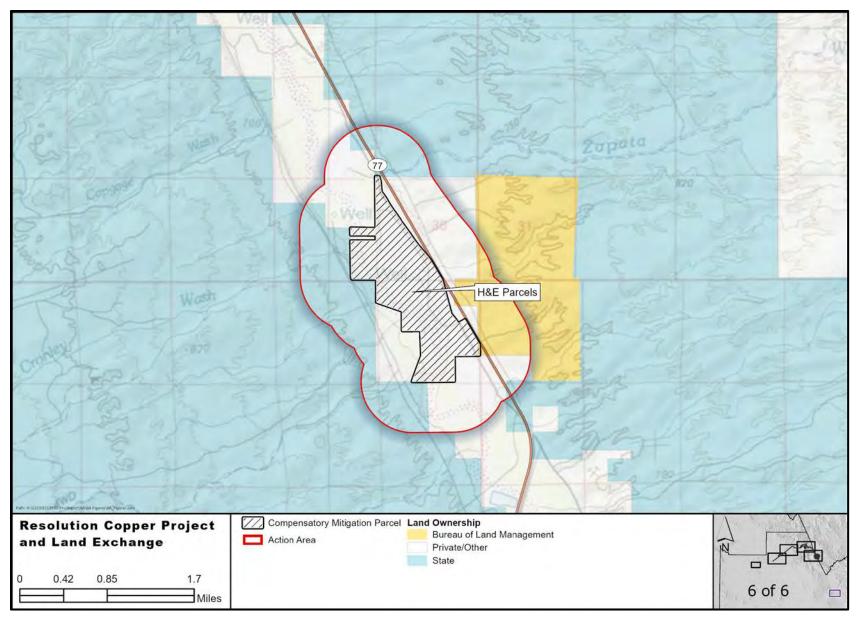


Figure 11-6. Topography with land ownership (6 of 6)

# 4.1 Water Sources Information within the Action Area

# 4.1.1 Surface Water Information

Perennial streams and springs are relatively rare in the area but do exist (see discussion in Section 3.7.1, Groundwater Quantity and Groundwater-Dependent Ecosystems, in the Draft EIS). For the most part, surface waters in the area consist of dry washes or ephemeral channels that flow only in response to moderate- to high-intensity rainfall events. Water that flows in these washes and streams due to runoff from rainfall events reflects conditions in the upstream watershed—the geographic area that contributes to flow in the stream—and these flows could change if the upstream watershed changes. The western part of the action area is drained by Queen Creek, which arises in the highlands around the Pinal Mountains and flows past Oak Flat and through the town of Superior. Queen Creek ultimately flows to Whitlow Ranch Dam, about 11 miles west of Superior. The dam is an ungated flood risk–management structure that was constructed in 1960 to reduce the risk of downstream flood damage to farmland and the communities of Chandler, Gilbert, Queen Creek, and Florence Junction. The dam includes a diversion structure to satisfy local water rights.

Devil's Canyon is located on the east side of Oak Flat, and drains southward to join Mineral Creek, near the reservoir of Big Box Dam. Portions of Devil's Canyon are perennial or intermittent. Dripping Spring Wash is located in the eastern part of the action area, where the tailings storage facility is located. Dripping Spring Wash flows to the southeast for approximately 18 miles before discharging into the Gila River downstream of the Coolidge Dam. The main stem channel of Dripping Spring Wash is entirely ephemeral, with no known perennial reaches. Figures 12-1 through 12-6 depict the water resources within the action area and their flow patterns and status.

The analysis area for surface water quantity NEPA analysis included the Queen Creek, Devil's Canyon, Dripping Spring Wash, and Donnelley Wash drainages: all of these watercourses are tributaries of the Gila River. The NEPA analysis concluded that the proposed action would cause two major changes to these watersheds. Once the subsidence area develops at the surface, precipitation falling within this area would no longer report to the downstream stream network, potentially reducing runoff reaching both Devil's Canyon and Queen Creek. In addition to the loss of runoff from the subsidence area, precipitation falling on or within the tailings storage facility would also be unavailable to downstream washes. All the tailings alternatives are designed to allow any runoff from upstream in the watershed to flow around the facility and continue flowing downstream. However, for the slurry tailings facilities, the top of the tailings facility is managed as a pond to allow process water to be recycled. Any rain falling within the bounds of a slurry facility, including the seepage recovery ponds at the downstream toe of the tailings embankment, is retained and recycled.

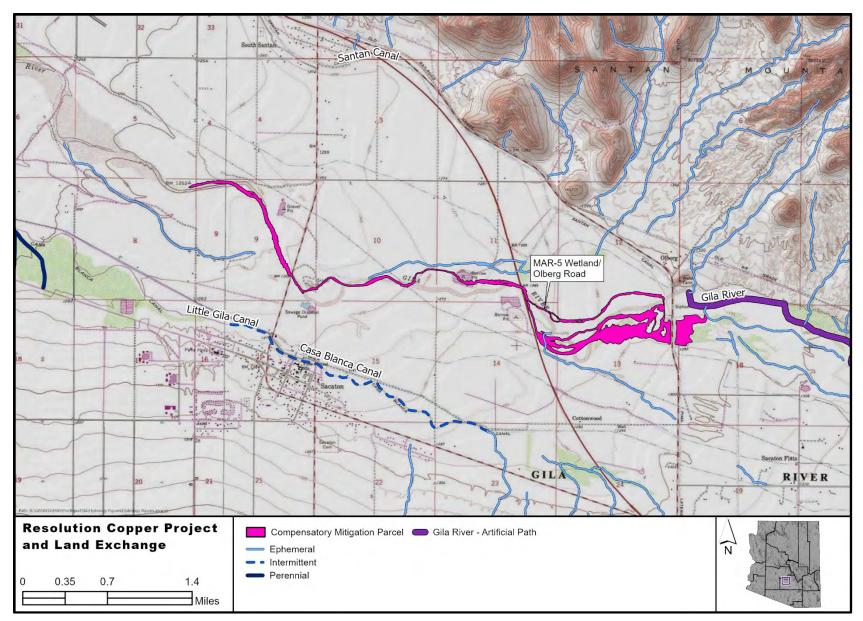


Figure 12-1. Suface water features in action area (1 of 6)

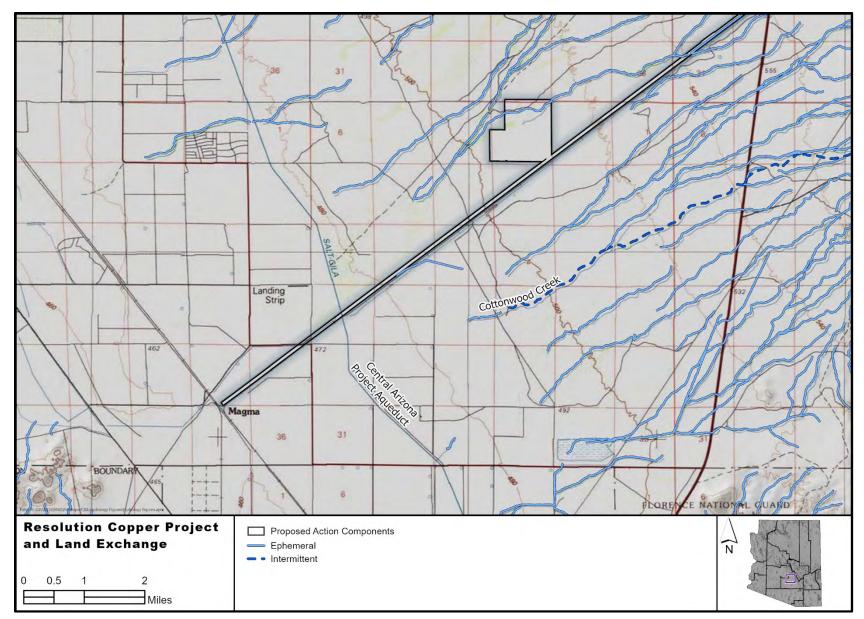


Figure 12-2. Suface water features in action area (2 of 6)

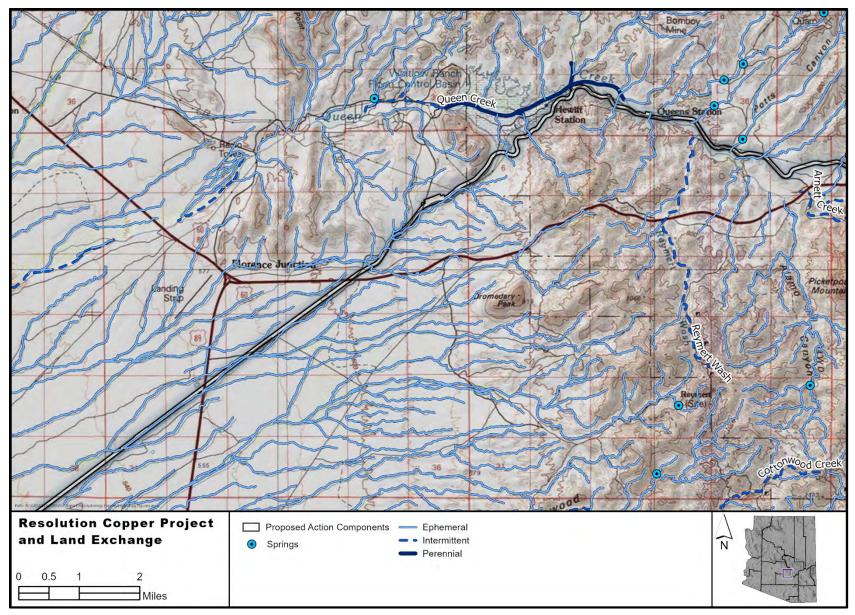


Figure 12-3. Suface water features in action area (3 of 6)

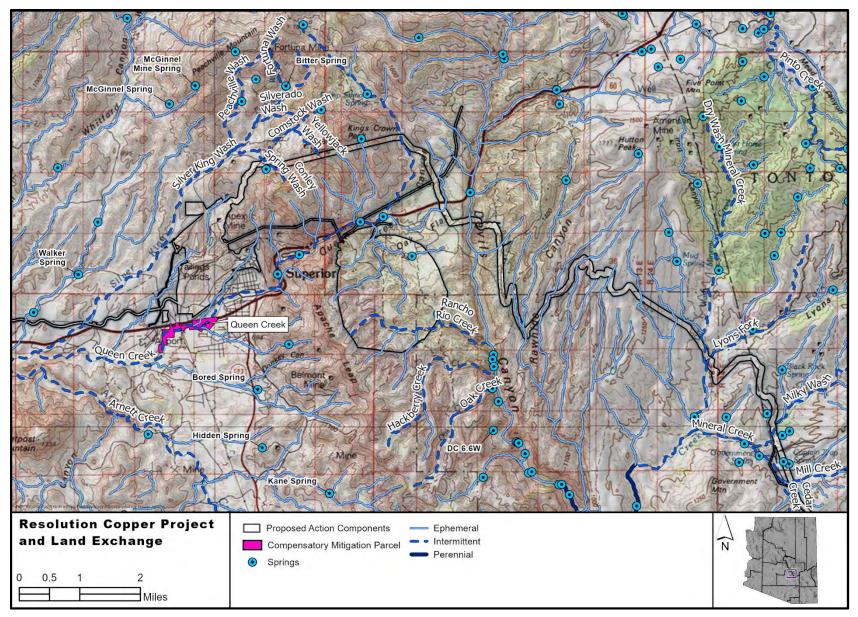


Figure 12-4. Suface water features in action area (4 of 6)

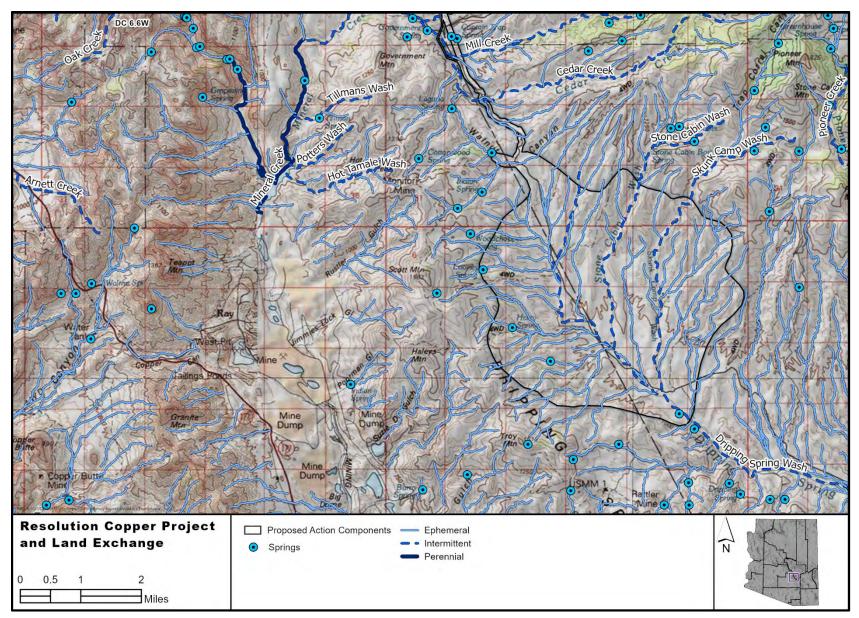


Figure 12-5. Suface water features in action area (5 of 6)

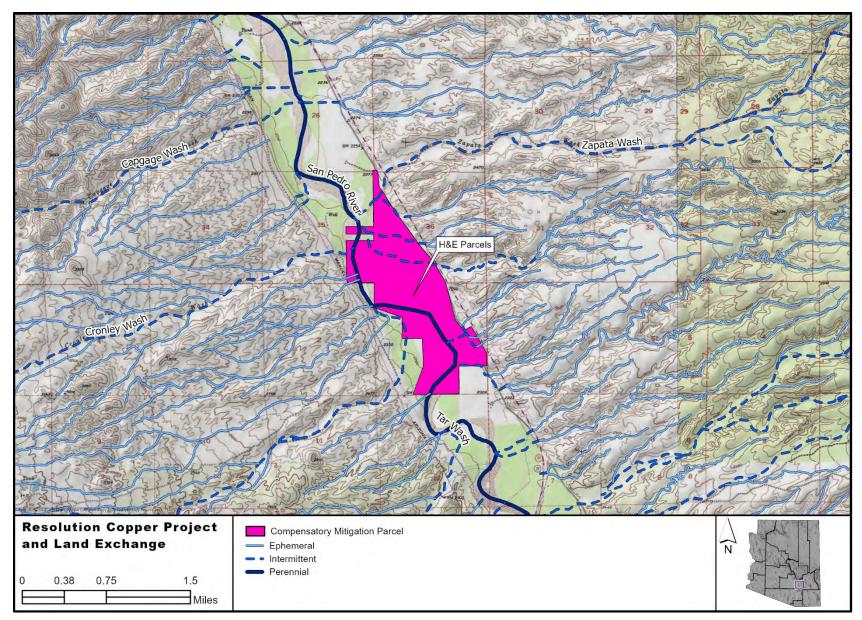


Figure 12-6. Suface water features in action area (6 of 6)

# 4.1.2 Groundwater

The project is located within a geological region known as the Basin and Range province, near the boundary with another geological region known as the Arizona Transition Zone. The Basin and Range aquifers generally consist of unconsolidated gravel, sand, silt, and clay, or partly consolidated sedimentary or volcanic materials. These materials have filled deep fault-block valleys formed by large vertical displacement across faults. Mountain ranges that generally consist of impermeable rocks separate adjacent valleys (Robson and Banta 1995), leading to compartmentalized groundwater systems. Stream alluvium is present along most of the larger stream channels. These deposits are about 100 feet thick and 1 to 2 miles wide along the Gila, Salt, and Santa Cruz Rivers in Arizona aquifers (Robson and Banta 1995). The hydrology of the Arizona Transition Zone is generally more complex, characterized largely by fractured rock aquifers with some small alluvial basins.

The semiarid climate in the region limits the amount of surface water available for infiltration, resulting in slow recharge of the groundwater with an average annual infiltration of 0.2 to 0.4 inch per year (Woodhouse 1997). Much of this recharge occurs as mountain-front recharge, where runoff concentrates along ephemeral channels.

# EAST PLANT SITE

The East Plant Site is located on Oak Flat, east of the Concentrator Fault. Three different types of groundwater occur in this area:

- Shallow, perched groundwater systems
- The regional Apache Leap Tuff aquifer
- A regional deep groundwater system

The Concentrator Fault is a barrier to flow in the deep groundwater systems on either side of the fault. The shallow groundwater system consists of several shallow, perched aquifers of limited areal extent hosted in alluvial deposits and the uppermost weathered part of the Apache Leap Tuff. The primary shallow aquifers in this area are located near Top-of-the-World and JI Ranch, and to a lesser degree along some of the major drainages such as Hackberry Canyon and Rancho Rio Canyon.

The Apache Leap Tuff aquifer is a fractured-rock aquifer that extends throughout much of the Upper Queen Creek and Devil's Canyon watersheds, and the western part of the Upper Mineral Creek watershed. The Apache Leap Tuff aquifer is separated from the deep groundwater system by a thick sequence of poorly permeable Tertiary basin-fill sediments (the Whitetail Conglomerate). In general, the direction of groundwater movement in the Apache Leap Tuff follows surface drainage patterns, with groundwater moving from areas of recharge at higher elevations to natural discharge areas in Devil's Canyon and in Mineral Creek.

The deep groundwater system east of the Concentrator Fault is compartmentalized, and faults separate individual sections of the groundwater system from each other. Depending on their character, faults can either inhibit or enhance groundwater flow. Based on available evidence, the faults in the project area tend to restrict groundwater flow between individual sections. The ore body and future block-cave zone lie within a geological structure called the Resolution Graben, which is bounded by a series of regional faults. The deep groundwater system in the Resolution Graben is hydraulically connected to existing mine workings, and a clear decrease in water levels in response to ongoing dewatering of the mine workings has been observed (Resolution Copper 2016a).

#### WEST PLANT SITE

At the West Plant Site, shallow and intermediate groundwater occurs in the Gila Conglomerate. In addition, groundwater occurs in shallow alluvium to the south of the West Plant Site and in fractured bedrock (Apache Leap Tuff) on the eastern boundary of the West Plant Site.

Groundwater in the shallow, unconfined Gila Conglomerate discharges locally, as evidenced by the presence of seeps and evaporite deposits. The groundwater deeper in the Gila Conglomerate, below a separating mudstone formation, likely flows to the south or southwest toward regional discharge areas (Resolution Copper 2016c). Several wells monitor the Gila Conglomerate near the West Plant Site. Most of these wells have shown steady long-term declines in water level since 1996. These declines are consistent with water-level declines occurring regionally in response to drought conditions (Montgomery and Associates Inc. 2017).

The deep groundwater west of the Concentrator Fault is hosted in low permeability Quaternary and Tertiary basin-fill deposits, fractured Tertiary volcanic rocks, and underlying Apache Leap Tuff. Four wells monitor the deep groundwater system west of the Concentrator Fault. These wells have shown varying rises and declines (Montgomery and Associates Inc. 2017).

# MARRCO CORRIDOR, FILTER PLANT AND LOADOUT FACILITY, AND DESERT WELLFIELD

Along much of the MARRCO corridor, groundwater is present in a shallow aquifer within the alluvium along Queen Creek. The groundwater flow direction in this part of the corridor generally follows the Queen Creek drainage to the west.

In the portion of the corridor between Florence Junction and Magma, where the filter plant and loadout facility would be located, the groundwater is present in deep alluvial units. The regional groundwater flow direction in this area is generally toward the northwest (Resolution Copper 2016a).

The makeup water supply<sup>7</sup> for the mine would come from a series of wells installed within the MARRCO corridor, drawing water from these deep alluvial units of the East Salt River valley. These wells are known as the "Desert Wellfield." Although groundwater development in the vicinity of the Desert Wellfield has heretofore been limited, historically areas of the East Salt River valley to the west and south have been heavily used for agriculture. Until the late 1980s to early 1990s, groundwater levels were declining in much of the basin. Passage of the 1980 Groundwater Management Act which imposed limits on pumping, the availability of a renewable source of water, and the development of a regulatory framework allowing for recharge of the aquifer, all of which in combination with reduced agricultural pumping, have contributed to rising water levels. In the NMIDD to the southwest, groundwater levels have recovered on the order of 170 feet over the past three decades, with somewhat lesser water-level increases occurring in the area of the Desert Wellfield (Bates et al. 2018). Current depths to groundwater in the vicinity of the Desert Wellfield range from 400 to 600 feet below ground surface.

### TAILINGS STORAGE FACILITY – ALTERNATIVE 6 – SKUNK CAMP

Deposits of sand and gravel less than 150 feet thick underlie the Skunk Camp location and contain shallow groundwater (Klohn Crippen Berger Ltd. 2018). Regional groundwater is assumed to flow from

<sup>&</sup>lt;sup>7</sup> The mine process incorporates numerous means of recycling water back into the process wherever possible. However, for all alternatives, there remains the need for substantial additional fresh water for the processing. The fresh water fed into the processing stream is termed "makeup" water.

northwest to southeast within the proposed tailings storage facility area toward the Gila River. Shallow groundwater flow is expected to be primarily through the surface alluvial channels and upper weathered zone of the Gila Conglomerate (Klohn Crippen Berger Ltd. 2018). The site is located in the Dripping Spring Wash groundwater basin.

#### **DEVIL'S CANYON**

The upper reach of Devil's Canyon includes a reach of perennial flow from approximately DC-11.0 to DC-10.6.<sup>8</sup> The geohydrology suggests that this section of Devil's Canyon lies above the water table in the Apache Leap Tuff aquifer and is most likely supported by snowmelt or precipitation stored in near-surface fractures, and/or floodwaters that have been stored in shallow alluvium along the stream, before slowly draining into the main channel. Further evaluation of hydrochemistry and flow data support this conclusion (Garrett 2018). Streamflow in Upper Devil's Canyon is not considered to be connected with the regional Apache Leap Tuff aquifer and would not be expected to be impacted by groundwater drawdown caused by the block-cave mining and dewatering. This portion of Devil's Canyon is also upstream of the subsidence area and unlikely to be impacted by changes in surface runoff.

Moving downstream in Devil's Canyon, persistent streamflow arises again about km 9.3. From this point downstream, Devil's Canyon contains stretches of perennial flow, aquatic habitat, and riparian galleries. Flow arises both from discrete springs along the walls of the canyon (four total: DC-8.2W, DC-6.6W, DC-6.1E, DC-4.1E), as well as groundwater inflow along the channel bottom. These reaches of Devil's Canyon also are supported in part by near-surface storage of seasonal precipitation; however, the available evidence indicates that these waters arise primarily from the regional Apache Leap Tuff aquifer. Streamflow in middle and lower Devil's Canyon is considered to be connected with the regional Apache Leap Tuff aquifer, which could potentially be impacted by groundwater drawdown caused by the block-cave mining and dewatering. These reaches of Devil's Canyon also receive runoff from the area where the subsidence area would occur and therefore may also lose flow during runoff events.

### QUEEN CREEK

The available evidence suggests that Queen Creek from headwaters to Whitlow Ranch Dam is ephemeral in nature, although in some areas above Superior it may be considered intermittent, as winter base flow does occur and likely derives from seasonal storage of water in streambank alluvium, which slowly seeps back in to the main channel (Garrett 2018). This includes three springs located along the main stem of Queen Creek above Superior.

An exception for Queen Creek is a perennially flowing reach between km 17.39 and 15.55, which is located downstream of Superior and upstream of Boyce Thompson Arboretum. Originally this flowing reach had been discounted because it receives effluent discharge from the Superior Wastewater Treatment Plant. However, discussions within the Groundwater Modeling Workgroup suggested that a component of baseflow supported by regional aquifer discharge may exist in this reach as well. Regardless of whether baseflow directly enters the channel from the regional aquifer, substantial flow in this reach also derives from dewatering discharges from a small open-pit perlite mining operation, where the mine pit presumably intersects the regional aquifer (Garrett 2018). Therefore, for several reasons, this reach was included as a potential GDE, with the potential to be impacted by regional groundwater drawdown. The AGFD conducted surveys on this reach in 2017 and found that while flow fluctuated throughout the

<sup>&</sup>lt;sup>8</sup> Many of the stream descriptions reference the distance upstream of the confluence, measured in kilometers. This reference system is also incorporated into many stream/spring monitoring locations. For instance, spring "DC-8.4W" is located 8.4 km upstream of the mouth of Devil's Canyon, on the west side of the drainage.

survey reach, aquatic wildlife and numerous other avian and terrestrial species use this habitat, and that aquatic species appeared to be thriving and reproducing (Warnecke et al. 2018).

Queen Creek also has perennial flow that occurs at Whitlow Ranch Dam and supports a 45-acre riparian area (primarily cottonwood, willow, and tamarisk). This location is generally considered to be where most subsurface flow in the alluvium along Queen Creek and other hydrologic units exits the Superior Basin. Queen Creek above and below Superior receives runoff from the area where the subsidence area would occur and therefore may also lose flow during runoff events. Runoff from over 20 percent of the Queen Creek watershed above Magma Avenue Bridge would be lost to the subsidence area (described in more detail in Section 3.7.3, Surface Water Quantity, in the Draft EIS).

# MINERAL CREEK

Mineral Creek is similar in nature to lower Devil's Canyon. While flows are supported in part by nearsurface storage of seasonal precipitation, the available evidence indicates that these waters arise partially from the Apache Leap Tuff aquifer and other regional sources. For the purposes of analysis, Mineral Creek is considered to be connected with regional aquifers, which could potentially be impacted by groundwater drawdown caused by the block-cave mining and dewatering; whether this impact is predicted to occur or not is determined using the results of the groundwater modeling.

Approximately the lower 4 miles of Mineral Creek exhibits perennial flow that supports riparian galleries and aquatic habitat. Three perennial springs also contribute to Mineral Creek (Government Springs, MC-8.4C, and MC-3.4W or Wet Leg Spring). Government Springs is the farthest upstream, roughly 5.4 miles above the confluence with Devil's Canyon (Garrett 2018).

Mineral Creek is designated as critical habitat for Gila chub. The AGFD has conducted fish surveys on Mineral Creek periodically since 2000 and has not identified Gila chub in Mineral Creek since 2000. While the presence of amphibians suggested acceptable water quality in this reach, until 2006 no fish populations were observed despite acceptable habitat. AGFD stocked native longfin dace in Mineral Creek downstream of Government Springs in 2006, and as of 2017, these fish were still present in the stream, though Gila chub have not been seen (Crowder et al. 2014; WestLand Resources Inc. [WestLand] 2009a, 2018a).

# ARNETT CREEK

Fairly strong and consistent evidence indicates that several reaches of Arnett Creek likely receive some contribution from groundwater that looks similar to the Apache Leap Tuff aquifer, though these units are not present in this area. This includes Blue Spring (located in the channel of Arnett Creek above Telegraph Canyon) and in the downstream portions of Arnett Creek immediately downstream of Telegraph Canyon. Arnett Creek is considered to be connected with regional aquifers, which could potentially be impacted by groundwater drawdown caused by the block-cave mining and dewatering; whether this impact is predicted to occur or not is determined using the results of the groundwater modeling.

# TELEGRAPH CANYON

Telegraph Canyon is a tributary to Arnett Creek. Unlike Arnett Creek, there was insufficient evidence to determine whether or not these waters were tied to the regional aquifers. In such cases, the Forest Service policy is to assume that a connection exists; therefore, Telegraph Canyon is also considered to be connected with the regional aquifers, which could potentially be impacted by groundwater drawdown

caused by the block-cave mining and dewatering; whether this impact is predicted to occur or not is determined using the results of the groundwater modeling.

#### TRIBUTARIES TO QUEEN CREEK AND DEVIL'S CANYON

A number of tributaries were evaluated originating in the Oak Flat area and feeding either Queen Creek or Devil's Canyon. These include Number 9 Wash and Oak Flat Wash (Queen Creek watershed) and Iron Canyon, Hackberry Canyon, and Rancho Rio Canyon (Devil's Canyon watershed). Sufficient evidence existed for all of these tributaries to demonstrate that they most likely have local water sources that are not connected to the regional Apache Leap Tuff aquifer and therefore are unlikely to be impacted by drawdown in the regional aquifer (Garrett 2018).

# 4.2 Vegetation Communities

Eleven vegetation communities and land cover types occur within the action area. These communities and land cover types along with the acres of each are given in table 7 and are shown figures 13-1 through 13-3. The vegetation community geographic information system (GIS) data used for this analysis consisted of a specialized dataset developed by the AGFD that is a crosswalk between the larger-scale (Brown 1994; Brown et al. 2007) and Southwest Regional Gap Analysis Project (SWReGAP) vegetation communities data and, more specifically, a modified SWReGAP layer that was used in the AGFD's statewide modeling process (Morey 2018). Landscape integrity and habitat fragmentation is shown in figure 14.

A brief description of the main vegetation communities in the action area is provided below.

Project Component	Vegetation Community or Landform Type	Project Area (acres)
Access Roads	Chihuahuan Desertscrub	<0.1
	Interior Chaparral	1.3
	Mohave Desertscrub	1.0
	Pinyon-Juniper Woodland	0.1
	Semidesert Grassland	0.1
	Upland Sonoran Desertscrub	1.0
	Xeric Riparian	0.7
East Plant Site and Magma Road realignment	Interior Chaparral	92.0
	Mohave Desertscrub	93.0
	Pinyon-Juniper Woodland	0.01
	Xeric Riparian	3.9
Filter plant/Loadout facility disturbance	Human dominated	2.7
	Sonoran/Mohave Desertscrub	411.6
	Upland Sonoran Desertscrub	138.3
MARRCO corridor	Human dominated	31.8
	Sonoran/Mohave Desertscrub	139.6
	Riparian	2.1
	Semidesert Grassland	1.2
	Xeric Riparian	<0.1
	Upland Sonoran Desertscrub	510.5

Project Component	Vegetation Community or Landform Type	Project Area (acres)
Pipeline	Interior Chaparral	31.5
	Mohave Desertscrub	20.9
	Pinyon-Juniper Woodland	4.6
	Semidesert Grassland	0.6
	Xeric Riparian	1.0
Pipeline and Transmission Line Collocated	Interior Chaparral	399.2
	Mesquite	1.1
	Mohave Desertscrub	117.9
	Ponderosa Pine-Evergreen Oak	1.3
	Pinyon-Juniper Woodland	23.1
	Semidesert Grassland	215.2
	Upland Sonoran Desertscrub	65.0
	Xeric Riparian	10.4
Pipeline Devils Canyon Span	Interior Chaparral	4.0
	Riparian	1.4
Pipeline North Tunnel	Interior Chaparral	81.1
	Mohave Desertscrub	89.7
	Pinyon-Juniper Woodland	21.2
	Semidesert Grassland	2.3
	Upland Sonoran Desertscrub	7.5
	Xeric Riparian	0.8
Pipeline Northern Span	Interior Chaparral	0.2
	Mohave Desertscrub	0.8
	Pinyon-Juniper Woodland	0.8
	Xeric Riparian	1.5
Pipeline Trenchless	Interior Chaparral	4.8
	Mesquite	0.2
	Mohave Desertscrub	14.7
	Pinyon-Juniper Woodland	5.1
	Riparian	<0.1
	Semidesert Grassland	23.0
	Upland Sonoran Desertscrub	5.8
	Xeric Riparian	7.3
Silver King Road realignment	Human Dominated	2.2
5 5	Mohave Desertscrub	0.24
	Sonoran/Mohave Desertscrub	0.5
	Upland Sonoran Desertscrub	10.1
Subsidence area (excluding East Plant Site	Interior Chaparral	901.8
,	Mohave Desertscrub	671.1
	Pinyon-Juniper Woodland	16.4
	Semidesert Grassland	29.6
	Upland Sonoran Desertscrub	0.7
	Xeric Riparian	52.8

Project Component	Vegetation Community or Landform Type	Project Area (acres)
Tailings Fence	Chihuahuan Desertscrub	3.8
	Interior Chaparral	247.3
	Mesquite	9.3
	Mohave Desertscrub	237.6
	Ponderosa Pine-Evergreen Oak	34.9
	Pinyon-Juniper Woodland	16.4
	Semidesert Grassland	3,732.7
	Sonoran/Mohave Desertscrub	7.9
	Upland Sonoran Desertscrub	184.8
	Wash	0.9
	Xeric Riparian	168.9
Failings Storage Facility	Chihuahuan Desertscrub	1.8
	Interior Chaparral	20.7
	Mesquite	0.9
	Mohave Desertscrub	220.7
	Pinyon-Juniper Woodland	19.8
	Semidesert Grassland	2,829.3
	Sonoran/Mohave Desertscrub	7.29
	Upland Sonoran Desertscrub	485.1
	Wash	2.4
	Xeric Riparian	414.2
Fransmission line 115 kilovolt (kV) Corridor	Human Dominated	<0.1
	Interior Chaparral	7.4
	Mohave Desertscrub	24.7
	Pinyon-Juniper Woodland	1.1
	Upland Sonoran Desertscrub	7.6
	Xeric Riparian	1.7
Fransmission line 115-230 kilovol(kV) Corridor	Chihuahuan Desertscrub	0.2
	Interior Chaparral	27.3
	Mohave Desertscrub	19.9
	Ponderosa Pine-Evergreen Oak	1.4
	Pinyon-Juniper Woodland	0.8
	Semidesert Grassland	4.1
	Xeric Riparian	7.4
ransmission Mineral Creek Crossing	Interior Chaparral	0.3
	Mohave Desertscrub	0.6
	Pinyon-Juniper Woodland	0.9
	Riparian	<0.1
	Semidesert Grassland	9.5
	Upland Sonoran Desertscrub	2.9
	Xeric Riparian	5.4

Project Component	Vegetation Community or Landform Type	Project Area (acres)
West Plant Site	Human dominated	372.8
	Mohave Desertscrub	21.6
	Semidesert Grassland	13.6
	Sonoran/Mohave Desertscrub	6.0
	Upland Sonoran Desertscrub	511.5
	Water	14.7
Off-Site CWA Compensatory Mitigation Parcel – H&E Parcels Area	Chihuahuan Desertscrub	96.3
	Human dominated	340.4
	Riparian	16.4
	Semidesert Grassland	128.3
	Upland Sonoran Desertscrub	12.1
Off-Site CWA Compensatory Mitigation Parcel – Queen Creek Area	Human dominated	25.7
	Mesquite	1.2
	Riparian	<0.1
	Upland Sonoran Desertscrub	11.2
	Xeric Riparian	40.6
Off-Site CWA Compensatory Mitigation Parcel – Mar-5 Wetland/Olberg Road	Human dominated	0.3
	Sonoran/Mohave Desertscrub	69.1
	Riparian	11.6
	Upland Sonoran Dscrub	64.5
	Total Acres	14,807.5

Note: Totals shown may not add up exactly due to rounding.

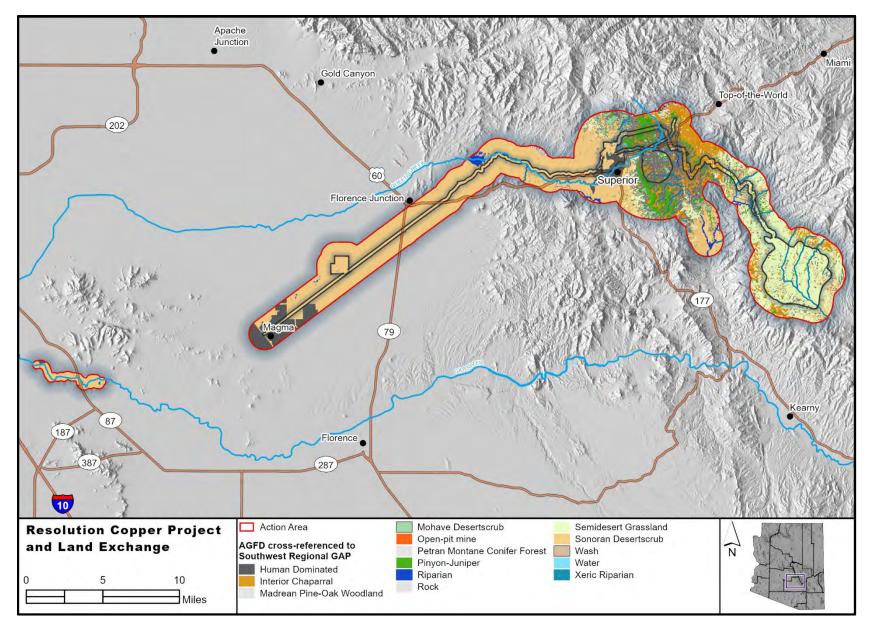


Figure 13-1. Vegetation communities in the action area (1 of 3)

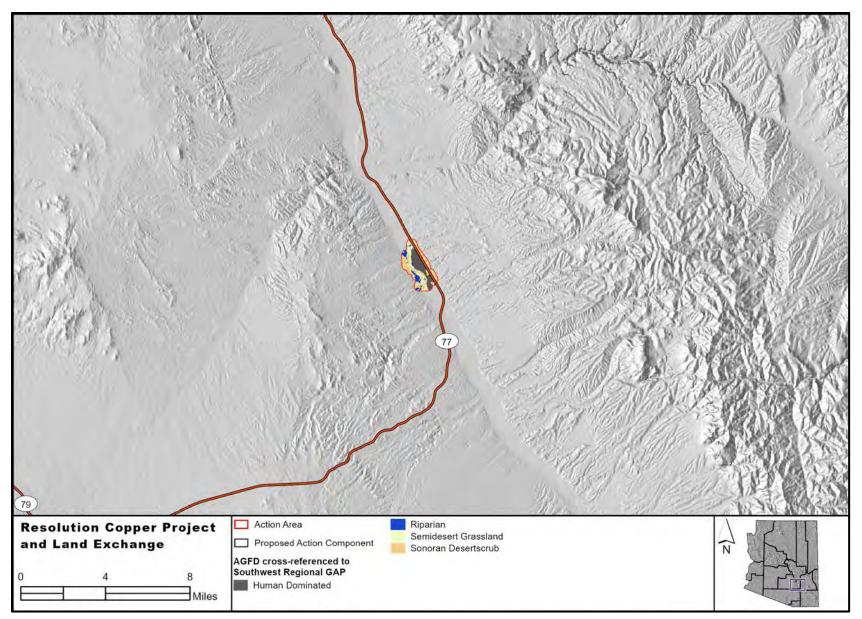


Figure 13-2. Vegetation communties in the action area (2 of 3)

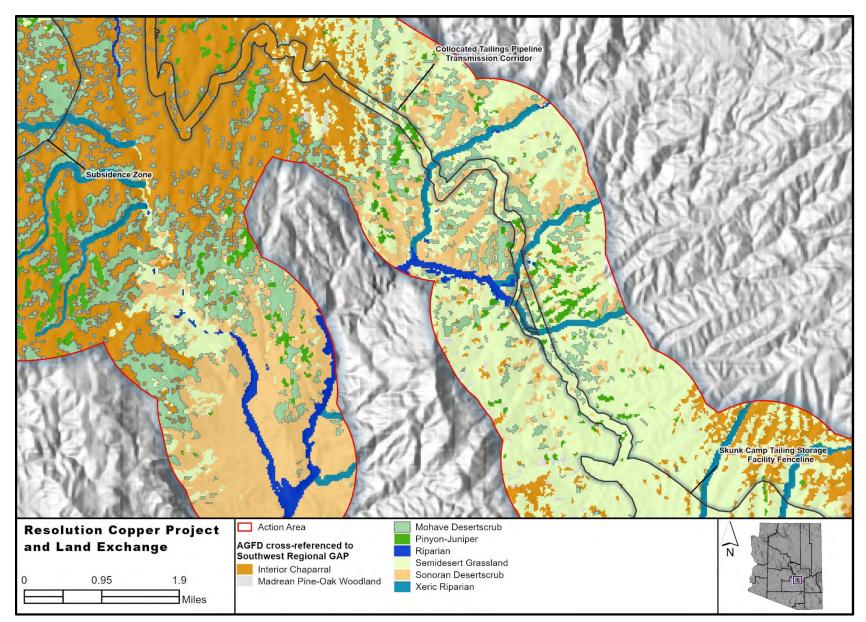


Figure 13-3. Vegetation communties in the action area (3 of 3)

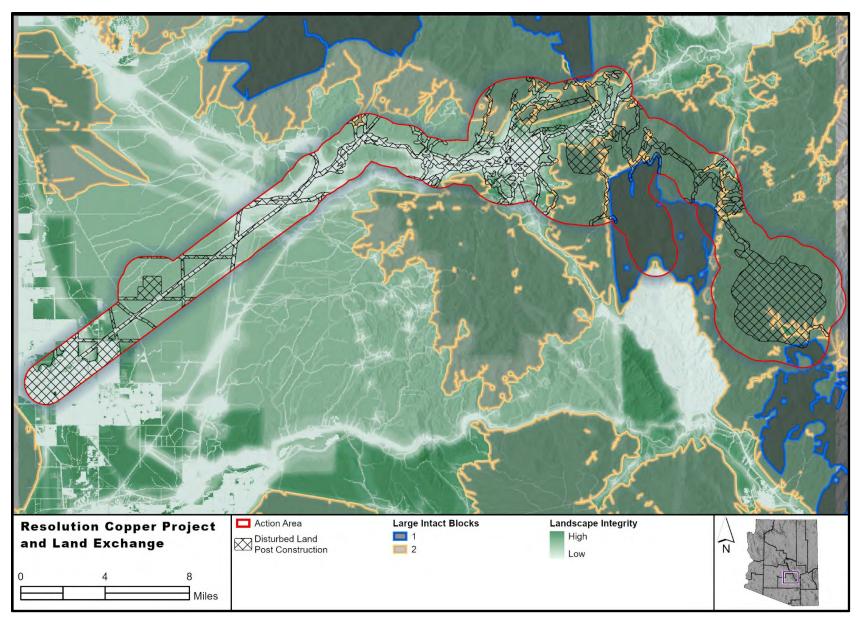


Figure 14. Existing habitat fragmentation map

# 4.2.1 Desert Ecosystems (includes Arizona Upland Sonoran Desertscrub and Lower Colorado River Sonoran Desertscrub)

This vegetation community generally dominates in broad valleys, lower bajadas, plains, and low hills of lower elevations. Trees are sparse and the understory is bare ground or sparse grass and shrubs, typically whitethorn, creosote, and bursage. Cacti are also present, such as saguaro, prickly pear, and cholla. Common trees are paloverde, catclaw acacia, mesquite, and ironwood. On slopes, plants are often distributed in patches around rock outcrops where suitable soil exists. These communities occur on a combined total of approximately 5,170 acres in the action area.

# 4.2.2 Semi-Desert Grasslands

Typically occurring roughly 3,000 to 5,000 feet in elevation, this vegetation community is dominated by diverse perennial grasses under ideal or improved conditions, which vary depending on the region, as well as by an established shrub layer with predominant shrubs, including mesquite, snakeweed, creosote, and catclaw acacia. This community occurs on about 18,389 acres in the action area.

# 4.2.3 Interior Chaparral

Typically occurring roughly 3,000 to 7,000 feet in elevation, this vegetation community consists of chaparral on side slopes that transition into pinyon-juniper woodlands. Chaparral is a term describing an ecosystem dominated by shrubs adapted to arid environments (i.e., sclerophyllous), grasses, and scrub oak. Interior chaparral has an open canopy and open space either bare or covered with grasses and forbs. This community occurs on about 17,414 acres in the action area.

# 4.2.4 Pinyon-Juniper Woodland

Typically occurring roughly 4,500 to 7,000 feet in elevation, these woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges, and are characterized by being an open forest dominated by low, bushy, evergreen junipers and pinyon pines. Annual and perennial grasses, forbs, and shrubs typically abound beneath the woodland overstories. This community occurs on about 1,252 acres in the action area.

# 4.2.5 *Ponderosa Pine-Evergreen Oak*

Typically occurring roughly 5,000 to 7,500 feet in elevation, these woodlands occur on mountains and plateaus generally south of the Mogollon Rim. Ponderosa pine intermingled with oak species predominate, mingled with patchy shrublands or grasslands. This community occurs on about 452 acres in the action area.

# 4.2.6 Xeric Riparian

Xeric riparian or xeroriparian vegetation typically occurs along washes or arroyos that receive concentrated runoff during storms. Although often dry, the intermittent flows in these washes greatly affect the vegetation by providing additional periodic soil moisture. Channels are often clear of vegetation, but shrubs and small trees are located along the banks, such as acacia, mesquite, paloverde, and desert broom. Xeroriparian vegetation can vary from sparse to thick, depending on the amount of moisture received. This community occurs on about 1,853 acres in the action area.

# 4.2.7 Riparian

Riparian corridors are located along medium to large perennial streams in canyons and desert valleys, supported by the presence of persistent groundwater. Dominant trees can include willow (*Salix* spp.), cottonwood (*Populus* spp.), mesquite (*Prosopis* spp.), ash (*Fraxinus* spp.), walnut (*Juglans* spp.), and sycamore (*Platanus* spp.). Understory is usually present, including herbaceous vegetation, grasses, and wetland species along streambanks. Note that a discussion of all areas determined to be dependent on groundwater is included in section 3.7.1 of the Draft EIS and in the Description of the Action Area section of this BA, including potential impacts caused by mine dewatering. Riparian vegetation occurs on about 1,487 acres in the action area.

# 4.2.8 Existing Land Disturbance

A variety of land use disturbances have affected the condition of vegetation and soils within and near the project area footprint. Historical and ongoing mining and mineral exploration, land development, grazing, recreation, and fires have left a legacy of disturbances to the landscape (table 8).

Proposed Action Component	Facilities Disturbance (acreage)	Road Disturbance* (acreage)	Fire Disturbance (acreage)	Total Disturbance (acreage)
Access Roads		0.6	0.1	0.7
East Plant Site and Magma Road realignment	38.8	6.2		45.0
Filter plant/Loadout facility disturbance	190.0	0.3	_	190.3
MARRCO corridor	89.4	177.5	14.3	281.2
Pipeline		22.8		22.8
Pipeline and Transmission Line Collocated		357.8		357.8
Silver King Road realignment	12.5	7.9	_	20.4
Subsidence area (excluding East Plant Site disturbance)	-	31.3	_	31.3
Skunk Camp tailings storage facility fence line	-	21.6	_	21.6
Skunk Camp tailings storage facility disturbance	-	21.6	_	21.6
Transmission Line 115-kV Corridor	<0.1	0.3		0.3
Transmission Line 115 kV-230-kV corridor	0.1	3.1	9.0	12.2
West Plant Site	755.7	49.1	_	804.8
Total Proposed Action	1,086.5	700.1	23.4	2,006.6

#### Table 8. Existing disturbance acreage within the project footprint

Note: Totals shown may not add up exactly due to rounding.

\* Single-track recreational trails excluded from area calculations.

# 4.2.9 *Mitigation Lands*

Vegetation along the active channel at the H&E Parcels CWA Compensatory Mitigation Parcel consists of narrow but dense stands of mesoriparian and xeroriparian trees and shrubs, including large-statured mesquite and tamarisk that area approximately 25 feet tall with a few cottonwood and patches of singlewhorl burrowbrush (*Hymenoclea monogyra*) (WestLand 2020). Vegetation on the floodplain terraces consists of moderately dese medium to large statured mesquite and tamarisk, and vegetation within the historical agricultural fields on the eastern portion of the site consists of sparsely populated small to medium-statured mesquite and lotebush (*Ziziphus obtusifolia*) (WestLand 2020b).

Dense stands of mature catclaw acacia (*Senegalia greggii*) and velvet mesquite shrubs occur long the drainage at the Queen Creek CWA Compensatory Mitigation Parcel, reaching approximately 16 feet tall and creating approximately 95 percent cover (WestLand 2020b). The floodplain of the Queen Creek CWA Compensatory Mitigation Parcel contains moderately dense (approximately 65 percent canopy cover) mesquite shrublands, and the uplands are dominated by creosote bush (*Larrea tridentata* var. *tridentata*) (WestLand 2020b).

Following in-stream discharge of CAP water, the Mar-5 CWA Compensatory Mitigation Parcel contains cattails, young Goodding's willow, and tamarisk in the Gila River with creosote bush and desert forbs occurring in the floodplain (WestLand 2020b). The Olberg Road site contains dense stands of tamarisk, approximately 20 feet tall, with floodplain terrace containing creosote and desert forbs (WestLand 2020b).

# 5 CONSERVATION MEASURES

The following conservation measures, i.e., applicant-committed environmental protection measures, that are specific to ESA-listed species in this BA have been incorporated into the proposed action for the project. In addition, other conservation measures that are part of the proposed action but are not necessarily specific to any ESA-listed species addressed in this BA, but which could provide some protection to ESA-listed species or their habitat, are included in appendix D.

# 5.1 Arizona Hedgehog Cactus Conservation Measures

- 1. Prior to any ground-disturbing activities, suitable habitat within the project area will be surveyed for Arizona hedgehog cactus.
- 2. Before construction begins within the Arizona hedgehog cactus known range (see figures 16-1 and 16-2 below), a biological monitor shall establish and clearly flag Arizona hedgehog cactus avoidance areas where individual cacti will be left in place based on preconstruction surveys. Flagging will extend out a minimum of 20 feet from the nearest Arizona hedgehog cactus within the project footprint but outside the area of ground disturbance.
- 3. Construction contractors shall avoid flagged avoidance areas.
- 4. Prior to any ground-disturbing activities, a biological monitor, a Forest Service–approved entity shall salvage Arizona hedgehog cacti that are inside the construction footprint in areas where ground disturbance will occur following the Waldron and Durham (2016) protocol (appendix E) as revised by the Forest Service (USFS 2020) and as required by the TNF biologist.
- 5. Healthy salvaged Arizona hedgehog cacti that occur in areas that will be disturbed will be replanted outside the construction footprint but within the action area on Federal lands. At the time of salvage if it is determined that individual Arizona hedgehog cactus are not healthy enough for transplanting

other measures such as transplanting individual healthy stems from otherwise dying individuals or collection of seed will be conducted. This could include having a Forest Service and USFWS approved nursery hold plants that need additional time to increase root mass, such as with individual healthy stems before replanting into the Action Area on Federal lands. These measures will be further developed in an Arizona Hedgehog Cactus Relocation, Salvage, and Monitoring Plan (see Conservation Measure 11 below). Salvage activities will take place between October and May whenever possible. If salvage activities must occur between May and October additional water will be provided to salvaged plants when replanted.

- 6. Before construction begins, the biological monitor shall identify those individual cactus that are growing downslope of construction areas that are at risk from rockfall and shifting material from above. Fencing or placement of barriers or other forms of protection will be used. A monitor will be present during work upslope of those cactus known to be in areas where shifting materials occur (see figures 16-3 and 16-4).
- 7. Prior to the start of each phase of construction, operations and maintenance, or closure and reclamation activities, the biological monitor shall conduct a training for all crew members regarding identification and avoidance of Arizona hedgehog cactus and inform crews of the presence and location of all known Arizona hedgehog cacti proximate to the new, proposed construction activities and measures required to avoid adverse impacts. This will include areas to be avoided where the species is present and the additional conservation measures provided here.
- 8. If a previously undocumented Arizona hedgehog cactus is found during construction, operations and maintenance, or closure and reclamation activities, it shall be reported to the biological monitor and the cactus shall be avoided, protected in place, or salvaged and replanted within the Action Area on Federal lands, if possible.
- 9. During construction, any Arizona hedgehog cacti that are salvaged shall be immediately, when possible, replanted within the action area on Federal lands and outside the area to be disturbed using the protocol in Waldron and Durham (2016) as modified (USFS 2020).
- 10. Transplanted cacti shall be monitored yearly during the plant flowering period for the first 10 years following transplanting and again every 5<sup>th</sup> year after that throughout the life of the project. Results of monitoring will be provided to the TNF and USFWS by the end of the calendar year in which the monitoring occurs.
- 11. Prior to relocation and salvage efforts, Resolution Copper would work with the USFWS and the Forest Service to develop an Arizona Hedgehog Cactus Relocation, Salvage, and Monitoring Plan. The plan would provide criteria for determining which cacti are suitable for immediate relocation as well as measures to collect seed or to salvage healthy stems from individuals that otherwise could not be salvaged.. Relocation areas would be approved by the Forest Service and the USFWS.
- 12. The two known Arizona hedgehog cacti on private property in the project area near the East Plant Site in the 230-kV corridor will be transplanted outside the disturbance area and onto TNF lands. Relocation areas would be approved by the Forest Service and the USFWS.

# 5.2 Gila Chub Conservation Measures

- 1. Develop site-specific wildlife mitigation plan in coordination with AGFD, USFWS, and Forest Service biologists to address construction-related actions to avoid, minimize, and mitigate impacts on special status species (e.g., timing of construction, species relocations, etc.).
- 2. All ground disturbing activities associated tailings pipeline and power line work near Mineral Creek and Gila chub designated critical habitat will occur outside the ordinary high-water mark and designated critical habitat.

- 3. In areas where project facilities intersect Mineral Creek trenchless/non-surface impact methods (i.e., horizontal drilling, micro-tunneling, etc...) will be used to avoid surface disturbance within the ordinary high-water mark and designated critical habitat.
- 4. The contractor shall clearly delineate the perimeter of the construction footprint with flagging or other appropriate markers to restrict heavy equipment use and other surface-disturbing activities to areas within the construction footprint. The biological monitor will be present at all times during construction and will help ensure that construction activities and equipment remain within designated limits and outside the ordinary high-water mark and designated critical habitat.
- 5. A stormwater pollution prevention plan (SWPPP) will be developed to reduce potential project related increases in sedimentation to Mineral Creek.

# 5.3 Southwestern Willow Flycatcher and Yellow-billed Cuckoo Conservation Measures

- 1. In areas where surveys have detected the presence of the yellow-billed cuckoo, closure and reclamation activities within 500 feet of the ordinary high water mark of Mineral Creek will not be completed during the period of May 1 through September 30 to remain outside the breeding season for the species.
- 2. Between May and September each year, a qualified biological monitor will be present in work areas that contain suitable habitat for the southwestern willow flycatcher and yellow-billed cuckoo along Mineral Creek during all surface-disturbing activities and will monitor for the presence of the species
- 3. Annual yellow-billed cuckoo surveys will be conducted in potentially suitable habitat of Devil's Canyon and Mineral Creek immediately upstream and downstream of disturbance areas and crossings, starting 2 years prior to surface-disturbing activities and continue until pipeline construction has been completed, including reclamation of temporary construction disturbance.
- 4. In areas where surveys show presence of yellow-billed cuckoo, to prevent direct effects on cuckoos (injuries or fatalities to adults, eggs, or young), vegetation clearing and ground disturbing activities associated with pipeline construction within 500 feet of the ordinary high water mark of Mineral Creek not be completed before May 1 or after September 30, outside the breeding season for the species.
- 5. Large trees (greater than 12 inches in diameter), including Fremont cottonwood (*Populus fremontii*) and willow species (*Salix* spp.), as well as dense stands of vegetation, will be avoided when possible.
- 6. Riparian trees that are removed will be cut to ground level, but when possible, root masses will be left intact to help to stabilize soils and provide opportunities for regrowth through adventitious shoots (e.g., in the case of willows).
- 7. The contractor shall clearly delineate the perimeter of the construction footprint with flagging or other appropriate markers to restrict heavy equipment use and other surface-disturbing activities to areas within the construction footprint. The biological monitor will be present at all times during construction and will help ensure that construction activities and equipment remain within designated limits and outside the ordinary high-water mark and proposed critical habitat.
- 8. During mine operations, yellow-billed cuckoo surveys will be conducted every 5 years in potentially suitable habitat of Devil's Canyon and Mineral Creek immediately upstream and downstream of project areas (crossings) to continue to monitor cuckoo presence in the area and prevent/minimize direct effects on cuckoos.

- 9. In areas where surveys show presence of possible, probable, or confirmed breeding yellow-billed cuckoos, large-scale, major noise-producing activities within 500 feet of the ordinary high water mark of Mineral Creek will be avoided to the extent possible (e.g., maintenance activities associated with pipeline replacement and cleaning that may affect cuckoo habitat during the breeding season [May 15 to September 30 annually]).
- 10. In order to minimize the potential risk for bird collisions with transmission lines, the lines and structures would be designed in accordance with Reducing Avian Collision with Power Lines (Avian Power Line Interaction Committee [APLIC] 2012) and line marking devices, i.e., flight diverters, would be placed at the proposed crossings of Queen Creek, Devil's Canyon, and Mineral Creek, especially in areas where suitable habitat for the yellow-billed cuckoo exists.

# 6 STATUS OF LISTED SPECIES/CRITICAL HABITAT

Table 9 outlines the 24 species that are listed for Pinal and Gila Counties under the ESA and are therefore addressed in this  $BA^9$ . Gray wolf (*Canis lupus*) and Mexican gray wolf (*C. l. baileyi*) are treated together in table 9.

Proposed and designated critical habitat occurs within the project area, action area, and project vicinity (figures 15-1 and 15-2).

<sup>&</sup>lt;sup>9</sup> The methods of analysis of effects in this BA are based on Endangered Species Act (ESA) (50 CFR 402 Sec §402.17) which states "A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action." In addition, this BA addresses effects to both plants and wildlife and it should be noted that each are protected differently under the ESA, i.e., provisions apply to live or dead plants, their progeny, and parts or products derived from them except that clearly labeled seeds of cultivated origin of threatened plants are exempt (section 4 (d), section 9 (a)(2), 50 CFR 17.61, and 50 CFR 17.71).

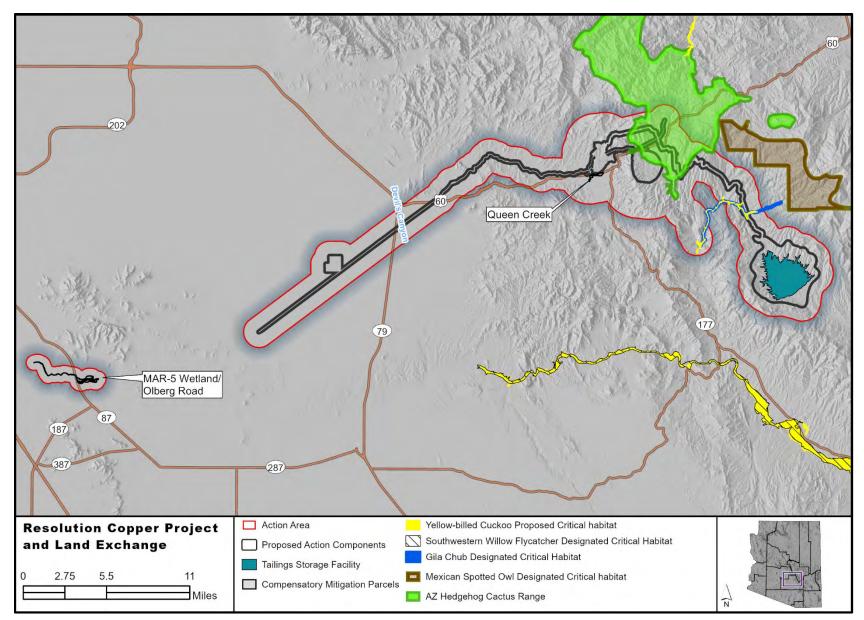


Figure 15-1. Critical habitat in project vicinity (1 of 2)

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	H&E Parcels	All all all
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Resolution Copper Project and Land Exchange	<ul> <li>Action Area</li> <li>Compensatory Mitigation Parcels</li> <li>Yellow-billed Cuckoo Proposed Critical habitat</li> </ul>	N
0 0.7 1.4	Southwestern Willow Flycatcher Designated Critical Habitat	

Figure 15-2. Critical habitat in project vicinity (2 of 2)

Common Name (Species Name)	Status*	Range or Habitat Requirements	Potential for Occurrence in Project Area	Determination of Effect
Acuña cactus (Echinomastus erectocentrus var. acunensis)	E with DCH	This cactus occurs in disjunct populations across southern Arizona on well-drained gravel ridges and knolls on granite- derived soils on slopes up to 30 percent. It grows in the Palo Verde-Saguaro association of the Arizona Upland subdivision of the Sonoran desertscrub plant association at elevations between 1,198 and 3,773 feet above mean sea level (amsl). This species occurs in Maricopa, Pima, and Pinal Counties (USFWS 2016a).	Unlikely to occur. The project area and action area are not within the current range of this species. General surveys of the project area did not locate this species. The nearest known location with this species is about 7 miles southeast of the project area (personal communication, S. Tonn, November 19, 2019).	No effect.
Apache trout ( <i>Oncorhynchus apache</i> )	Т	High-elevation, cold, clear streams, including the upper Salt, Gila, Blue, and Little Colorado drainages in the White Mountains, in Apache, Gila, Graham, Greenlee, and Navajo Counties (USFWS 2008a, 2009c).	Unlikely to occur. The project area is outside the known species' range and no suitable habitat occurs within the action area. The closest record of this species from the mining portion of the project area is 65 miles to the southeast in Grant Creek (personal communication, S. Tonn, November 19, 2019).	No effect.
Arizona hedgehog cactus (Echinocereus triglochidiatus var. arizonicus)	E	Found on open slopes of rugged, steep-walled canyons with granite or dacite bedrock among boulder piles in Arizona desert grassland and in the understory of shrubs in the ecotone between Madrean evergreen woodland and interior chaparral at elevations between 3,400 and 5,300 feet amsl. This species is found in Gila, Maricopa, and Pinal Counties (USFWS 2000).	Known to occur (personal communication, S. Tonn, November 19, 2019; WestLand 2004, 2009b, 2009d, 2010a, 2013a, 2013c, 2013d, 2014a, 2016, 2017a, 2019a).	See section 6.1 below.
Chiricahua leopard frog ( <i>Rana chiricahuensis</i> )	T with DCH	Headwater streams, springs, and livestock tanks. An important characteristic of habitat is that it be free or have low levels of nonnative species including nonnative fish, crayfish, bull frogs ( <i>Lithobates catesbeianus</i> ), and barred tiger salamanders ( <i>Ambystoma mavortium</i> ). This species occurs in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Navajo, Pima, Pinal, Santa Cruz, and Yavapai Counties (USFWS 2012a).	Unlikely to occur. The project area is outside the known species' range. The closest documented record for the species is 40 miles to the northeast on the San Carlos Reservation and 43 miles to the southeast in the Pinaleño Mountains (personal communication, S. Tonn, November 19, 2019).	No effect.
Colorado pikeminnow ( <i>Ptychocheilus lucius</i> )	E with DCH, EXPN	Juveniles prefer slackwater, backwater, and side channels with little or no flow and silty substrates; adults utilize turbid, deep and fast-flowing waters. Species was reintroduced at an elevation of 1,960 feet amsl. Non-essential experimental populations of this fish in Arizona are located in the Salt and Verde River drainages. This species is found in Coconino, Gila, Maricopa, and Yavapai Counties (USFWS 2009a).	Unlikely to occur. The project does not include areas where this species is known to occur or where reintroductions have occurred or are planned. The closest documented record for the species from the mining portion of the project area is 44 miles north along the Verde River and Horseshoe Reservoir (personal communication, S. Tonn, November 19, 2019). In addition, project- related surveys did not find this species in any areas where suitable habitat exists (AGFD 2014; Robinson 2007, 2008a, 2008b; WestLand 2009b, 2018a).	No effect.

#### Table 9. Federally listed species potentially occurring in Pinal and Gila Counties, Arizona

Common Name (Species Name)	Status*	Range or Habitat Requirements	Potential for Occurrence in Project Area	Determination of Effect
Desert pupfish (Cyprinodon macularius)	E with DCH	Found in shallow water of desert springs, small streams, and marshes below 5,000 feet amsl. The species tolerates high salinities and high water temperatures. One natural population still occurs in Quitobaquito Spring and pond in Pima County and reintroductions have been made in Pima, Pinal, Maricopa, Graham, Cochise, La Paz, and Yavapai Counties, Arizona (USFWS 2010a).	Unlikely to occur. The project does not include areas where this species is known to occur, and project-related surveys did not find this species in any areas where suitable habitat exists. Although there is a refugia population of this species in Ayer Lake at Boyce Thompson Arboretum State Park (USFWS 1993; personal communication, S. Tonn, November 19, 2019), which is within the action area, the project activities are not expected to impact this lake.	No effect.
Gila chub ( <i>Gila intermedi</i> a) <sup>10</sup>	E with DCH	Found in pools, springs, cienegas, and streams at elevations between 2,000 and 5,500 feet amsl. The species is dependent on undercut banks, terrestrial vegetation, boulders, root wads, fallen logs, and thick overhanging or aquatic vegetation for cover. This species occurs in Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties (USFWS 2005, 2015b).	Possible to occur and designated critical habitat does occur. See sections 6.2 and 6.3.	See sections 6.2 and 6.3.
Gila topminnow ( <i>Poeciliopsis occidentalis</i> )	E	Occurs in small streams, springs, and cienegas at elevations below 4,500 feet amsl, primarily in shallow areas with aquatic vegetation and debris for cover. In Arizona, most of the remaining native populations are in the Santa Cruz River system. This species is found in Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties (USFWS 2018b, 2019a).	Unlikely to occur. The project area and action area do not include areas where this species is known to occur, and project-related surveys did not find this species in any areas where suitable habitat exists. Although there is a refugia population of this species in Ayer Lake at Boyce Thompson Arboretum State Park (personal communication, S. Tonn, November 19, 2019), which is within the action area, the project activities are not expected to impact this lake.	No effect.
Gila trout (Oncorhynchus gilae)	т	Endemic to the Verde River system of Arizona and upper Gila basin of New Mexico, in streams at high elevations (5,000–10,000 feet amsl). This species is found in Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties (USFWS 2006).	Unlikely to occur. The project area is outside the known species' range and no suitable habitat occurs within the action area. The closest documented record for the species from the mining portion of the project area is 76 miles to the north at a reintroduction site in Chase Creek (personal communication, S. Tonn, November 19, 2019).	No effect.

<sup>&</sup>lt;sup>10</sup> On April 6, 2017, the U.S. Fish and Wildlife Service withdrew the proposed listing for headwater chub (*Gila nigra*) and roundtail chub (*Gila robusta*) in the Lower Colorado River Basin due to the findings of the Joint Committee on the Names of Fishes. These findings concluded that the two formerly proposed species as well as the currently listed Gila chub (*Gila intermedia*) are no longer valid species and should all be considered roundtail chub. The USFWS is still working internally to clarify. Currently, roundtail and headwater chub have no Federal listing status but remain on the Regional Forester's sensitive species list as separate entities; therefore, they continue to be analyzed as sensitive species, but grouped into a single analysis (USFWS 2017).

Common Name (Species Name)	Status*	Range or Habitat Requirements	Potential for Occurrence in Project Area	Determination of Effect
Gray wolf ( <i>Canis lupus</i> ): Mexican gray wolf ( <i>Canis lupus baileyi</i> ) population	E with DCH, EXPN	Found in variety of vegetation types, except low deserts. Cover, water, and sufficient prey, such as deer and elk, are important. Reintroduction areas are typically rugged lands in coniferous forest. Elevational range of 3,000–12,000 feet amsl. This species is found in Apache, Coconino, Gila, Greenlee, and Navajo Counties (USFWS 2019b).	Unlikely to occur. Although the project area and action area are within Wolf Management Zone 2 of the 10(j) for the species, it is outside the species' known range and the species would have a very low likelihood of dispersing into the project area. The closest documented record of the species is 54 miles to the northeast at Canyon Creek (personal communication, S. Tonn, November 19, 2019). Potential habitat for the Mexican gray wolf is present on the Globe Ranger District under the revised geographic boundaries for the Mexican wolf experimental population area (MWEPA; USFWS 2015a). Potential habitat is split into two categories: primary habitat (zone 1) and secondary habitat (zone 2). Primary habitat is mixed conifer with aspen, pinyon-juniper oak woodland, and ponderosa pine forest, as defined by the Potential Natural Vegetation Types (PNVT), in the portion of Zone 1 of the MWEPA on the TNF. Secondary habitat is all remaining acres of PNVT except mines and water in zone 2 of the MWEPA on the TNF. No known pack or individual wolf activity has been reported on the Globe Ranger District; therefore, the Mexican wolf is unlikely to occur (Mexican Wolf Interagency Field Team 2020; USFWS n.d.).	No effect.
Little Colorado spinedace ( <i>Lepidomeda vittata</i> )	T with DCH	Habitat consists of medium to small streams and is characteristically found in pools with water flowing over fine gravel and silt-mud substrates; elevational range of 4,000– 8,000 feet amsl. This species is found in Apache, Coconino, Gila, and Navajo Counties (USFWS 2008b).	Unlikely to occur. The project area and action area are outside the known species' range and project- related surveys did not find this species in any areas where suitable habitat exists. The closest documented record for the species mining portion of the project area is 70 miles to the north throughout the East Clear Creek system (personal communication, S. Tonn, November 19, 2019; USFWS 2018a).	No effect.
Loach minnow ( <i>Tiaroga cobitis</i> )	T with DCH	At elevations below 8,000 feet amsl in small to large perennial streams with swift shallow water over cobble and gravel. Recurrent flooding and natural hydrography are important. This species is found in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Pinal, and Yavapai Counties (USFWS 2012b).	Unlikely to occur. The project area and action area are outside the known species' range and project- related surveys did not find this species in any areas where suitable habitat exists. The closest documented record for the species to the mining portion of the project area is 24 miles to the southeast in Aravaipa Canyon (personal communication, S. Tonn, November 19, 2019).	No effect.

Common Name (Species Name)	Status*	Range or Habitat Requirements	Potential for Occurrence in Project Area	Determination of Effect
Mexican spotted owl ( <i>Strix occidentalis lucida</i> )	T with DCH	Found in mature montane forests and woodlands and steep, shady, wooded canyons. Can also be found in mixed-conifer and pine-oak vegetation types. Generally nests in older forests of mixed conifers or ponderosa pine ( <i>Pinus</i> <i>ponderosa</i> )–Gambel oak ( <i>Quercus gambelii</i> ). Nests in live trees on natural platforms (e.g., dwarf mistletoe [ <i>Arceuthobium</i> spp.] brooms), snags, and canyon walls at elevations between 4,100 and 9,000 feet amsl. This species is found in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yavapai Counties (USFWS 2004, 2013c).	Unlikely to occur. There are no montane forests or shady, wooded canyons in or near the project area. The project area is also below the known elevational range of this species. The boundary of designated critical habitat for the species, BR-W-6, Pinal Mountains, is located 1.52 mile from the project area (nearest project component is tailings/transmission corridor) and 0.52 mile from the action area (USFWS 2004).	No effect.
Nichol's Turk's head cactus (Echinocactus horizonthalonius var. nicholii)	E	Found in Sonoran desertscrub with limestone-derived alluvium at elevations between 2,000 and 3,600 feet amsl. In Arizona, its known range is limited to the Waterman and Vekol Mountains. This species is found in Pima and Pinal Counties (USFWS 2009d).	Unlikely to occur. The project area is far from known populations. The closest documented record of the species is 46 miles to the south and southwest of the project area in the Vekol and Silverbell Mountains (personal communication, S. Tonn, November 19, 2019).	No effect.
Northern Mexican gartersnake ( <i>Thamnophis eques</i> <i>megalops</i> )	T with PCH	Inhabits streams, rivers, cienegas, and ponds with dense shoreline vegetation from Sonoran desertscrub up into Petran montane conifer forest. This species is found in Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yavapai Counties (USFWS 2013b, 2014a).	Possible to occur but proposed critical habitat does not occur within the action area.	See section 6.8.
Ocelot ( <i>Leopardus pardalis</i> )	Ε	Habitats preferred by ocelots are variable, from tropical semiarid deserts to brushy forests and semiarid deserts in the northern part of its range. Densely vegetated movement corridors and small, semi-isolated habitat patches are important for facilitating dispersal movements in fragmented habitats (USFWS 2016b). The current distribution extends into southern Arizona; dispersing individuals range more widely, as evidenced by the 2010 roadkill (on U.S. 60) near Top-of-the-World, Gila County. Little is known about ocelot habitat use In Arizona and Sonora, Mexico. Current information is lacking to draw conclusions about ocelot populations in Arizona although more sightings have been substantiated recently in southern Arizona, in the vicinity of the U.SMexico border. No information exists as to any established or breeding populations in Arizona. The individual killed near Top-of-the-World, between Superior and Globe along U.S. 60, is considered by some to be an extreme occurrence and well beyond its reasonable range.	Unlikely to occur. The species is very rare, and in recent years has been documented in several areas in southern Arizona. Vegetation in the action area does not appear suitable to attract or hold this species. Apparently, ocelots in south Texas prefer >95% canopy cover and avoid areas of intermediate (50%–75%) to no cover (USFWS 2016b, 2010b). Connectivity to southern Arizona also appears limiting for dispersing individuals. Although a dead ocelot was found in 2010 on U.S. 60 between Superior and Globe, no camera detections or other observations of the species have been documented in this region since that time (e.g., the TNF has had one to two along the northern edge of the Resolution Baseline Activities area for about 3 to 4 years). Thus, this species would have a very low likelihood of occurrence in the project area and action area.	No effect.

Common Name (Species Name)	Status*	Range or Habitat Requirements	Potential for Occurrence in Project Area	Determination of Effect
Razorback sucker ( <i>Xyrauchen texanus</i> )	E with DCH	Found in riverine and lacustrine areas, generally not in fast- moving water, and may use backwaters at elevations below 6,000 feet amsl. This species is found in Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pinal, Yavapai, and Yuma Counties (USFWS 2009e).	Unlikely to occur. The project area is outside the species' known range and project-related surveys did not find this species in any areas where suitable habitat exists (USFWS 2019a). The closest documented record to the mining portion of the project area for the species is 21 miles to the north at Roosevelt Lake (personal communication, S. Tonn, November 19, 2019).	No effect.
Sonoran pronghorn (Antilocapra americana sonoriensis)	E, EXPN	Found in Sonoran desertscrub within broad, intermountain alluvial valleys with creosote bush ( <i>Larrea tridentata</i> )– ragweed ( <i>Ambrosia</i> spp.) and paloverde ( <i>Parkinsonia</i> spp.)– mixed cacti associations at elevations between 2,000 and 4,000 feet amsl. The only extant U.S. population is in southwestern Arizona; however, reintroductions have occurred in La Paz County. This species is found in La Paz, Maricopa, Pima, Pinal, Santa Cruz, and Yuma Counties (USFWS 2016c).	Unlikely to occur. The project and action area are not within the 10(j) area for the species, and the project area is outside the currently known range for this species. The closest documented record to the project area is 54 miles to the southwest near the Barry M. Goldwater Range (personal communication, S. Tonn, November 19, 2019).	No effect.
Southwestern willow flycatcher ( <i>Empidonax traillii extimu</i> s)	E with DCH	Found in dense riparian habitats along streams, rivers, and other wetlands where cottonwood, willow, boxelder ( <i>Acer</i> <i>negundo</i> ), tamarisk ( <i>Tamarix</i> spp.), Russian olive ( <i>Elaeagnus angustifolia</i> ), buttonbush ( <i>Cephalanthus</i> spp.), and arrowweed ( <i>Pluchea sericea</i> ) are present. Nests are found in thickets of trees and shrubs, primarily those that are 13 to 23 feet high, among dense, homogeneous foliage. Habitat occurs at elevations below 8,500 feet amsl. This species is found in Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai, and Yuma Counties (USFWS 2013a).	Possible to occur and designated critical habitat does occur (WestLand 2010b, 2013d, 2013e, 2014b, 2017b, 2018b, 2018d, 2018e).	See sections 6.4 and 6.7.
Spikedace ( <i>Meda fulgid</i> a)	E with DCH	Mid-water habitats, including runs, pools, and swirling eddies below 4,500 feet amsl. This species is found in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Pinal, and Yavapai Counties.	Unlikely to occur. The project area is outside the known species' range. The closest documented record for the species to the mining portion of the project area is 12 miles south on the Gila River (personal communication, S. Tonn, November 19, 2019).	No effect.
Woundfin ( <i>Plagopterus argentissimus</i> )	E with DCH, EXPN	Inhabits shallow, warm, turbid, fast-flowing water. Tolerates high salinities and relatively warm water temperatures. Found in habitats below 4,500 feet amsl. This species is found in Coconino, Gila, Graham, Greenlee, Maricopa, and Yavapai Counties (USFWS 2009b).	Unlikely to occur. The project and action areas are outside the known species' range and outside of the designated critical habitat. The closest documented record for the species to the mining portion of the project area is 290 miles northwest (personal communication, S. Tonn, November 19, 2019).	No effect.

Common Name (Species Name)	Status*	Range or Habitat Requirements	Potential for Occurrence in Project Area	Determination of Effect
Yellow-billed cuckoo (Western Distinct Population Segment) ( <i>Coccyzus americanus</i> )	T with PCH	Typically found in riparian woodland vegetation (cottonwood, willow, or tamarisk) at elevations below 6,600 feet amsl. Dense understory foliage appears to be an important factor in nest site selection. The highest concentrations in Arizona are along the Agua Fria, San Pedro, upper Santa Cruz, and Verde River drainages and Cienega and Sonoita Creeks. This species is found in all counties in Arizona (USFWS 2014a).	Known to occur and proposed critical habitat does occur (Prager and Wise 2015, 2017; WestLand 2010b, 2011, 2013b, 2014b, 2015, 2017c, 2018c, 2018d, 2018e).	See sections 6.5 and 6.6.
Yuma clapper/Ridgway's rail ( <i>Rallus longirostris</i> <i>yumanensis</i> )	E	Found in freshwater and brackish marshes below 4,500 feet amsl. This species is found in Gila, La Paz, Maricopa, Mohave, Pinal, and Yuma Counties (USFWS 2020a).	Unlikely to occur. The project area and action area are outside the known range for this species and there is no suitable habitat for this species in or adjacent to the project area.	No effect.

Sources: Range or habitat information is from AGFD (2020a [see appendix F in this BA], 2020b); Arizona Rare Plant Committee (ca. 2000); Brennan and Holycross (2006); Corman and Wise-Gervais (2005); Cornell Lab of Ornithology (2020); Hatten et al. (2005); Jaguar Recovery Team and USFWS (2012); Page and Burr (1991); Rosen and Schwalbe (1988); USFWS (2020a).

#### \* USFWS Status Definitions:

E = Endangered. Endangered species are those in imminent jeopardy of extinction. The ESA specifically prohibits the take of a species listed as endangered. Take is defined by the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct.

EXPN = Non-Essential Experimental Population. Experimental populations of a species designated under Section 10(j) of the ESA for which the USFWS, through the best available information, believes is not essential for the continued existence of the species. Regulatory restrictions are considerably reduced under a Non-Essential Experimental Population designation.

T = Threatened. Threatened species are those in imminent jeopardy of becoming endangered. The ESA prohibits the take of a species listed as threatened under Section 4d of the ESA. Take is defined by the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct.

DCH = Designated Critical Habitat

PCH = Proposed Critical Habitat

# 6.1 Arizona Hedgehog Cactus

# 6.1.1 Species Status in Action Area

The Arizona hedgehog cactus was listed as an endangered species in 1979 without critical habitat and occurs on dacite or granite soils in an area between the towns of Superior and Globe in Pinal and Gila Counties, Arizona, south of the Superstition Wilderness Area to Devil's Canyon at elevations from approximately 3,400 to 5,300 feet above mean sea level. The range includes two small subpopulations: the Apache Peak subpopulation north of the city of Globe, and the El Capitan subpopulation south of Globe (USFWS 2000).

Arizona hedgehog cactus occurs in the Upper Sonoran Life Zone from approximately 3,300 to 5,800 feet in elevation within semi-desert, interior chaparral, Madrean oak woodland, cypress woodland, and narrowly into ponderosa pine vegetation communities. The species is most dominant in open chaparral and oak woodlands with fewer individuals found in moderately dense stands of chaparral. Arizona hedgehog cactus is able to tolerate complete shade or exposure with preference occurring somewhere between. The species is strongly associated with open rocky slopes and steep fractured cliffs and is most prevalent in Apache Leap Tuff and Schultz granite, while Pinal schist and the Pioneer Formation in proximity also offer habitat. Additional observations of numerous individuals were recorded in Whitetail Conglomerate, which is limited in surface exposure, as well as a few in limestone outcrops within the Superstition Wilderness. Both geologic types have not previously been associated with Arizona hedgehog cactus habitat.

Arizona hedgehog cactus is known to occur within the proposed project footprint and in adjacent areas within the action area. The western portions of the project and action areas, i.e., MARRCO corridor, filter plant and loadout facility, Skunk Camp tailings storage facility, and West Plant Site, do not contain suitable habitat for the species or are outside the species' currently known range. Surveys for Arizona hedgehog cactus within or overlapping portions of the action area have been conducted by the TNF, WestLand, and SWCA. These surveys were conducting by qualified biologists using accepted protocols and data validation was conducted by staff from TNF and SWCA. These surveys did not cover the entire project area within the known species' range (see figure 16-1).

- 2004 survey of the Oak Flat Federal Parcel. A survey for Arizona hedgehog cactus was conducted on the 3,025-acre Oak Flat Federal Parcel between April 5 and April 28, 2004. Individual Arizona hedgehog cacti were identified during the survey, which included portions of the East Plant Site, the subsidence area, and a portions of the 230-kV transmission line corridor and the collocated 115-kV transmission line and tailings pipeline corridor (WestLand 2004).
- 2007/2008 surveys of the pre-feasibility activity areas. Surveys for Arizona hedgehog cactus were conducted in the pre-feasibility activity area plus a 50- to 100-foot-wide survey buffer in July and September 2007, as well as January, February, and March 2008. These surveys occurred on about 738 acres and identified individual cacti on TNF lands and an additional individuals outside of the survey area or along planned access roads on private lands. This survey area included portions of the East Plant Site, subsidence area, and the collocated 115-kV transmission line and tailings pipeline corridor (WestLand 2009b, 2009d).
- 2010 survey of the pre-feasibility activity areas. Surveys for Arizona hedgehog cactus were conducted in the pre-feasibility activity area plus a 50- to 100-foot-wide survey buffer between April 22 and May 13, 2010. These surveys identified individual cacti. This survey area was about 738 acres and included portions of the East Plant Site, subsidence area, and the collocated 115-kV transmission line and tailings pipeline corridor (WestLand 2010a).

- 2011 survey of the drill pad OF-3 drill site and access road. The location of the drill site was move 200 feet south from its originally planned location and an approximately 100-foot-long segment of access road was realigned. The survey was performed on December 29, 2010 and did not detect any Arizona hedgehog cactus (WestLand 2011).
- 2012 survey of the East Plant Site vicinity and Magma Mine Road. Surveys of the East Plant Site and Magma Mine Road conducted during April 2012 on about 70 acres found individual Arizona hedgehog cacti. This survey included a portion of the East Plant Site and the subsidence area (WestLand 2013a).
- 2012 survey of the pre-feasibility action area. Surveys for Arizona hedgehog cactus were conducted in the pre-feasibility activity area plus a 50- to 100-foot-wide survey buffer between April 2 and May 3, 2012. These surveys identified individual cacti in addition to the individuals previously detected within these areas during 2010 surveys. This survey area was part of the approximately 738-acre block and included portions of the East Plant Site, subsidence area, and the collocated 115-kV transmission line and tailings pipeline corridor (WestLand 2013c).
- 2014 survey of geotechnical drill pad sites. Surveys for Arizona hedgehog cactus were conducted for geotechnical drill pad sites between April 7 and May 7, 2014. These surveys were conducted along a 200-foot-wide corridor centered along roadways as well as a 500 × 500-foot square centered on each drill pad site. The survey area included portions of the East Plant Site, subsidence area, and the collocated 115-kV transmission line and tailings pipeline corridor. This survey area was part of the approximately 738-acre block and surveys identified additional Arizona hedgehog cacti beyond those found during the 2010 and 2012 surveys (Westland 2014a).
- 2015 survey of East Plant Site and West Plant Site. Surveys for Arizona hedgehog cactus were conducted on about 300 acres within portions of the East Plant Site, West Plant Site, and the subsidence area between April 7 and April 16, 2015. Individual Arizona hedgehog cactus were identified that had not been observed during previous surveys of the area (WestLand 2016a).
- 2016 survey of suitable or potential Arizona hedgehog cactus habitat within the Action Area between April 7, 2016 and May 4, 2016. A total of the new Arizona hedgehog cactus were found, a total of the Arizona hedgehog cacti are known and tagged within the 2016 survey area (WestLand 2016b).
- 2017 survey of the East Plant Site. Surveys for Arizona hedgehog cactus were conducted on about 360 acres, including portions of the East Plant Site and the subsidence area between April 25 and May 10, 2017. These surveys identified new individual Arizona hedgehog cacti in addition to the individuals that were identified previously in this area (WestLand 2017a).
- 2019 survey of the 230-kV transmission line corridor, Skunk Camp tailings site, 115-kV power line, and the north Skunk Camp tailings pipeline corridor. Surveys for Arizona hedgehog cactus conducted in 2019 included surveys of portions of the 230-kV transmission line corridor, the Skunk Camp tailings 115-kV transmission line corridor, and the North Skunk Camp tailings pipeline corridor. The surveys were conducted between April 15 and May 17, 2019 and identified individual Arizona hedgehog cacti. Of these cacti, were identified within the 230-kV transmission line corridor, and were identified within the Skunk Camp tailings 115-kV transmission line corridor, were identified within the Skunk Camp tailings 115-kV transmission line corridor, and were identified within the Skunk Camp tailings pipeline corridor (WestLand 2019a).

• 2020 survey of predicted Arizona hedgehog cactus habitat at the East Plant Site. The survey was conducted on April 1-3 and 22, 2020. The 2020 surveys detected from new plants, of the from, only were within the East Plant Site boundary, but from other cacti were within 25 feet of the boundary. The other from newly detected cacti were discovered while visiting previously tagged Arizona hedgehog cacti, approximately previously tagged cacti were visited and WestLand verified that 31 were still alive. In total, WestLand has detected from Arizona hedgehog cacti within the East Plant Site, with verified as living and werified dead in April 2020 (WestLand 2020a).

Surveys conducted by WestLand since 2004 to identify individual Arizona hedgehog cactus occurred on about 745.4 acres within the known species' range in the project area and on 2,662.7 acres within the action area. The area surveyed within the project area is about 80.8 percent of the total project area within the known species' range and about 1.9 percent of the total known species' range (39,725.3 acres). The area surveyed within the action area is about 28.6 percent of the total action area within the known species' range and about 6.7 percent of the total known species' range. Surveys did not cover about 167.6 acres within the project area in the known species' range. Surveys did not cover about 167.6 acres within the known species' range. The action area within the known species' range. The action area within the known species' range. The action area covers about 23.7 percent of the total known species' range. These surveys were conducted prior to the determination of the proposed action and for other efforts and thus do not cover the entire project and action areas.

In total, 165 Arizona hedgehog cacti have been documented during project-related surveys within the project area. An additional 2,087 individuals were located outside the project area but within the action area. The number of individuals is representative of surveys on about 80.8 percent of the known species' range within the project area. Assuming that the species is present on the remaining 19.2 percent of the Skunk Camp tailings pipeline corridor known species' range within the project area at the same density as the surveyed area, it is estimated that 23 cacti occur in that area, bringing the total to 188 individual Arizona hedgehog cacti estimated in the project area. Sixty additional Arizona hedgehog cactus individuals were added to the 188 estimated individuals as we assume additional individuals would be found during preconstruction surveys. Assuming that the species is present throughout the action area at the same density as the 28.6 percent of the action area not including those in the project area within the known species' range. See table 10 for a summary.

Proposed Action Component	Project Component (acreage)	Project Component Disturbance within Known Species' Range (acreage)	Percent of Project Component Surveyed within Known Species' Range	Individuals Observed during Surveys	Individuals Estimated for Project Component
Access Roads	4.2	1.6	75.3%		
East Plant Site and Magma Road realignment	188.8	22.1	100%		
Filter plant/Loadout facility disturbance	552.5	_	-	_	_
MARRCO corridor	685.2	_	_	_	_
Silver King Road realignment	13.0	_	-	_	_
Subsidence area (excluding East Plant Site disturbance)	1,672.4	387.1	98.1%		
Skunk Camp tailings storage facility fence line	4,644.5	_	_	_	_
Skunk Camp tailings pipeline	56.7	56.7	98.3%		
Skunk Camp tailings storage facility disturbance	4,002.1	_	-	_	_
Transmission line 115-kV corridor	42.5	3.0	100%		
Transmission line 115-kV/ Tailings pipeline collocated corridor	833.1	294.9	68.9%		I
Transmission lines collocated	61.0	57.3	100%		
West Plant Site	940.1	_	_	_	_
Total Project Area	13,989.9	822.8	87.8%	165	188

#### Table 10. Arizona hedgehog cactus survey summary

# ACCESS ROADS

The access roads are related to the transmission lines and ground disturbance would occur on about 1.6 acres within the range of Arizona hedgehog cactus outside corridors for other project features. Of the 1.6 acres 1.2 acres (75.3 percent) have been surveyed for the species, no Arizona hedgehog cactus were identified during surveys.

### UNDERGROUND MINING AND SUBSIDENCE AREA

Approximately 387.1 acres of the subsidence area is within the range of Arizona hedgehog cactus. Surveys have been conducted within portions of the subsidence area in 2004, 2012, 2013, 2014, 2015, 2017, and 2020 (WestLand 2004, 2013a, 2016, 2017a, 2020a). Together these surveys have occurred on 100 percent of the 379.6 acres in the subsidence area (see figure 16-1). In total, Arizona hedgehog cacti individuals were identified within this area during surveys.

### EAST PLANT SITE

The East Plant Site occurs on approximately 22.1 acres within the range of Arizona hedgehog cactus. The East Plant Site has been surveyed in 2012, 2015, 2017, and 2020 on 100 percent of the 22.1 acres

within the species known range. **The species** individual Arizona hedgehog cacti were identified in this area during surveys, **the** of which are currently on private land (WestLand 2013a, 2016, 2017a, 2020a).

### ORE CONVEYOR/INFRASTRUCTURE CORRIDOR

The proposed ore conveyor/infrastructure corridor would occur entirely outside the range of Arizona hedgehog cactus (see figure 16-1).

### WEST PLANT SITE

The proposed West Plant Site activities would occur entirely outside the range of Arizona hedgehog cactus (see figure 16-1). The West Plant Site was surveyed for Arizona hedgehog cactus in 2015 and no individuals of the species were observed (WestLand 2016).

### SKUNK CAMP TAILINGS STORAGE FACILITY

The Skunk Camp tailings storage facility was surveyed in 2019 and no Arizona hedgehog cactus were observed (WestLand 2019a). In addition, the tailings storage facility activities would occur entirely outside the range of Arizona hedgehog cactus (see figure 16-1).

# TAILINGS PIPELINE CORRIDOR

The tailings pipeline corridor is broken into two areas, the tailings pipeline corridor where the pipeline would occur alone and the second area where it would be collocated with the 115-kV transmission line (see figure 16-1). Each of these areas is discussed separately below.

### Tailings Pipeline Corridor

The tailings pipeline corridor occurs on about 56.7 acres within the known species' range (see figure 16-1). About 55.7 acres (98.3 percent) of this corridor was surveyed in 2019, and 87 Arizona hedgehog cacti were identified within the survey area in the corridor (WestLand 2019a). Assuming that the species occurs at the same density in the portion of the corridor within the known species' range that has not been surveyed, it is estimated that there would be individual cacti.

# Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line is 500 feet wide and occurs on about 294.9 acres within the known species' range. The entire corridor width is assumed to be disturbed for the purposes of the BA; however, it is unlikely that during construction the entire 500-foot width would be disturbed. Based on initial conceptual designs, the right-of-way for the pipeline is likely to be 150 feet wide with only a portion of that disturbed during construction. Permanent disturbance would primarily be associated with an access road that overlaps these rights-of-way, and infrastructure like tower footings. The disturbed areas would be reclaimed and revegetated after construction; however, there is the possibility of additional disturbance in this corridor when facilities are removed at mine closure, which would require further reclamation and revegetation. Surveys for Arizona hedgehog cactus were conducted in 2019 on approximately 203.1 acres (68.9 percent) of the collocated corridor and no Arizona hedgehog cacti were identified during this survey within the project area (see figure 16-1).

### MARRCO CORRIDOR

The MARRCO corridor activities would occur entirely outside the known range of Arizona hedgehog cactus (see figure 16-1).

### FILTER PLANT AND LOADOUT FACILITY

The proposed filter plant and loadout facility would occur entirely outside the known range of Arizona hedgehog cactus.

#### ELECTRICITY SUPPLY AND TRANSMISSION LINES

The electricity supply and transmission lines are broken into three areas—the collocated 115-kV and 230-kV corridor, the collocated 115-kV and tailings pipeline corridor, and the 115 kV line corridor (see figure 16-1). The collocated 115-kV and 230-kV corridor and the115 kV line corridor are discussed separately below the collocated 115-kV and tailings pipeline corridor is addressed above.

#### Collocated 230-kV/115-kV Transmission Lines

The collocated 230- and 115-kV transmission lines would occur on about 57.3 acres within the known range of Arizona hedgehog cactus. Surveys conducted in 2019 covered 100 percent of this corridor and found individual Arizona hedgehog cacti (WestLand 2019a).

#### 115 kV Transmission Line

The 115-kV transmission line would occur on about 3.0 acres within the known range of Arizona hedgehog cactus. Surveys conducted in 2019 covered 100 percent of this corridor and found individual Arizona hedgehog cacti (WestLand 2019a).

### ACTION AREA OUTSIDE PROJECT FOOTPRINT

The action area covers about 23.4 percent of the overall Arizona hedgehog cactus known species' range. Approximately 2,662.7 acres of the action area, outside the project footprint but within the known species' range, have been surveyed for Arizona hedgehog cactus. This is approximately 6.7 percent of the known species' range. Surveys conducted for other actions and prior to the determination of the proposed action identified 2,087 Arizona hedgehog cacti within the action area. It is estimated, using densities from surveys within the species' range, that there would be about 7,302 individual Arizona hedgehog cacti in the action area within the known species' range. All individuals in the action area occur on lands within the TNF except for 36 individuals located on private land owned by Resolution Copper.

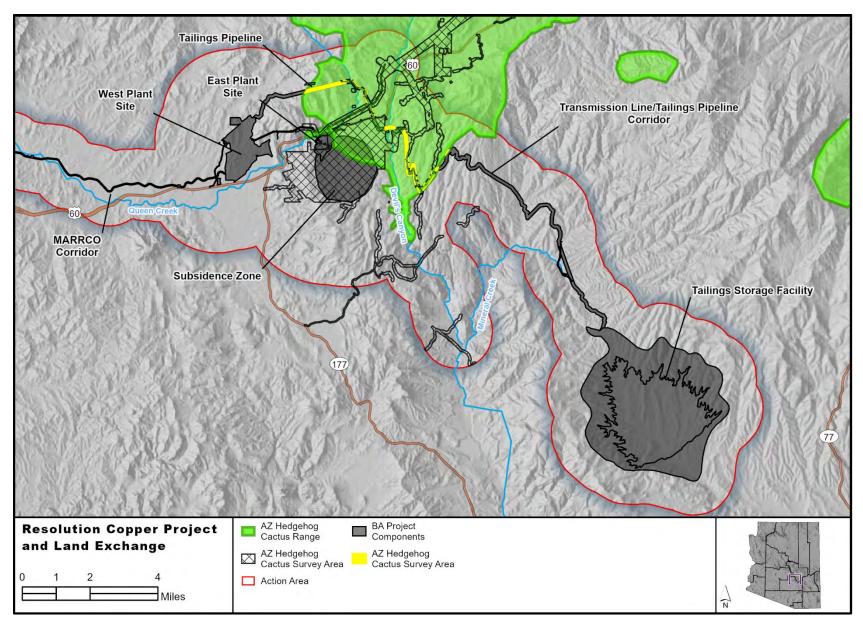


Figure 16-1. Arizona hedgehog cactus surveys

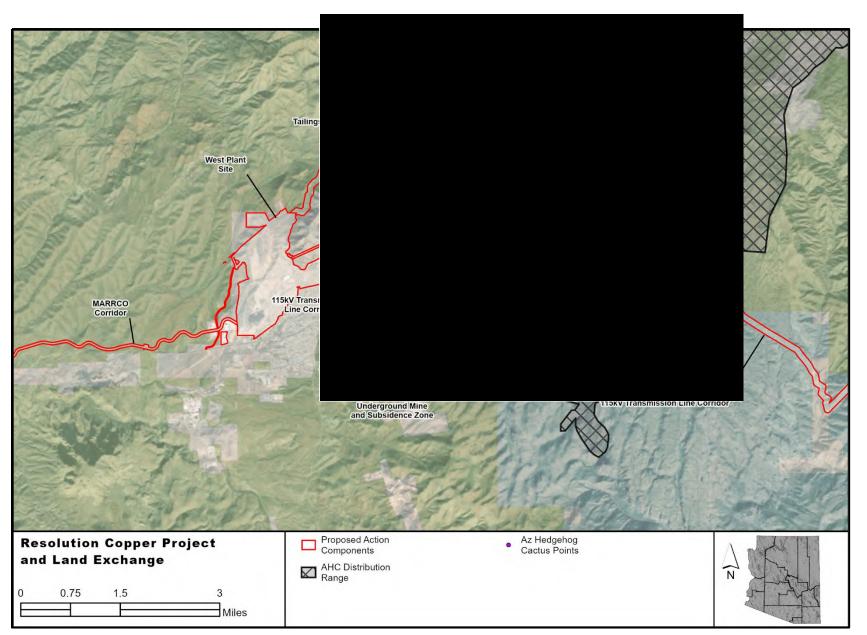


Figure 16-2. Arizona hedgehog cactus locations

Peoplution Conner Project	BA Project AZ Hedgebog	
Resolution Copper Project and Land Exchange	<ul> <li>BA Project Components</li> <li>AZ Hedgehog</li> <li>Cactus High Slope</li> <li>AZ Hedgehog</li> <li>Cactus in high slope</li> </ul>	
0 0.01 0.03 0.06	<ul> <li>Cactus in high slope area</li> </ul>	
Miles		N

Figure 16-3. Arizona hedgehog cactus downslope from project features

<b>Resolution Copper Project</b>	BA Project       AZ Hedgehog         Components       Cactus High Slope         AZ Hedgehog       Analysis Area	
and Land Exchange 0 0.01 0.03 0.06	AZ Hedgehog • Cactus in high slope area	For
Miles		Ŕ

Figure 16-4. Arizona hedgehog cactus downslope from project features

# 6.1.2 *Analysis of Effects*

## CONSTRUCTION

#### Access Roads

The development of the access roads outside the transmission and pipeline corridors would lead to ground disturbance of about 1.6 acres within the known range of Arizona hedgehog cactus. As no individuals were identified in the footprint of the access roads during surveys it would be unlikely that the species or the associated seed bank would be present and impacted in these areas during construction. The potential impacts on these 1.6 acres would include ground disturbance that could make these areas unsuitable for species re-establishment in the future after the project life span due to the changes to soils and geological formations from grading during construction.

#### **Underground Mining and Subsidence**

The subsidence area occurs partially within the range of Arizona hedgehog cactus (see figure 16-1). Approximately 387.1 acres of the subsidence area occurs within the range of Arizona hedgehog cactus. Surveys conducted in the subsidence area identified 10 individual Arizona hedgehog cacti (WestLand 2004, 2013a, 2016, 2017a, 2020a).

Potential construction-related impacts on Arizona hedgehog cactus from underground mining and subsidence would be related only to development of the subsidence area. The potential impacts from the subsidence area would occur later in time than construction activities and as such are addressed below in Operations and Maintenance.

#### East Plant Site

The East Plant Site occurs on approximately 22.1 acres within the known range of Arizona hedgehog cactus. Thirteen individual Arizona hedgehog cacti were identified in this area during surveys, which covered 100 percent of the East Plant Site project footprint (WestLand 2013a, 2016, 2017a, 2020a).

Potential construction-related effects on the species at the East Plant Site would include the removal of individual Arizona hedgehog cactus and a reduction or loss of the seed bank in areas of ground disturbance. Surveys have identified 13 individuals of the species within the East Plant Site project area. To reduce the potential impacts from construction activities on individual Arizona hedgehog cactus, the area of disturbance will be surveyed by a qualified biologist to locate any previously identified individuals and any that may have become established since the most recent survey in 2017 (WestLand 2017a). Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance prior to construction activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

There would be some mortality of individual Arizona hedgehog cactus on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time.

Ground disturbance associated with construction at the East Plant Site would remove about 22.1 acres within the range of the Arizona hedgehog cactus (see figure 16-1). These areas would likely no longer be

suitable for re-establishment of Arizona hedgehog cactus after the project is completed. Ground disturbance and construction of facilities at the site would lead to a reduction or loss of the seed bank; habitat degradation and fragmentation; increased distance between individuals; increased potential for invasive and noxious weed establishment and spread; and changes to individual plant photosynthetic potential from increased dust related to construction (if retained in place and avoided within the project area).

Ground disturbing activities would lead to a reduction or loss of the Arizona hedgehog cactus seed bank on up to 22.1 acres at the East Plant Site. These areas would no longer have Arizona hedgehog cactus to continue contributing to the seed bank and ground disturbance can change conditions that reduce suitability for seed germination.

Increasing distance between individual plants and habitat fragmentation may reduce the likelihood of effective localized pollination and thus reduce reproductive potential of the individuals in and adjacent to project features. However, as the species is pollinated by both hummingbirds and some bee species (Aslan 2015) and these species are mobile enough to move across the areas of disturbance, it is unlikely that localized pollination would be measurably reduced.

Soil disturbance associated with construction activities may lead to the increased potential for the introduction and colonization of disturbed areas by noxious and invasive plant species. This could lead to increased competition for resources as well as changes in vegetation communities, including a possible shift over time to more wildfire-adapted vegetation. This could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

While cactus species can be damaged by fire, they can also survive in areas with low fuel abundance and in areas where topography leads to uneven burning. The increased potential for fires could lead to mortality of individuals or long-term changes to habitat above those that would occur naturally. These potential impacts would be greatest in areas to be disturbed and in areas adjacent to disturbance and would decrease with distance from disturbance. However, as this species is found in habitat types that are adapted to fire, it is likely that Arizona hedgehog cactus has evolved with fire and therefore may be somewhat adapted to fire.

Fugitive dust from construction activities has the potential to affect photosynthetic rates and decrease individual plant productivity. Dust can have both physical and chemical impacts (Farmer 1993; Goodquarry 2011; Havaux 1992; Sharifi et al. 1997; Thompson et al. 1984; Walker and Everett 1987). Physical impacts of windborne fugitive dust on individual Arizona hedgehog cacti could include blockage and damage to stomata, shading, and abrasion of the plant surface. Dust can increase plant surface temperature; inhibit pollen germination; reduce photosynthetic activity, respiration, transpiration, and fruit set; decrease productivity; alter community structure; and contribute to cumulative impacts. Some studies, however, indicate that plant species living in high light conditions are flexible to adapting to lower light conditions (e.g., desert plants) (Alves et al. 2002; Barber and Andersson 1992; Werner et al. 2002) and that some plant species show improved growth with increased dust deposition (i.e., limestone) (Brandt and Rhoades 1972). The overall impact on the species from fugitive dust would be localized near sources of dust and would be highest near areas of ground disturbance during construction activities and would decrease with the completion of construction activities. Conservation measures, including wetting

of surfaces during construction, would reduce the amount of fugitive dust and the potential associated effects on Arizona hedgehog cactus.

The potential rerouting of Magma Mine Road could lead to road cuts and fill creating loose soil/rocks that could shift downslope and bury or crush individual Arizona hedgehog cacti. Surveys of the area have found 3 individual Arizona hedgehog cactus within or near the proposed reroute. This could lead to a direct loss of individuals of the species. For those plants that cannot be salvaged but are downslope from a construction area, measures would be implemented to protect them from rolling or sliding debris.

# **Tailings Pipeline Corridor**

The tailings pipeline corridor is broken into two areas—the tailings pipeline corridor, and the tailings pipeline corridor collocated with the 115-kV transmission line (see figure 16-1). Each of these areas is discussed separately below.

#### Tailings Pipeline Corridor

In total, 89 Arizona hedgehog cacti are estimated to occur within the 56.7-acre tailings pipeline corridor. Potential effects on the species from construction of the pipeline would include the removal of up to 89 individual Arizona hedgehog cacti and any additional individuals that have become established since surveys occurred in 2019 as well as a reduction or loss of the seed bank in areas of ground disturbance. To reduce the potential impacts from construction activities on individual Arizona hedgehog cacti, the area of disturbance will be surveyed by a qualified biologist to identify any previously identified individuals and any that may have become established since the most recent survey. Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance prior to construction activities, following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

There would be some mortality of individual Arizona hedgehog cacti on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time.

Ground disturbance associated with construction of the tailings pipeline including grading and trenching would remove up to 56.7 acres of habitat within the range of the Arizona hedgehog cactus (see figure 16-1). Ground disturbance would lead to habitat degradation and fragmentation; increased distance between individuals; increased potential for invasive and noxious weed establishment and spread; a reduction or loss of the seed bank in areas of ground disturbance; and changes to individual plant photosynthetic potential from increased dust related to construction. These actions would likely reduce or eliminate the suitability of these 56.7 acres for the species to re-establish after the project life span due to the changes to soils and geological formations from grading and trenching during construction.

Increasing distance between individual plants and habitat fragmentation due to the corridor and transplanting of individual Arizona hedgehog cacti outside disturbed areas may reduce the likelihood of effective localized pollination and thus reduce reproductive potential of the individuals in and adjacent to project features. However, as the species is pollinated by both hummingbirds and some bee species (Aslan 2015) and these species are mobile enough to move across the areas of disturbance, it is unlikely that localized pollination would be measurably reduced.

Soil disturbance associated with construction activities may lead to the increased potential for the introduction and colonization of disturbed areas by noxious and invasive plant species. This could lead to increased competition for resources as well as changes in vegetation communities, including a possible shift over time to more wildfire-adapted vegetation. This could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

Ground disturbing activities would lead to a reduction or loss of the Arizona hedgehog cactus seed bank on up to 56.7 acres in the Tailings Pipeline Corridor. Areas of ground disturbance would no longer have Arizona hedgehog cactus to continue contributing to the seed bank and ground disturbance can change conditions to make them less suitable for seed germination.

Fugitive dust from construction activities has the potential to affect photosynthetic rates and decrease individual plant productivity. Dust can have both physical and chemical impacts (Farmer 1993; Goodquarry 2011; Havaux 1992; Sharifi et al. 1997; Thompson et al. 1984; Walker and Everett 1987). Physical impacts of windborne fugitive dust on individual Arizona hedgehog cacti could include blockage and damage to stomata, shading, and abrasion of the plant surface. Dust can increase plant surface temperature; inhibit pollen germination; reduce photosynthetic activity, respiration, transpiration, and fruit set; decrease productivity; alter community structure; and contribute to cumulative impacts. Some studies, however, indicate that plant species living in high light conditions are flexible to adapting to lower light conditions (e.g., desert plants) (Alves et al. 2002; Barber and Andersson 1992; Werner et al. 2002) and that some plant species show improved growth with increased dust deposition (i.e., limestone) (Brandt and Rhoades 1972). The overall impact on the species from fugitive dust would be localized near sources of dust and would be highest near areas of ground disturbance during construction activities and would decrease with the completion of construction activities. Conservation measures, including wetting of surfaces during construction, would reduce the amount of fugitive dust and the potential associated effects on Arizona hedgehog cactus.

The development of the access road within the corridor (where existing access roads are not sufficient) could lead to road cuts and fill creating loose soil/rocks that could shift downslope and bury or crush individual Arizona hedgehog cacti outside the area to be disturbed. There are an estimated 11 individual Arizona hedgehog cactus within 100 feet of the project area that are downslope from project activities (see figures 16-3 and 16-4). This could lead to a direct loss of individuals of the species. For those plants that cannot be salvaged but are downslope from a construction area, measures would be implemented to protect the individuals from rolling or sliding debris to avoid potential impacts from burying or crushing .

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line would be 500 feet wide and occurs on about 294.9 acres within the known species' range, this includes about 4.2 acres within the corridor for access roads. Construction would take place in accordance with SRP procedures, some of which have been determined through previous consultation with USFWS (see section 5). For purposes of this document, a 500-foot-wide corridor of disturbance was assumed; however, the actual disturbance would likely be less.

Surveys for Arizona hedgehog cactus were conducted in 2019 on approximately 203.1 acres (68.9 percent) of the collocated corridor (see figure 16-1). No Arizona hedgehog cacti were identified

during this survey within the project area (WestLand 2019a). As this corridor was surveyed in 2019 and there were no Arizona hedgehog cacti identified within the project area in this corridor, there would be no construction-related effects on the species in this area. This corridor would be surveyed for the species prior to the initiation of construction activities to make certain that no individuals are present in the previous survey area and the approximately 91.8 acres that have not been surveyed. All conservation measures for the species would be implemented within this corridor if future surveys find any Arizona hedgehog cacti within the corridor. Should any individuals be found during surveys the potential effects on the species would be similar to those described for the tailings pipeline corridor above.

Within the collocated corridor about 4.2 acres would be disturbed for access roads. An additional 214.0 acres of the corridor would see long-term or permanent changes associated with the high levels of soil and geologic formation disturbance from pipeline construction. These areas (218.4 acres total in the corridor) would be unlikely to remain suitable for the species to re-establish after the project life span due to the changes to soils and geological formations from grading and trenching during construction.

For the 80.0 acres in the corridor that would be utilized for the 115-kV transmission line the only areas of ground disturbance besides access roads within the corridor (see above) would be for the tower locations (acreage unknown) and large portions of this part of the corridor would be spanned by the transmission lines and would not have ground disturbance. This would likely help retain conditions in areas that would not have ground disturbance to allow for future re-establishment of the species into those areas. Areas that would be disturbed for towers would be unlikely to remain suitable for the species to re-establish after the project life span.

# Electricity Supply and Transmission Lines

#### Collocated 230-kV/115-kV Transmission Lines

The collocated 230-kV and 115-kV transmission lines would occur on about 57.3 acres within the range of Arizona hedgehog cactus. This acreage includes about 1.2 acres for access roads within the corridor. Surveys conducted in 2019 covered 100 percent of this corridor and found 39 individual Arizona hedgehog cacti (WestLand 2019a).

Potential construction-related effects on the species from the collocated 230-kV and 115-kV transmission lines, associated access roads, and staging areas would include the removal of 39 individual Arizona hedgehog cacti and any additional individuals that have become established since surveys occurred in 2017. To reduce the potential impacts from construction activities on individual Arizona hedgehog cacti, the area of disturbance will be surveyed by a qualified biologist to identify any previously identified individuals and any that may have become established since the most recent survey. Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance prior to construction activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

There would be some mortality of individual Arizona hedgehog cacti on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time. Ground disturbance associated with construction of the collocated 230-kV and 115-kV transmission lines would remove about 57.3 acres of habitat within the range of the Arizona hedgehog cactus (see figure 16-1). Disturbance would lead to habitat degradation and fragmentation; increased distance between individuals; increased potential for invasive and noxious weed

establishment and spread; a reduction in or loss of the seed bank; and changes to individual plant photosynthetic potential from increased dust related to construction.

Increasing distance between individual plants due to the corridor and transplanting of individual Arizona hedgehog cactus outside disturbed areas may reduce the likelihood of effective localized pollination and thus reduce reproductive potential of the individuals in and adjacent to project features. However, as the species is pollinated by both hummingbirds and some bee species (Aslan 2015) and these species are mobile enough to move across the areas of disturbance, it is unlikely that localized pollination would be measurably reduced.

Soil disturbance associated with construction activities may lead to the increased potential for the introduction and colonization of disturbed areas by noxious and invasive plant species. This could lead to increased competition for resources as well as changes in vegetation communities, including a possible shift over time to more wildfire-adapted vegetation. This could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

Ground disturbing activities would lead to a reduction or loss of the Arizona hedgehog cactus seed bank on up to 57.3 acres from the collocated 230-kV and 115-kV transmission lines. Areas of ground disturbance would no longer have Arizona hedgehog cactus to continue contributing to the seed bank and ground disturbance can change conditions to make them less suitable for seed germination. However, these impacts would not occur on the entire 57.3 acres and ground disturbance would be limited to the access roads (1.2 acres) within the corridor and tower locations (acreage unknown). Where disturbance for the access roads and towers would occur it would reduce suitability of those areas for Arizona hedgehog cactus to re-establish after the life of the project.

Fugitive dust from construction activities has the potential to affect photosynthetic rates and decrease individual plant productivity. Dust can have both physical and chemical impacts (Farmer 1993; Goodquarry 2011; Havaux 1992; Sharifi et al. 1997; Thompson et al. 1984; Walker and Everett 1987). Physical impacts of windborne fugitive dust on individual Arizona hedgehog cacti could include blockage and damage to stomata, shading, and abrasion of the plant surface. Dust can increase plant surface temperature; inhibit pollen germination; reduce photosynthetic activity, respiration, transpiration, and fruit set; decrease productivity; alter community structure; and contribute to cumulative impacts. Some studies, however, indicate that plant species living in high light conditions are flexible to adapting to lower light conditions (e.g., desert plants) (Alves et al. 2002; Barber and Andersson 1992; Werner et al. 2002) and that some plant species show improved growth with increased dust deposition (i.e., limestone) (Brandt and Rhoades 1972). The overall impact on the species from fugitive dust would be localized near sources of dust and would be highest near areas of ground disturbance during construction activities and would decrease with the completion of construction activities. Conservation measures, including wetting of surfaces during construction, would reduce the amount of fugitive dust and the potential associated effects on Arizona hedgehog cactus.

The development of the access road, where existing access is not sufficient, within the corridor could lead to road cuts and fill creating loose soil/rocks that could shift downslope and bury or crush individual Arizona hedgehog cactus. This could lead to a direct loss of individuals of the species. For those plants

that cannot be salvaged but are downslope of a construction area, measures would be implemented to protect from rolling or sliding debris.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line is addressed above under Tailings Pipeline Corridor.

#### 115 kV Transmission Line

The 115-kV transmission line would occur on about 3.0 acres within the known range of Arizona hedgehog cactus, this includes about 0.1 acre for access roads within the corridor. Surveys conducted in 2019 covered 100 percent of this corridor and found 2 individual Arizona hedgehog cacti (WestLand 2019a).

Potential construction-related effects on the species from the 115-kV transmission lines, associated access roads, and staging areas would include the removal of 2 individual Arizona hedgehog cacti and any additional individuals that have become established since surveys occurred in 2019. To reduce the potential impacts from construction activities on individual Arizona hedgehog cacti, the area of disturbance will be surveyed by a qualified biologist to identify any previously identified individuals and any that may have become established since the most recent survey. Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance prior to construction activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

There would be some mortality of individual Arizona hedgehog cacti on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time. Ground disturbance associated with construction of the 115-kV transmission line would remove about 3.0 acres of habitat within the range of the Arizona hedgehog cactus (see figure 16-1). Disturbance would lead to habitat degradation and fragmentation; increased distance between individuals; increased potential for invasive and noxious weed establishment and spread; a reduction in or loss of the seed bank; and changes to individual plant photosynthetic potential from increased dust related to construction.

Increasing distance between individual plants due to the corridor and transplanting of individual Arizona hedgehog cactus outside disturbed areas may reduce the likelihood of effective localized pollination and thus reduce reproductive potential of the individuals in and adjacent to project features. However, as the species is pollinated by both hummingbirds and some bee species (Aslan 2015) and these species are mobile enough to move across the areas of disturbance, it is unlikely that localized pollination would be measurably reduced.

Soil disturbance associated with construction activities may lead to the increased potential for the introduction and colonization of disturbed areas by noxious and invasive plant species. This could lead to increased competition for resources as well as changes in vegetation communities, including a possible shift over time to more wildfire-adapted vegetation. This could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area. Applications of herbicide will be done

following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

Ground disturbing activities would lead to a reduction or loss of the Arizona hedgehog cactus seed bank on up to 3.0 acres from the 115-kV transmission line. These areas would no longer have Arizona hedgehog cactus to continue contributing to the seed bank and ground disturbance can change conditions to make them less suitable for seed germination. However, these impacts would not occur on the entire 3.0 acres and ground disturbance would be limited to the access roads (0.1 acre) within the corridor and tower locations (acreage unknown). Where disturbance would occur it would reduce suitability of those areas for Arizona hedgehog cactus to re-establish after the life of the project.

Fugitive dust from construction activities has the potential to affect photosynthetic rates and decrease individual plant productivity. Dust can have both physical and chemical impacts (Farmer 1993; Goodquarry 2011; Havaux 1992; Sharifi et al. 1997; Thompson et al. 1984; Walker and Everett 1987). Physical impacts of windborne fugitive dust on individual Arizona hedgehog cacti could include blockage and damage to stomata, shading, and abrasion of the plant surface. Dust can increase plant surface temperature; inhibit pollen germination; reduce photosynthetic activity, respiration, transpiration, and fruit set; decrease productivity; alter community structure; and contribute to cumulative impacts. Some studies, however, indicate that plant species living in high light conditions are flexible to adapting to lower light conditions (e.g., desert plants) (Alves et al. 2002; Barber and Andersson 1992; Werner et al. 2002) and that some plant species show improved growth with increased dust deposition (i.e., limestone) (Brandt and Rhoades 1972). The overall impact on the species from fugitive dust would be localized near sources of dust and would be highest near areas of ground disturbance during construction activities and would decrease with the completion of construction activities. Conservation measures, including wetting of surfaces during construction, would reduce the amount of fugitive dust and the potential associated effects on Arizona hedgehog cactus.

The development of the access road, where existing access is not sufficient, within the corridor could lead to road cuts and fill creating loose soil/rocks that could shift downslope and bury or crush individual Arizona hedgehog cactus. This could lead to a direct loss of individuals of the species. For those plants that cannot be salvaged but are downslope of a construction area, measures would be implemented to protect them from rolling or sliding debris.

#### Anticipated Surface Water Impacts

Arizona hedgehog cactus relies on precipitation to obtain water. As such, it is not anticipated that there would be any surface water impacts to the species from any changes to watershed size or other surface water impacts.

# Project Components with No Effect on the Species from Construction

No effects on Arizona hedgehog cactus would be expected as a result of construction at the following project components, as they would occur entirely outside the species' known range: West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility.

# Action Area Outside Project Footprint

The action area covers about 23.8 percent of the overall Arizona hedgehog cactus species' known range. Approximately 2,662.7 acres of the action area, outside the project footprint but within the known species' range, have been surveyed for Arizona hedgehog cactus. This is approximately 6.7 percent of the

known species' range. Surveys identified 2,087 Arizona hedgehog cacti within the action area. It estimated that there are 7,302 individual Arizona hedgehog cacti in the action area within the known species' range. All individuals in the action area occur on lands within the TNF except for 36 individuals found on private land. Potential construction-related impacts to the action area outside of the project footprint would be limited to effects that occur outside the project area or later in time. These would include the increased potential for invasive and noxious weed establishment and spread from the project area where soil disturbance would occur to adjacent areas within the action area and changes to individual plant photosynthetic potential from increased dust related to construction.

Soil disturbance associated with construction activities may lead to the increased potential for the introduction and colonization of disturbed areas by noxious and invasive plant species. This could lead to increased competition for resources as well as changes in vegetation communities, including a possible shift over time to more wildfire-adapted vegetation outside the project footprint within the Action Area. This could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

Fugitive dust from construction activities has the potential to affect photosynthetic rates and decrease individual plant productivity. Dust can have both physical and chemical impacts (Farmer 1993; Goodquarry 2011; Havaux 1992; Sharifi et al. 1997; Thompson et al. 1984; Walker and Everett 1987). Physical impacts of windborne fugitive dust on individual Arizona hedgehog cactus could include blockage and damage to stomata, shading, and abrasion of the plant surface. Dust can increase plant surface temperature; inhibit pollen germination; reduce photosynthetic activity, respiration, transpiration, and fruit set; decrease productivity; alter community structure; and contribute to cumulative impacts. Some studies, however, indicate that plant species living in high light conditions are flexible to adapting to lower light conditions (e.g., desert plants) (Alves et al. 2002; Barber and Andersson 1992; Werner et al. 2002) and that some plant species show improved growth with increased dust deposition (i.e., limestone) (Brandt and Rhoades 1972). The overall impact on the species from fugitive dust would be localized near sources of dust and would be highest near portions of the action area adjacent to ground-disturbing construction activities and would decrease with the completion of and distance from construction activities. Conservation measures, including wetting of surfaces during construction, would reduce the amount of fugitive dust and the potential associated effects on Arizona hedgehog cactus.

# **OPERATIONS AND MAINTENANCE**

# Access Roads

Potential effects on Arizona hedgehog cactus from operations and maintenance of the Access Roads outside the transmission and pipeline corridors would include those from noxious weed establishment and spread, fugitive dust, and increased potential for fire ignition due to the presence of workers and equipment. While these potential effects would continue to occur during the operations and maintenance phase of the project, they would be reduced from those previously described for construction activities for the Access Roads as there would be minimal ground disturbance, primarily associated with maintenance activities. This would also reduce the levels of fugitive dust in the area. While workers and equipment would still be present during operations and maintenance, they would be reduced from the construction phase and the potential for fire ignition from those workers and equipment would also be reduced. As previously described for construction activities, the increased establishment and spread of noxious and invasive weed species could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, the implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area to affect Arizona hedgehog cactus. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

## **Underground Mining and Subsidence**

Potential operations and maintenance–related impacts on Arizona hedgehog cactus from underground mining and subsidence would be related to the formation of the subsidence area. Surveys of the subsidence area covered 100 percent of the subsidence area, including the 387.1 acres within the known species' range, and identified 24 individual Arizona hedgehog cacti.

Subsidence of the ground surface is anticipated to occur beginning approximately 6 years after initiation of mining activities. It is anticipated to continue until approximately 40 years after initiation of mining activities on about 1,672.5 acres, approximately 387.1 acres of which are within the range of Arizona hedgehog cactus. Within the subsidence area there are approximately 11.5 acres of existing disturbance. Subsidence would occur gradually with some larger fracturing events. Larger subsidence and fracturing events could bury or destroy individual cactus. This could affect the 24 individuals currently known from within the subsidence area boundary, as well as any additional individuals not observed during surveys or that have established since surveys were completed. To reduce potential effects on the species, any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the subsidence area but within the species' range in the action area following the protocol found in Waldron and Durham (2016) as revised (USFS 2020). The crater created by subsidence would modify existing habitat for Arizona hedgehog cactus by changing slope and through movement of rocks and soil downslope, which could also lead to the reduction or loss of the seed bank. Some areas of existing habitat in the subsidence area may be made unsuitable for the species while other areas may become suitable for the species due to surface soil and slope changes. Overall this would reduce the potential for the species to persist or re-establish in areas where habitat becomes unsuitable.

There would be some mortality of individual Arizona hedgehog cacti on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time.

# East Plant Site

Potential effects on Arizona hedgehog cactus from operations and maintenance of the East Plant Site would include those from noxious weed establishment and spread, fugitive dust, and increased potential for fire ignition due to the presence of workers and equipment. While these potential effects would continue to occur during the operations and maintenance phase of the project, they would be reduced from those previously described for construction activities at the East Plant Site as there would be minimal ground disturbance, primarily associated with maintenance activities. This would also reduce the levels of fugitive dust in the area. While workers and equipment would still be present during operations

and maintenance, they would be reduced from the construction phase and the potential for fire ignition from those workers and equipment would also be reduced.

As previously described for construction activities, the increased establishment and spread of noxious and invasive weed species could lead to more frequent and more intense fires in areas where dry fuel loads increase. To reduce the potential impacts associated with noxious and invasive plant species, the implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area to affect Arizona hedgehog cactus. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

### Tailings Pipeline Corridor

The tailings pipeline corridor is broken into two areas—the tailings pipeline corridor where it occurs alone, and the tailings pipeline corridor where it is collocated with the 115-kV transmission line (see figure 16-1). Each of these areas are discussed separately below.

#### Tailings Pipeline Corridor

The 89 Arizona hedgehog cacti that are estimated to occur within the 56.7-acre tailings pipeline corridor would have been salvaged and transplanted within the action area but outside the area of disturbance within the corridor prior to construction activities. Potential impacts on the species from operations and maintenance activities would include impacts to the project area and action area from the increased potential for the introduction and spread of invasive and noxious weed species; the increased potential for fire ignition due to the presence of workers, vehicles, and other equipment; and the increased levels of dust associated with vehicles and equipment. These potential impacts would be greatly reduced from those anticipated from construction activities. These potential impacts would occur primarily during maintenance activities. While workers and equipment would still be present during operations and maintenance, they would be reduced from the construction phase and the potential for fire ignition from those workers and equipment would also be reduced. With the implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area to affect Arizona hedgehog cactus. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

No Arizona hedgehog cactus were identified during the survey of the collocated tailings pipeline corridor and 115-kV transmission line within the project area (WestLand 2019a). As this corridor was surveyed in 2019 and there were no Arizona hedgehog cacti identified within the project area in this corridor, it is anticipated that there would be no operations and maintenance–related effects on the species in this area. All conservation measures for the species would be implemented within this corridor if future surveys find any Arizona hedgehog cacti within the corridor. Should any individuals be found during surveys, the potential effects on the species would be similar to those described for the tailings pipeline corridor above.

## **Electricity Supply and Transmission Lines**

#### Collocated 230-kV/115-kV Transmission Lines

Potential operations and maintenance–related effects on the species from the collocated 230-kV and 115kV transmission lines would be minimal as the 39 individual Arizona hedgehog cactus and any additional individuals identified in pre-construction surveys will have been salvaged and planted into areas outside the area of disturbance following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

Potential impacts on the species from operations and maintenance activities would include impacts to the project area and action area from the increased potential for the introduction and spread of invasive and noxious weed species; the increased potential for fire ignition due to the presence of workers, vehicles, and other equipment; potential for herbicide to drift during vegetation management activities and impact individual cacti that were avoided during construction within the project area; and the increased levels of dust associated with vehicles and equipment. These potential impacts would be greatly reduced from those anticipated from construction activities. These potential impacts would occur primarily during maintenance activities.

There would be some mortality of individual Arizona hedgehog cacti on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time as described above under construction impacts.

Maintenance activities could lead to the creation of fugitive dust. Potential effects on the species from fugitive dust would be as described above under construction; however, as maintenance activities would involve only occasional activities and a reduced number of workers, vehicles, equipment, and ground disturbance the potential effects would be greatly reduced.

While workers and equipment would still be present during operations and maintenance, they would be reduced from the construction phase and the potential for fire ignition from those workers and equipment would also be reduced. With the implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area to affect Arizona hedgehog cactus. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line is addressed above under Tailings Pipeline Corridor.

#### 115 kV Transmission Line

Potential operations and maintenance–related effects on the species from the 115-kV transmission line would be minimal as the 2 individual Arizona hedgehog cactus and any additional individuals identified in pre-construction surveys will have been salvaged and planted into areas outside the area of disturbance following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

Potential impacts on the species from operations and maintenance activities would include impacts to the project area and action area from the increased potential for the introduction and spread of invasive and noxious weed species from the project are; the increased potential for fire ignition due to the presence of workers, vehicles, and other equipment; potential for herbicide to drift during vegetation management activities and impact individual cacti that were avoided during construction within the project area; and the increased levels of dust associated with vehicles and equipment. These potential impacts would be greatly reduced from those anticipated from construction activities. These potential impacts would occur primarily during maintenance activities.

There would be some mortality of individual Arizona hedgehog cacti on an ongoing basis due to natural factors and lifespans as well as those associated with the salvage and transplant activities, due to a decreased ability to uptake nutrients or water as a result of a reduction in root-to-shoot ratio. The loss of these individual plants would reduce the overall numbers of the species that contribute to genetic variation in the population. Decreased genetic variation may reduce population resiliency to short- and long-term disturbance over time as described above under construction impacts.

Maintenance activities could lead to the creation of fugitive dust. Potential effects on the species from fugitive dust would be as described above under construction; however, as maintenance activities would involve only occasional activities and a reduced number of workers, vehicles, equipment, and ground disturbance the potential effects would be greatly reduced.

While workers and equipment would still be present during operations and maintenance, they would be reduced from the construction phase and the potential for fire ignition from those workers and equipment would also be reduced. With the implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area to affect Arizona hedgehog cactus.

Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

#### Anticipated Groundwater and Surface Water Impacts

As Arizona hedgehog cacti are not reliant on groundwater or surface waters, the species would not be impacted by changes to groundwater and surface waters from operations and maintenance.

# Project Components with No Effect on the Species from Operations and Maintenance

No effects on Arizona hedgehog cactus would be expected as a result of operations and maintenance activities at the following project components as they would occur entirely outside the species' known range: West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility.

# Action Area Outside Project Footprint

Potential effects on Arizona hedgehog cactus in the action area from operations and maintenance activities would be similar to those described above for construction activities, including the potential for noxious and invasive weed introduction and spread, increased fugitive dust, potential for herbicide to drift during vegetation management activities and impact individual cacti that were avoided during construction within the project area, and increased fire ignition sources from the presence of vehicles and workers. However, these impacts would be less than those described above for construction as there would be less equipment and fewer workers present. Implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

# CLOSURE AND RECLAMATION

### East Plant Site Closure and Reclamation

Closure and reclamation of the East Plant Site would result in short- and long-term impacts on vegetation and soil resources. During this phase, facilities would be decommissioned, sites would be regraded (as needed) and reclaimed, soil or capping material would be applied along tailings and other surfaces (as needed), erosion control measures would be implemented, and disturbed areas would be revegetated. The goal of this phase would be to reestablish vegetation on all disturbed areas, to reduce soil erosion potential, and, over time, create stable, functioning ecosystems. Prior to initiation of closure and reclamation activities, any area that would be disturbed or used for staging or stockpile areas within the range of Arizona hedgehog cactus at the East Plant Site would be surveyed for the species. Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance or used in reclamation activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020). Reclamation activities are not anticipated to return the area to being suitable for Arizona hedgehog cactus at the end of the project life.

Disturbance associated with reclamation activities at the East Plant Site would create increased potential for invasive and noxious weed establishment and spread and changes to nearby individual plant photosynthetic potential from increased dust related to construction. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area during closure and reclamation activities.

#### Water Supply Facilities and Pipelines Closure and Reclamation

#### Tailings Pipeline Corridor

Potential effects on Arizona hedgehog cactus during closure and reclamation of the tailings pipeline corridor would be similar to those described for construction activities. Prior to initiation of closure and reclamation activities any area that would be disturbed or used for staging or stockpile areas within the range of Arizona hedgehog cactus at the tailings pipeline corridor would be surveyed for the species. Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance or used in reclamation activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

Disturbance associated with reclamation activities at the East Plant Site would create increased potential for invasive and noxious weed establishment and spread and changes to nearby individual plant photosynthetic potential from increased dust related to construction. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the

potential for noxious and invasive weed establishment and spread in the project area and action area during closure and reclamation activities.

Reclamation activities are not anticipated to return the pipeline corridor to being suitable for Arizona hedgehog cactus at the end of the project life.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

Potential effects on Arizona hedgehog cactus during closure and reclamation of the collocated tailings pipeline corridor and 115-kV transmission line would be similar to those described for construction activities. Prior to initiation of closure and reclamation activities, any area that would be disturbed or used for staging or stockpile areas within the range of Arizona hedgehog cactus in the corridor would be surveyed for the species. Any healthy individuals of the species that are suitable for transplant will be salvaged and planted into areas outside the area of disturbance or used in reclamation activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

Disturbance associated with reclamation activities at the collocated tailings pipeline corridor and 115-kV transmission line would create increased potential for invasive and noxious weed establishment and spread and changes to nearby individual plant photosynthetic potential from increased dust related to construction. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area during closure and reclamation activities. Power Transmission Facilities Closure and Reclamation

#### Collocated 230-kV/115-kV Transmission Lines

Potential effects on Arizona hedgehog cactus during closure and reclamation of the collocated 230-kV and 115-kV transmission lines would be similar to those described for construction activities. Prior to initiation of closure and reclamation activities any area that would be disturbed or used for staging or stockpile areas within the range of Arizona hedgehog cactus would be surveyed for the species. Any healthy individuals of the species that are suitable for transplant would be salvaged and planted into areas outside the area of disturbance or used in reclamation activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

Disturbance associated with closure and reclamation activities of the collocated 230-kV and 115-kV transmission line would create increased potential for invasive and noxious weed establishment and spread and changes to nearby individual plant photosynthetic potential from increased dust related to construction. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area during closure and reclamation activities. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line is addressed above under Tailings Pipeline Corridor.

#### 115-kV Transmission Line

Potential effects on Arizona hedgehog cactus during closure and reclamation of the 115-kV transmission line would be similar to those described for construction activities. Prior to initiation of closure and reclamation activities any area that would be disturbed or used for staging or stockpile areas within the range of Arizona hedgehog cactus would be surveyed for the species. Any healthy individuals of the species that are suitable for transplant would be salvaged and planted into areas outside the area of disturbance or used in reclamation activities following the protocol found in Waldron and Durham (2016) as revised (USFS 2020).

Disturbance associated with closure and reclamation activities of the 115-kV transmission line would create increased potential for invasive and noxious weed establishment and spread and changes to nearby individual plant photosynthetic potential from increased dust related to construction. To reduce the potential impacts associated with noxious and invasive plant species, conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area during closure and reclamation activities. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

#### Anticipated Groundwater and Surface Water Impacts

As Arizona hedgehog cactus are not reliant on groundwater or surface waters, the species would not be impacted by changes to groundwater and surface waters from closure and reclamation activities.

#### Project Components with No Effect on the Species from Closure and Reclamation

No effects on Arizona hedgehog cactus would be expected as a result of closure and reclamation activities at the following project components as they would occur entirely outside the species' known range: West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility.

#### Action Area Outside Project Footprint

The action area covers about 23.8 percent of the overall Arizona hedgehog cactus known species' range. Approximately 2,662.7 acres of the action area, outside the project footprint but within the known species' range, have been surveyed for Arizona hedgehog cactus. This is approximately 6.7 percent of the known species' range. Surveys identified 2,087 Arizona hedgehog cacti within the action area. It estimated that there are 7,302 individual Arizona hedgehog cacti in the action area within the known species' range. All individuals in the action area occur on lands within the TNF, with the exception of 360 individuals present on private property owned by Resolution Copper at the East Plant Site. Potential closure and reclamation-related impacts to the action area outside the project footprint would be include the increased potential for invasive and noxious weed establishment and spread from the project area where soil disturbance would occur to adjacent areas within the action area and changes to individual plant photosynthetic potential from increased dust related to construction.

Soil disturbance associated with construction activities may lead to the potential for noxious and invasive weed introduction and spread, increased fugitive dust, and increased fire ignition sources from the presence of vehicles and workers. However, these impacts would be less than those described above for construction as there would be less equipment and fewer workers present. Implementation of conservation measures (see section 5.1) and the Noxious Weed and Invasive Species Management Plan (Resolution

Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the and action area. Applications of herbicide will be done following label directions as required by law, which do not approve applications during times of high winds. This would reduce or eliminate the potential for herbicide drift to reach individual Arizona hedgehog cactus.

# OTHER CONSEQUENCES

Interrelated and interdependent actions, e.g., power lines, pipelines etc., were all included in the proposed action; thus, there are no additional interrelated or interdependent actions that would cause additional effects.

Potential cumulative effects on Arizona hedgehog cactus would include the effects of all future non-Federal actions. As the action area and known habitat for the species is primarily found on lands managed by the TNF, it is anticipated that future activities within the action area that could impact the species would be subject to Section 7 consultation under the ESA.

The only cumulative action identified is a wildlife water source improvements project proposed by the AGFD. This proposed AGFD project involves catchments on both TNF-administered lands and on private lands. Those catchments on the TNF would involve a separate environmental analysis. For those on private lands, if the AGFD is using state funds or Federal grant monies for the project, then an environmental analysis will also be completed. However, none of the catchments proposed for improvement occur within the known range of Arizona hedgehog cactus, and as such, no additional cumulative effects on the species would occur.

There is the potential for impacts related to increased access within the project area and action area from project-related roadways. However, these potential impacts would be avoided through measures to limit access to administrative use only.

# 6.1.3 Determination of Effects

The proposed project would be expected to lead to habitat disturbance within the range of the Arizona hedgehog cactus and would lead to the removal of individual hedgehog cacti. Proposed conservation measures, including transplanting individual cactus when feasible outside areas of disturbance, would reduce the severity of the potential effects on the species but would not eliminate them. As such, the proposed action, which would include conservation measures for the species, may affect and is likely to adversely affect the Arizona hedgehog cactus. This determination is based on the following:

- construction, closure, and reclamation activities may disturb up to approximately 822.8 acres (about 1.8 percent) within the known species' range; including 299.9 acres of permanent impacts that would likely preclude future re-establishment of the species within those areas; and about 521.9 acres of impacts to areas within the species' known range that would only be partially disturbed for Transmission line towers and the subsidence area. These areas could remain or become suitable for the species to re-establish after the life of the project.
- removal or transplant of a known 165 individuals of the species detected during project surveys and an additional estimated 23 additional individuals estimated (for a total of 188 individuals) across the entire project area. This was determined using densities of individuals in specific project features and extrapolating that density to areas that were not surveyed within the known species' range. In addition we assume approximately 60 additional Arizona hedgehog cactus individuals would be found during pre-construction surveys leading to potential impacts on up to 247 individuals.

- increased potential for mortality from transplant activities due to the decreased ability to uptake nutrients or water due to a reduction in root-to-shoot ratio from project-related transplanting activities; and
- indirect impacts from habitat fragmentation, increased invasive and noxious weed establishment and spread, and fugitive dust.

# 6.2 Gila Chub

# 6.2.1 Species Status in Action Area

The Gila chub (*Gila intermedia*) was listed as endangered with designated critical habitat in 2005. On April 6, 2017, the USFWS withdrew the proposed listing for headwater chub (*Gila nigra*) and roundtail chub (*Gila robusta*) in the Lower Colorado River Basin due to the findings of the Joint Committee on the Names of Fishes (USFWS 2017). These findings concluded that the two formerly proposed species as well as the currently listed Gila chub are no longer valid species and should all be considered roundtail chub. The USFWS is still working internally to clarify how this ruling may be applied for Gila chub. The Gila chub is not known to occur in the project area or action area; however, the USFWS still considers Mineral Creek occupied since the survey efforts by AGFD have not been extensive enough to consider the population extirpated, but the USFWS estimates that the population in Mineral Creek is low in numbers (Gordon 2020).

Project-related surveys and other surveys of suitable habitat in Mineral Creek and Devil's Canyon within the action area did not detect this species, no surveys were conducted in the project area. The tailings pipeline corridor was changed since the Draft EIS, to avoid biological resources within Mineral Creek. There have been no surveys for Gila chub within the project area. However, within the action area, approximately 12 percent of Queen Creek, 71 percent of Mineral Creek, and 48 percent of Devil's Canyon have been surveyed. These surveys for Gila chub were conducted within or overlapping portions of the action area by TNF, WestLand, and SWCA. These surveys were conducted using accepted protocols by qualified biologists and data validation was conducted by staff from TNF and SWCA. The AGFD surveyed this area and found Gila chub in Mineral Creek in 2000; however, additional surveys in 2002, 2006, 2007, 2008, 2009, and 2013 found no Gila chub. Therefore, the AGFD assumed the creek to be fishless in 2007 (Robinson 2007; Robinson et al. 2010). Additionally, WestLand surveyed Mineral Creek in 2017 but did not find any Gila chub (WestLand 2018a). These surveys did not cover the entire project area within suitable habitat (figures 17-1 and 17-2). The surveys conducted include:

- 2007 survey of Mineral Creek Big Box Dam Reservoir (Robinson 2007)
  - On April 11 and 12, 2007, AGFD biologists surveyed the Mineral Creek reservoir, which was created by Big Box Dam. Methods of sampling included setting gill nets at dispersed locations around the reservoir and electrofishing the entire shoreline. The only fish species captured were green sunfish (*Lepomis cyanellus*) and fathead minnow (*Pimephales promelas*). Green sunfish were also found in Mineral Creek, just upstream of the reservoir during a February 26, 2007, survey. Although the habitat was noted suitable for Gila chub, it was recommended that nonnatives be removed first before reintroducing Gila chub.
- 2008 survey of Telegraph Canyon and Arnett Creek (Robinson 2008a)
  - From 1992 to 1999, the AGFD and TNF collaborated on evaluating and establishing a native fishery in Arnett Creek and Telegraph Canyon. Effort to eliminate nonnative fishes including a barrier were completed. The reintroduction efforts in 1999 of longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus clarkii*), and Sonora sucker (*Catostomus insignis*) were not successful. Subsequently, in 2002, drying of all or portions of Arnett Creek and also

possibly Telegraph Canyon went dry. No fish were detected in the 2004–2007 surveys. However, part of the process included additional reintroductions and in July 2007, longfin dace was reintroduced again into Arnett Creek.

- The AGFD survey on July 23, 2008, was to assess the longfin dace population and habitat suitability for the Gila chub in Arnett Creek and Telegraph Canyon. Methods included backpack electrofishers and dip-nets in both areas. Longfin dace were the only species detected and the habitat was rated poor for Gila chub for both Arnett Creek and Telegraph Canyon. They indicated that until there is an increase in deeper pool habitat to increase habitat suitability for Gila chub, restocking efforts should not occur.
- 2008 survey of Mineral Creek (Robinson 2008b)
  - On April 21 and 22, 2008, AGFD surveyed Mineral Creek from Big Box Dam Reservoir upstream to the confluence with Lyons Canyon. Methods of sampling included using a backpack electrofisher and collapsible minnow traps. Fish species captured included longfin dace, green sunfish, and fathead minnows.
- 2007/2008 survey of Devil's Canyon and upper Mineral Creek (WestLand 2009b)
  - On November 13, 2007, three WestLand biologists surveyed the perennial portions of Mineral Creek from 0.25 mile downstream from Lyons Fork for 2.6 miles. Methods included visual (unaided eye and binoculars) and snorkeling of pools. The only fish species observed was longfin dace.
  - On November 14, 2007, two WestLand biologists surveyed from near the confluence of Rancho Rio Creek downstream approximately 1.5 river miles to a point just upstream of the Crater Tanks portions of Devil's Canyon. Methods included visual (unaided eye and binoculars) and snorkeling of pools. Green sunfish were the only fish species observed.
  - On May 8 and 9, 2008, WestLand biologists surveyed the deep pools of the Crater Tanks in Devil's Canyon. Methods included visual (unaided eye and binoculars) and snorkeling of pools. Green sunfish were the only fish species observed.
  - On May 29 and 30, 2008, WestLand biologists conducted visual, angling, and dip-net surveys
    of Hackberry Tank and a stock pond located just west of Devil's Canyon on the north side of
    U.S. 60. No fish species were detected.
- 2009 survey of Devil's Canyon and Mineral Creek (Robinson et al. 2010)
  - On July 14, 2009, AGFD biologists surveyed Devil's Canyon from the U.S. 60 bridge to 2,350 meters (m) downstream. Methods included using a backpack electrofisher and a dip net. Fish species captured included mosquitofish, green sunfish, and fathead minnows.
  - On April 15 and 16, 2009, AGFD biologists surveyed Devil's Canyon from Rancho Rio Creek to approximately 2,440 m downstream. Methods included using a backpack electrofisher and collapsible mini hoop nets. Fish species captured included mosquitofish and green sunfish.
  - On August 3 and 4, 2009, AGFD biologists surveyed the plunge pools below each of the five falls along Devil's Canyon. Methods included an experimental monofilament gill net, baited mini hoop nets, and snorkeling. Fish species captured included green sunfish.
  - On August 4, 2009, AGFD biologists surveyed along Devil's Canyon from approximately 50 m downstream of the lowest of the five falls downstream 3,070 m to about 175 m past the confluence of Rawhide Canyon. Methods an experimental monofilament gill net, baited mini hoop nets, and snorkeling. Fish species captured included green sunfish.
  - On August 3, 2009, AGFD biologists surveyed along Devil's Canyon from Rawhide Canyon from its mouth upstream 650 m to a dry waterfall. Methods included using a backpack

electrofisher, collapsible mini hoop nets, and collapsible minnow traps. Fish species captured included green sunfish and fathead minnow.

- 2013 survey of Mineral Creek and Mineral Creek drainage stock tank (Crowder et al. 2014)
  - On May 29, 2013, AGFD biologists surveyed a 3.3-mile (5.3-km) stretch of upper Mineral Creek Methods included using a backpack electrofisher and collapsible minnow traps. Fish species captured included longfin dace. Although Gila chub were not detected the AGFD biologists concluded that suitable habitat for the species still exists in Mineral Creek.
- 2017 survey of Mineral Creek (WestLand 2018a)
  - From June 6 through 9, 2017, WestLand biologists surveyed 3.4 miles (5.5 km) within four stretches of Mineral Creek. Methods included using minnow traps. Fish species captured included longfin dace in large numbers throughout three of the four survey segments.
  - From June 21 through 23, 2017, WestLand biologists surveyed 1.4 miles (2.3 km) within three stretches of Queen Creek. Methods included using minnow traps. Fish species captured included green sunfish in survey segment three.
- 2017 aquatic surveys of Queen Creek (Warnecke et al. 2018)
  - On October 31, 2017, AGFD biologists surveyed Queen Creek, downstream of Superior, from the first wetted section of the creek within Boyce Thompson Arboretum State Park to upstream approximately 1 mile. Methods used included electrofishing. Fish species captured included green sunfish.
- 2020 fish survey of Mineral Creek and Mill Creek within Gila chub designated critical habitat (Westland 2020b).
  - Report in preparation. No Gila chub observed. Survey area included 3.4 miles of Mineral Creek and 1.4 miles of Mill Creek within Gila chub designated critical habitat.

Although the species has not been detected in the action area since 2000, designated critical habitat for the Gila chub is present within the project and action areas (see figures 15-1 and 15-2). An analysis of effects on Gila chub designated critical habitat is provided in section 6.3.

Gila chub are not known to occur in the Gila River in Maricopa County (MAR-5 Wetland/Olberg Road), in Queen Creek (Queen Creek), or in the San Pedro River within Pinal County (H&E Ranch or the Lower San Pedro River Wildlife Area) (USFWS 2020b). Gila chub have been stocked into a pond on the Nature Conservancy's Lower San Pedro River Preserve, just north of Dudleyville (USFWS 2015b). , and Gila chub would not be expected to naturally disperse in the area or into the H&E Ranch from this location.

# 6.2.2 Analysis of Effects

This section outlines the analysis of effects on the Gila chub species from each of the proposed action components. For each of the phases (Construction, Operations and Maintenance, and Closure and Reclamation), only components that may have effects or that need explanation are discussed individually. The remaining components are grouped together under a no effects subheading because they do not contain habitat, or are outside the known distribution of the species, or both.

## CONSTRUCTION

#### Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

The tailings pipelines will use a trenchless crossing where the corridor crosses Mineral Creek upstream of Government Springs Ranch. The 115-kV Transmission line will pass overhead of Mineral Creek, but new power poles will be placed outside of Mineral Creek and Gila chub critical habitat. The existing road crossing Mineral Creek would be used, with no improvements or alterations, and now access roads would be constructed to access the power poles (access would be walking only). Thus, no direct ground disturbance would occur within Mineral Creek or within the ordinary high water mark of the Creek, within Gila chub critical habitat, or nearby riparian vegetation as a result of construction of these components.

Ground disturbance within the watershed could still contribute sediment to Mineral Creek during storm events. However, erosion and sedimentation will be prevented through implementation of a SWPPP. BMPs would reduce, minimize, and possibly eliminate any indirect effects from sedimentation on Mineral Creek.

During construction, there will be a temporary increase the number of vehicles that use the existing access road that crosses Mineral Creek. If this portion of Mineral Creek contains water at time of construction, Gila chub could occur, although its presence at the crossing during construction is unlikely given that the species prefers quiet, deep pools, which do not occur in this location. If an individual Gila chub were present during vehicular crossing, it would be expected to move away from the area temporarily. If any are present in the project or action area during construction, individual Gila chub may also experience behavioral changes resulting from the disturbance, noise, or vibration that would occur as a result of vehicles crossing Mineral Creek or heavy equipment operating nearby. Individual Gila chub experiencing impacts from disturbance, noise, or vibration would be likely to temporarily move away from the area into other areas within Mineral Creek that contain suitable habitat. These are potential impacts; however, they are not reasonably certain to occur.

Individuals, if present downstream, could be negatively impacted by lowered water quality arising from sedimentation created by vehicles using water crossings. These impacts would extend for a short distance downstream of the vehicular crossing or other impacts and would be temporary. Impacts to individuals could include avoidance behaviors, or a reduction in health, fitness, or survival. However, these impacts would be temporary and minor, and would only be experienced by individuals occurring directly downstream of a vehicle crossing the water, and best management practices, including implementation of a SWPPP, would be implemented during construction to reduce, minimize, and possibly eliminate impacts from sedimentation.

Vehicle or equipment spills within Mineral Creek could negatively impact water quality and thus lead to Gila chub injury or mortality. However, best management practices would be adhered to during construction (e.g., no refueling of equipment in drainages), and these sorts of impacts would be unlikely.

Construction within the pipeline tailings corridor could increase the potential for the establishment and spread of noxious weeds in the vicinity. The presence of some weedy species could lead to the increased potential for fire along drainages, which could cause silting and sedimentation impacts to downstream areas, including Mineral Creek. Silting and sedimentation as a result of fire could reduce the quality or quality of Gila chub habitat within portions of Mineral Creek. Best management practices, including implementation Weed Management Plan that would require the use of certified weed-free seed, would be used to reduce, minimize, and possibly eliminate the likelihood of noxious weed establishment or spread within the project area. In addition, the proposed project does not include ground disturbance within the

ordinary high water mark of Mineral Creek, thus further reducing the likelihood of noxious weed spread in areas potentially occupied by Gila chub.

Because this species has not been observed in the action area since the year 2000 despite repeated surveys, it is likely extremely rare in Mineral Creek, if it is still extant. Therefore, there is an extremely low likelihood of an individual Gila chub being directly impacted through behavioral changes, or habitat loss from sedimentation, effects of fire, or from equipment spills. In addition, construction of the transmission lines would employ best management practices, including implementation of a SWPPP and Weed Management Plan that would require the use of certified weed-free seed, to reduce the risk of sedimentation, equipment spills, or noxious weed establishment or spread. If this species is re-established into Mineral Creek before construction activities commence, this could increase the likelihood of potential impacts occurring; however, any reintroductions would require a separate ESA analysis and consultation with the FWS: therefore, those potential impacts are not analyzed in this BA. Further, reintroductions are not currently planned and as such impacts to individuals are unlikely to occur. Thus, effects on Gila chub from construction of the pipelines and access road would be insignificant and discountable.

### Anticipated Surface Water Impacts

The subsidence area would have no impact on the surface flow of Mineral Creek (Garrett 2018), which is the only location within the action area where Gila chub have the potential to occur. Creation of the Skunk Camp tailings storage facility would result in loss of stormwater runoff to the Dripping Spring Wash. However, Gila chub are not known to occur in Dripping Spring Wash. Thus, there would be no effects on Gila chub from underground mine construction.

#### Project Components with No Effect on the Species from Construction

No effects on Gila chub would be expected as a result of construction at the following project components: Underground Mining and Subsidence, East Plant Site, Ore Conveyor/Infrastructure Corridor, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV Line Collocated with the Tailings Pipeline Corridor, discussed above). There is no habitat for Gila chub within these areas, or the species is not known to occur, or both.

# **OPERATIONS AND MAINTENANCE**

#### Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

Impacts would not be expected as a result of routine operation of the tailings pipelines or collocated transmission lines. Maintenance activities could potentially impact Gila chub, to the extent that those activities occurred within or near the Mineral Creek channel, when Gila chub are present. If Gila chub are reintroduced in this area, the likelihood of impacts would increase; however, any reintroductions would require a separate ESA analysis and consultation with the FWS: therefore, those potential impacts are not analyzed in this BA.

The pipeline would be inspected at intervals throughout the year and vegetation management activities would occur below the powerlines would occur as described in Section 3 of this document. Maintenance or inspections of the pipeline would increase the number of vehicles crossing Mineral Creek at the existing location. Individual Gila chub, if present in Mineral Creek at the time of crossing, would be expected to move away from the Mineral Creek crossing area temporarily into other areas of suitable habitat within Mineral Creek. An temporary increase of sedimentation occurring directly downstream of

the Mineral Creek crossing would be expected from vehicles, if water is present at time of crossing. However, this temporary localized increase of sedimentation would not be expected to negatively impact the habitat value of Mineral Creek. Individuals would be expected to move into adjacent portions of Mineral Creek until water cleared.

Use of the access road for maintenance or operations could increase the potential for the establishment and spread of noxious weeds in the vicinity, which could impact Gila chub as described in the Tailings Pipeline Corridor subsection under the Construction heading.

#### Anticipated Groundwater and Surface Water Impacts

Mineral Creek is the only location within the action area where Gila chub have the potential to occur. Because no drawdown is anticipated to occur in Mineral Creek, either as a result of ongoing dewatering or as a result of block-caving (Garrett 2018), no effects on Gila chub species would occur.

Portions of Mineral Creek would be monitored for groundwater drawdown. If, in the future, Mineral Creek experiences drawdown, which would be unexpected based on results of modeling (Garrett 2018), Resolution Copper could implement actions to supply replacement water. Actions could include creation of surface water diversions or check dams, or the installation of wells, guzzlers, or spring boxes. The specific actions are currently unknown, and these actions could have effects on Gila chub or habitat for the species, if these actions occurred in Mineral Creek when Gila chub are present. Should drawdown affect flows in Mineral Creek the development of actions to resupply water could lead to temporary, construction-related impacts to the species that would be similar to those described above for construction including potential for temporary increases in sedimentation. However, because these water replacement mitigations would be taken to conserve species and their habitat, it is assumed for purposes of this document that any future water replacement actions would incorporate measures to reduce or avoid potential adverse effects on listed species or their critical habitat. Replacement of water in Mineral Creek could have a beneficial effect on Gila chub, if present, by maintaining or improving the quality and quantity of available habitat within Mineral Creek.

# Project Components with No Effect on the Species from Operations and Maintenance

No effects on Gila chub would be expected as a result of operations and maintenance at the following project components: Underground Mining and Subsidence, East Plant Site, Ore Conveyor/Infrastructure Corridor, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV Line Collocated with the Tailings Pipeline Corridor, discussed above). There is no habitat for Gila chub within these areas, or the species is not known to occur, or both.

# **CLOSURE AND RECLAMATION**

#### Water Supply Facilities and Pipelines Closure and Reclamation

Pipelines and water supply facilities would be decommissioned and removed, with the disturbed areas being recontoured and reseeded. However, the pipelines will use a trenchless crossing and no ground disturbance would occur within the ordinary high water mark of Mineral Creek. Thus, reclamation of the pipeline would occur outside of suitable Gila chub habitat. If Gila chub are present in Mineral Creek at time of closure and reclamation, individuals may experience behavior changes by avoiding areas with increased sedimentation from additional vehicle crossing Mineral Creek or individuals avoiding areas

with increased noise or vibration, similar to those impact described in the Tailings Pipeline Corridor subsection under the Construction heading.

Water quality could decrease as a result of sedimentation or equipment spills within Mineral Creek. However, as described in the Tailings Pipeline Corridor subsection under the Construction heading, best management practices, including implementation of a SWPPP and Weed Management Plan that would require the use of certified weed-free seed, would be employed to reduce, minimize, and possibly eliminate the likelihood of these impacts. Vehicles may produce sedimentation if they cross a wetted portion of Mineral Creek. This impact would be temporary and occur only for a short distance downstream of the vehicle crossing.

Recontouring and reseeding within the corridor could increase the potential for the establishment and spread of noxious weeds in the vicinity. As described in the Tailings Pipeline Corridor subsection under the Construction heading, noxious weeds could increase the potential for fire along drainages, which in turn could cause an increase in silting and sedimentation within Mineral Creek, depending on the extent and severity of the burned area. Best management practices, including implementation of a SWPPP and Weed Management Plan that would require the use of certified weed-free seed, would be used to reduce, minimize, and possibly eliminate the potential for noxious weed establishment or spread within the project area.

These effects on Gila chub species would be insignificant and discountable because effects to Gila chub as a result of this project would be minor, temporary, and localized. No ground disturbing activity would occur in Mineral Creek, where this species occurs. The use of BMPs and implementation of the SWPP and Weed Management plan would reduce potential impacts to this species and its habitat in Mineral Creek.

#### Power Transmission Facilities Closure and Reclamation

It is unknown at present whether the transmission lines will be removed, or a post-mining use found.

If the transmission lines are not decommissioned and removed, impacts would continue to occur from maintenance and operations of these power lines as described in the Pipeline Corridor and Collocated 115-kV Transmission Line subsection under the Operations and Maintenance heading. If transmission lines and substations are decommissioned and removed, the disturbed areas would be recontoured and reseeded. None of the new power poles would occur within the ordinary high water mark for Mineral Creek, and reclamation activities would not occur within Mineral Creek where this species occurs. If Gila chub are present in Mineral Creek at time of closure and reclamation, individuals could experience impacts similar to those described in the Pipeline Corridor and Collocated 115-kV Transmission Line subsection under the Construction heading. Impacts would be reduced, minimized, and possibly eliminated through best management practices, including implementation of a SWPPP and Weed Management Plan that would require the use of certified weed-free seed; and Gila chub have a low likelihood of occurring within Mineral Creek. Thus, effects on any individual Gila chub would be insignificant and discountable.

# Project Components with No Effect on the Species from Closure and Reclamation

No effects on Gila chub would be expected as a result of closure and reclamation at the following project components: Underground Mining and Subsidence, East Plant Site, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility. There is no habitat for Gila chub within these areas, or the species is not known to occur, or both.

# **CLEAN WATER ACT SECTION 404 PERMIT**

#### Impacts to Waters of the U.S.

Impacts to waters of the U.S. within the tailings storage facility would have no effect on Gila chub, because there is no suitable habitat within this project component area, and they do not occur.

Impacts to waters of the U.S. as a result of construction of the pipeline/power line corridor could have adverse effects on Gila chub. The impacts associated with temporary impacts at Mineral Creek are discussed under the Tailings Pipeline Corridor subsection under the Construction heading. Additional impacts to individual Gila chub could occur as a result to impacts to ephemeral waters of the U.S. that flow into Mineral Creek. If these impacted ephemeral drainages flowed into Mineral Creek, impacts could include increased sedimentation or a temporary change in stormwater flow quantity or timing. However, the project will employ best management practices, including implementation of a SWPPP and Weed Management Plan, to reduce, minimize, and possibly eliminate these impacts. Thus, any impacts to Gila chub would be insignificant and discountable.

#### **Compensatory Mitigation**

Gila chub critical habitat does not occur within any of the CWA Compensatory Mitigation parcels, and no effect is expected to Gila chub critical habitat as a result of any impacts occurring within any of the CWA Compensatory Mitigation parcels.

#### OTHER CONSEQUENCES

Interrelated and interdependent actions, e.g., power lines, pipelines, etc., were all included in the proposed action; thus, there are no additional interrelated or interdependent actions that would cause additional effects. Potential cumulative effects on Gila chub would include the effects of all future non-Federal actions. As the action area and known habitat for the species is primarily found on lands managed by the TNF it is anticipated that future activities within the action area that could impact the species would be subject to Section 7 consultation under the ESA.

The only cumulative action identified is a wildlife water source improvements project proposed by AGFD. This proposed AGFD project involves catchments on both TNF-administered lands and on private lands. Those catchments on the TNF would involve a separate environmental analysis. For those on private lands, if the AGFD is using state funds or Federal grant monies for the project, then an environmental analysis will also be completed. However, none of the catchments proposed for improvement are near Mineral Creek and as such, no additional cumulative effects on Gila chub would occur.

There is the potential for impacts related to increased access within the project area and action area from project-related roadways. However, these potential impacts would be avoided through measures to limit access to administrative use only.

# 6.2.3 Determination of Effects

The proposed project may affect, but is not likely to adversely affect, the Mineral Creek population of the Gila chub species for the following reasons:

• Effects would be temporary, minor and be restricted to a small portion of the total available habitat for Gila chub within Mineral Creek.

- Mineral Creek, the only location within the action area where this species is thought to possibly occur, is not expected to experience reductions in surface water or groundwater; thus, the overall amount and extent of habitat is expected to remain the same.
- Best management practices, including implementation of a SWPPP and Weed Management Plan that would require the use of certified weed-free seed during construction, maintenance and operations, and reclamation activities, would reduce, minimize, and possibly eliminate adverse effects from sediment, contaminants, or establishment or spread of noxious weeds.
- Gila chub has not been observed in Mineral Creek since the year 2000; however, the species may possibly persist at very low population numbers. Individuals have a low likelihood of being impacted by any portion of the proposed action, particularly following the design modification of the corridor footprint to avoid the ordinary high-water mark of Mineral Creek, including designated critical habitat

# 6.3 Gila Chub Designated Critical Habitat

# 6.3.1 Status in Action Area

Designated critical habitat for the Gila chub was finalized in 2005 and is present within the project and action areas and includes Area 2: Middle Gila River Area, which includes Mineral Creek to its confluence with Devil's Canyon (USFWS 2005). Within the project area, there are 14.37 acres of designated critical habitat for the Gila chub and a total of 410.75 acres in the action area. The status classification for the area is "unstable" and "threatened," which is defined as "rare, have limited distribution, predatory or competitive nonnatives are present, or the habitat area in 2000 (figures 17-1 and 17-2). Threats identified to this critical habitat area include fire, grazing, and nonnative species. At the time of the critical habitat designation in 2005, the area was considered occupied and expanded the known range of the species in an area previously considered unoccupied in this region. The purpose of the inclusion of this critical habitat area was to possibly expand future populations of the species within this region of the Middle Gila River Area (USFWS 2005).

Mineral Creek is located to the immediate east of Devil's Canyon and discharges into the reservoir of Big Box Dam. Big Box Dam was constructed to divert flows from Devil's Canyon and Mineral Creek around the Ray Mine and into the Gila River.

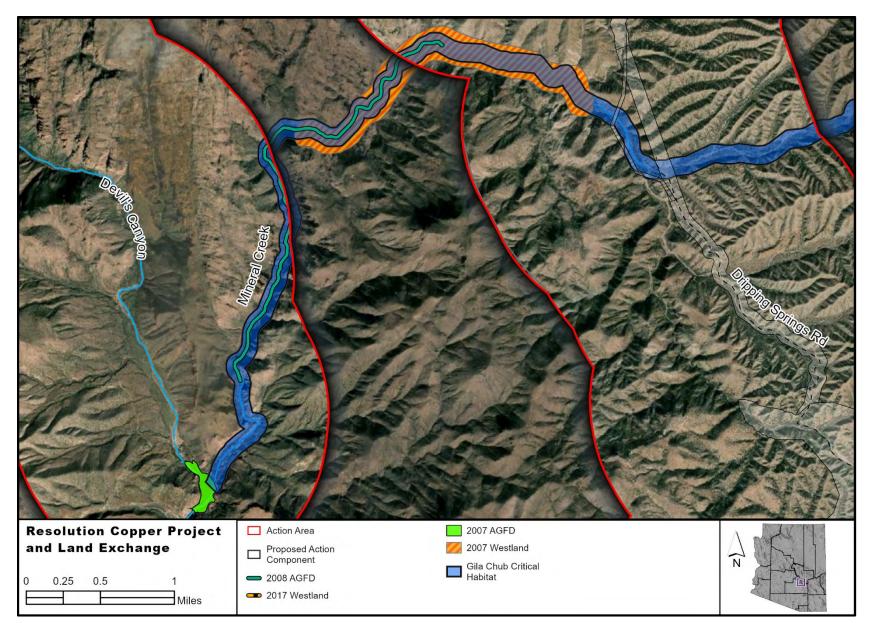


Figure 17-1. Gila chub surveys in the action area and vicinity (1 of 2)

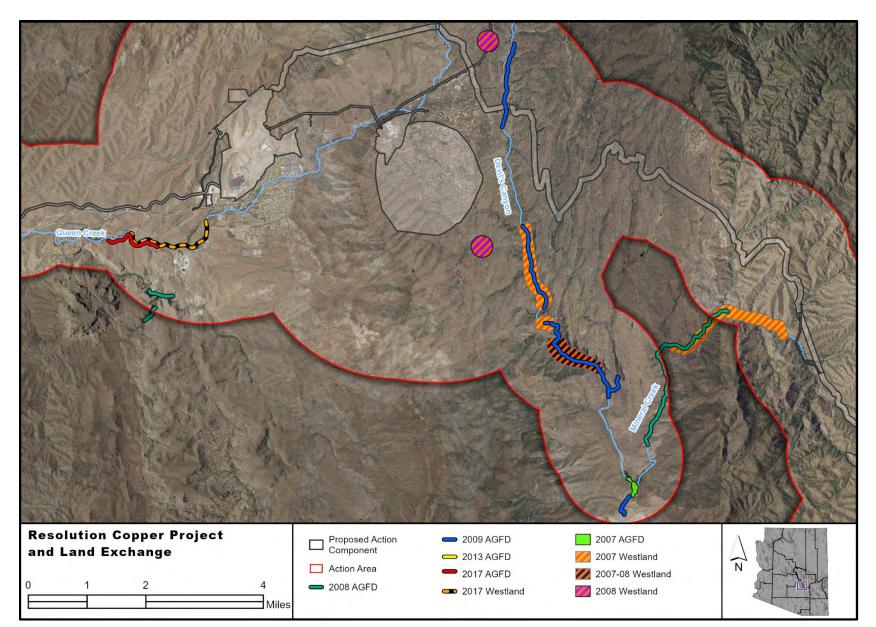


Figure 17-2. Gila chub surveys in the action area and vicinity (2 of 2)

Primary constituent elements (PCEs) associated with Gila chub designated critical habitat (USFWS 2005) include:

- Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies, all found in headwaters, springs, and cienegas, generally of smaller tributaries.
- Water temperatures for spawning ranging from 17 to 24 degrees Celsius (°C) (62.6–75.2 degrees Fahrenheit [°F]), and seasonally appropriate temperatures for all life stages (varying from approximately 10°C to 30°C [50°F–86°F]).
- Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (e.g., ranging from 6.5 to 9.5), dissolved oxygen (e.g., ranging from 3.0 to 10.0 parts per million) and conductivity (e.g., 100 to 1,000 millimhos).
- Food base consisting of invertebrates (e.g., aquatic and terrestrial insects) and aquatic plants (e.g., diatoms and filamentous green algae).
- Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, a high degree of streambank stability, and a healthy, intact riparian vegetation community.
- Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives are kept at a level that allows Gila chub to continue to survive and reproduce.
- Streams that maintain a natural flow pattern including periodic flooding.

At the time of designation, the Middle Gila River Area designated critical habitat contained the following PCEs: perennial pools; the necessary vegetation that provides cover; and adequate water quality (USFWS 2005). However, the survey reports noted in this BA also indicate that all PCEs are present in Mineral Creek except being devoid of nonnatives. The survey reports indicated that green sunfish are present in abundance (Robinson et al. 2010). The Draft Recovery Plan for the Gila chub indicates that the recovery goals for this portion of designated critical habitat is to protect all extant populations of Gila chub and repatriate them into new streams (USFWS 2015b).

# 6.3.2 Analysis of Effects

# CONSTRUCTION

This section outlines the analysis of effects on Gila chub designated critical habitat from each of the proposed action components. For each of the phases (Construction, Operations and Maintenance, and Closure and Reclamation), only components that may have effects on critical habitat or that need explanation to rule out effects are discussed individually. The remaining components are grouped together under a no effects subheading because they do not contain critical habitat, and no direct or indirect effects are expected as a result of project activities.

#### Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

Approximately 14.37 acres of Gila chub critical habitat lie within the tailings pipeline corridor (representing 3.5 percent of the total Gila chub critical habitat within the action area). Of that 14.37 acres, 7.65 acres occurs within the trenchless Mineral Creek crossing, 6.15 acres occurs within the transmission line, and 0.57 acre occurs within the access roads. However, even though these acres are included in the

project area, they are not included within the disturbance area because no direct ground disturbance will occur within Mineral Creek or critical habitat during construction. As described in Section 3, the pipeline will use a trenchless crossing, the power poles will all be located outside critical habitat and Mineral Creek, and the existing road crossing at Mineral Creek will be used.

Construction within the Mineral Creek watershed has the potential to affect sedimentation for a portion of the Creek, i.e., as included in the action area. In addition, the increased use of the existing Mineral Creek crossing during construction would increase the potential for sedimentation immediately downstream of the crossing. However, use of BMPs from the SWPPP would reduce, minimize, and possibly eliminate effects from sedimentation within this portion of Mineral Creek within the action area. Increased sedimentation from increased vehicle crossing during construction would have a minor, temporary impact on Gila chub critical habitat PCEs including water quality or availability of prey. However, these effects would be confined to the immediate area of the crossing for a short duration of time and would include a very small portion of the total 14.37-acre area of Gila chub designated critical habitat in the tailings corridor, access roads, and, transmission line within this portion of Mineral Creek.

These changes would be restricted locally to the area being disturbed and would occur for a short period of time. Because impacts are not expected to the surface flow or groundwater in Mineral Creek, the PCEs of perennial pools, water temperature, and lack of nonnative species would not be expected to be impacted.

Impacts to PCEs from the spread of noxious weeds, which could increase the prevalence in fire in the Mineral Creek watershed, would be reduced, minimized, or eliminated through the implementation of the Weed Management Plan that would require the use of certified weed-free seed.

## Anticipated Surface Water Impacts

The subsidence area is anticipated to impact Queen Creek and Devil's Canyon by reducing surface flows but would have no impact on surface flows at Mineral Creek, which is the only location within the action area where Gila chub critical habitat occurs. Surface flows in Devil's Canyon at its confluence with Mineral Creek would be reduced; however, the effects would not be felt upstream in Mineral Creek within Gila chub designated habitat. Thus, surface water flow reduction from construction of the subsidence create would not affect Gila chub critical habitat.

Creation of the Skunk Camp tailings storage facility would result in loss of stormwater runoff to the Dripping Spring Wash. However, no Gila chub critical habitat occurs in Dripping Spring Wash. Thus, there would be no effects on Gila chub designated critical habitat from underground mine construction.

# Project Components with No Effect on Designated Critical habitat from Construction

No effects on Gila chub designated critical habitat would be expected as a result of construction at the following project components: Underground Mining and Subsidence, East Plant Site, Ore Conveyor/ Infrastructure Corridor, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV transmission line collocated with the tailings pipeline corridor, which is discussed above). There is no Gila chub designated critical habitat within these areas, and no direct or indirect effects are expected as a result of project activities.

### OPERATIONS AND MAINTENANCE

#### Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

Impacts to Gila chub critical habitat would not be expected as a result of routine operation of the tailings pipelines or collocated transmission line. Maintenance activities would not be expected to impact PCEs or any additional acres of critical habitat. The pipeline would be inspected at intervals throughout the year and vegetation management activities would occur below the powerlines would occur as described in Section 3 of this document. Impacts to Gila chub critical habitat PCEs from these activities would be limited to a minor, temporary increase in sedimentation from vehicular crossings which could impact PCEs including water quality or prey availability for a short time directly downstream of the Mineral Creek crossing. These impacts would be minor and temporary.

In the event that maintenance includes excavation in order to repair a pipeline, impacts would be similar to those described in the Tailings Pipeline Corridor subsection under the Construction heading, but would be expected to be of shorter duration and likely less severe. No additional acres of Gila chub critical habitat would be impacted. PCEs, including water quality or availability of prey, could be impacted from the increased sedimentation within the action area. However, these impacts would temporary, minor, and localized, and would be reduced, minimized, or eliminated by using BMPs as described in the SWPPP.

#### Anticipated Groundwater and Surface Water Impacts

There are no anticipated changes to groundwater or surface water quantity within Mineral Creek, the location of Gila chub critical habitat within the action area. Thus, groundwater drawdown or surface water reduction would have no effect on Gila chub critical habitat or its PCEs.

#### Project Components with No Effect on Designated Critical habitat from Operations and Maintenance

No effects on Gila chub designated critical habitat would be expected as a result of operations and maintenance at the following project components: Underground Mining and Subsidence, East Plant Site, Ore Conveyor/Infrastructure Corridor, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV transmission line collocated with the tailings pipeline corridor, which is discussed above). There is no Gila chub designated critical habitat within these areas, and no direct or indirect effects are expected as a result of project activities.

#### CLOSURE AND RECLAMATION

#### Water Supply Facilities and Pipelines Closure and Reclamation

Pipelines and water supply facilities would be decommissioned and removed, with the disturbed areas being recontoured and reseeded. Water quality could be negatively impacted during pipeline removal and recontouring, if equipment or vehicles cause sedimentation or spills within Mineral Creek. All of these impacts to PCEs would be temporary and would cease as soon as reclamation activities were completed. Best management practices, including implementation of an SWPPP and Weed Management Plan that would require the use of certified weed-free seed, would also be implemented to reduce, minimize, and possibly eliminate the potential for sedimentation or the establishment or spread of invasive weeds species.

#### Power Transmission Facilities Closure and Reclamation

It is unknown at present whether the transmission lines will be removed, or a post-mining use found.

If the transmission lines are not decommissioned and removed, further impacts to Gila chub critical habitat and its PCEs would not be anticipated. If transmission lines and substations are decommissioned and removed, the disturbed areas would be recontoured and reseeded. This could cause similar impacts to Gila chub critical habitat at its PCEs as described above (for the small portion of the collocated transmission line) in the Water Supply Facilities and Pipelines Closure and Reclamation subsection.

# Project Components with No Effect on Designated Critical habitat from Closure and Reclamation

No effects on Gila chub designated critical habitat would be expected as a result of closure and reclamation at the following project components: Underground Mining and Subsidence, East Plant Site, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV transmission line collocated with the tailings pipeline corridor, which is discussed above). There is no Gila chub designated critical habitat within these areas, and no direct or indirect effects are expected as a result of project activities.

### **CLEAN WATER ACT SECTION 404 PERMIT**

#### Impacts to Waters of the U.S.

Impacts to waters of the U.S. within the tailings storage facility would have no effect on Gila chub critical habitat, because no critical habitat occurs within this project component area.

Impacts to waters of the U.S. as a result of construction of the pipeline/power line corridor, could have adverse effects on Gila chub critical habitat and its PCEs. The effects on critical habitat associated with temporary impacts at Mineral Creek are discussed under the Tailings Pipeline Corridor subsection under the Construction heading. These impacts would be temporary and minor.

Additional impacts to Gila chub critical habitat could occur as a result to impacts to ephemeral waters of the U.S. that flow into Mineral Creek. If these impacted ephemeral drainages flowed into Mineral Creek, impacts could include increased sedimentation or a temporary change in stormwater flow quantity or timing, which would be minor, temporary effects on PCEs within critical habitat. However, the project will employ best management practices, including implementation of a SWPPP and Weed Management Plan that would require the use of certified weed-free seed, to reduce, minimize, and possibly eliminate these impacts.

#### **Compensatory Mitigation**

Gila chub critical habitat does not occur within any of the CWA Compensatory Mitigation parcels, and no effect is expected to Gila chub critical habitat as a result of any impacts occurring within any of the CWA Compensatory Mitigation parcels.

#### OTHER CONSEQUENCES

Interrelated and interdependent actions, e.g., power lines, pipelines etc., were all included in the proposed action; thus, there are no additional interrelated or interdependent actions that would cause additional

effects. Potential cumulative effects on Gila chub designated critical habitat would include the effects of all future non-Federal actions. As the action area and known habitat for the species is primarily found on lands managed by the TNF it is anticipated that future activities within the action area that could impact the species would be subject to Section 7 consultation under the ESA.

The only cumulative action identified is a wildlife water source improvements project proposed by AGFD. This proposed AGFD project involves catchments on both TNF-administered lands and on private lands. Those catchments on the TNF would involve a separate environmental analysis. For those on private lands, if the AGFD is using state funds or Federal grant monies for the project, then an environmental analysis will also be completed. However, none of the catchments proposed for improvement are near Mineral Creek and as such, no additional cumulative effects on Gila chub critical habitat would occur.

There is the potential for impacts related to increased access within the project area and action area from project-related roadways. However, these potential impacts would be avoided through measures to limit access to administrative use only.

# 6.3.3 Determination of Effects

The proposed project may affect, but is not likely to adversely affect the Mineral Creek Unit of Gila chub designated critical habitat and its PCEs for the following reasons:

- Through the use of best management practices, including implementation of a SWPPP during construction, and as identified in the water quality analysis, no water quality effects, i.e., sediment or contaminant, are anticipated.
- Water quantity effects, i.e., 3.5 percent average reduction in flows, would only occur at the confluence of Mineral Creek with Devil's Canyon downstream of Gila chub critical habitat.
- The trenchless pipeline occurs within 7.65 acres of critical habitat, the transmission line occurs within 6.15 acres of critical habitat, and the access roads near Mineral Creek occur within 0.57 acres of critical habitat (3.5 percent of the total Gila chub critical habitat that occurs within the analysis area). However, little direct ground disturbance will occur within critical habitat as most project components would be placed outside the ordinary high water mark of Mineral Creek and outside designated critical habitat. The pipeline will use a trenchless to go beneath Mineral Creek and critical habitat, the new power poles will be constructed outside of Mineral Creek and critical habitat though lines will pass overhead, and the existing Mineral Creek crossing will be used. New access road spurs would be created to allow access from existing roads to newly constructed power poles.
- With measures in place to avoid impacts (including a Weed Management Plan), the proposed action would not contribute effects from the threats (i.e., fire, grazing, and nonnative weedy species) to this area of Gila chub critical habitat.
- No effects on Gila chub designated critical habitat are expected to occur due to operations of the proposed action; however, maintenance activities could include minor, temporary, and localized impacts to PCEs arising from increased sedimentation downstream from use of the access road.

# 6.4 Southwestern Willow Flycatcher

# 6.4.1 Species Status in Action Area

The southwestern willow flycatcher was listed as endangered in 1995 with critical habitat designated in 2013 (USFWS 2013a). Willow flycatchers of undetermined subspecies have been documented in the action area associated with the mine components. These detections include migratory and foraging observations, but no breeding behaviors were observed. Riparian habitat that may be suitable for use as migratory or stopover habitat by the species in the action area is located in narrow stringers along Devil's Canyon, Mineral Creek, Queen Creek, and Bored Spring. These narrow stringers consist of a mix of riparian vegetation, including Fremont cottonwood and Goodding's willow. Bored Spring has infrastructure improvements and consists of an approximately  $65 \times 25$ -foot depression with a cattle trough downstream (WestLand and Montgomery and Associates Inc. [Montgomery] 2018). Site visits from 2002 to 2017 indicated that this site does not always contain water and often has little flow; however, a cottonwood occurs at the site and a string on scattered riparian vegetation occurs downstream for approximately 500 feet in the vicinity of Bored Spring, including Goodding's willow, velvet mesquite, tamarisk, and African sumac (Rhus lancea) (WestLand and Montgomery 2018). TNF biologist Mark Taylor noted from past site visits that water is not always present at the site and the riparian vegetation in the spring vicinity is sparse and does not contain riparian vegetation density or a multi-canopy structure that would indicate habitat suitability for this species. In addition, Bored Spring is located directly adjacent to, and part of, a minerals material Arizona Department of Transportation (ADOT) storage facility that is currently in use. See section 4.2.7 for a further description of riparian habitat. Habitat in these areas is not likely to be used by the species for breeding; however, these areas would be suitable and may be used for migratory or stopover activities by the species. In total, approximately 3.5 acres of riparian habitat occur within the footprint of the project components; 2.1 of these acres occur in areas where there would be no ground disturbance, 27.9 acres within the proposed mitigation areas (see below), and an additional 1,747.5 acres in the action area (see figures 13-1 through 13-3).

Hidden, McGinnel, McGinnel Mine, Walker, Bitter, and Kane Springs all have infrastructure improvements to some degree and host relatively little riparian vegetation, although standing water and herbaceous and wetland vegetation may be present. These areas are unlikely to be migratory or stopover habitat for the species due to the very limited riparian vegetation present.

Two official surveys for the southwestern willow flycatcher have been conducted by WestLand within the project and action areas (figure 18):

- 2017 Southwestern Willow Flycatcher Survey for the Resolution Copper Project (WestLand 2017b)
  - This survey was conducted during the 2017 survey season by qualified biologists using the currently accepted 2010 (Sogge et al. 2010) protocol, and data validation was conducted by staff from TNF and SWCA. The survey area included the Whitlow Ranch Dam survey area, located in the Whitlow Ranch Flood Control Basin; the Boyce Thompson Arboretum transect, located along Queen Creek, upstream of the arboretum and downstream of the Superior Wastewater Treatment Plant; the Arnett Creek transect, located southwest of the Haborlite perlite mine; the Queen Creek transect, located along Queen Creek upstream of Superior; and the Mineral Creek North and South transects, located along Mineral Creek on State Trust Lands. One willow flycatcher was detected during these 2017 surveys, along the Boyce Thompson Arboretum transect on June 3, 2017. This date is too early in the season for the individual to be considered a resident, and WestLand concluded that no breeding territories were identified within the survey area during the 2017 season.

- 2018 Southwestern Willow Flycatcher Survey for the Resolution Copper Project (WestLand 2018b)
  - This survey was conducted during the 2018 survey season by qualified biologists using the currently accepted 2010 (Sogge et al. 2010) protocol, and data validation was conducted by staff from TNF and SWCA. The survey area included the Whitlow Ranch Dam survey area, located in the Whitlow Ranch Flood Control Basin; the Boyce Thompson Arboretum transect, located along Queen Creek, upstream of the arboretum and downstream of the Superior Wastewater Treatment Plant; the Arnett Creek transect, located southwest of the Haborlite perlite mine; the Queen Creek transect, located along Queen Creek upstream of Superior; and the Mineral Creek North and South transects, located along Mineral Creek on State Trust Lands. Two willow flycatchers were detected during these surveys, one along the Boyce Thompson Arboretum transect and one in the Whitlow Ranch Dam survey area. These willow flycatchers were detected prior to the non-migrant period; therefore, these detections are not considered to be adult residents with a territory (i.e., southwestern willow flycatchers).

Southwestern willow flycatcher surveys were also completed near Whitlow Ranch Dam in earlier years:

- Southwestern Willow Flycatcher Final Survey and Monitoring Report (Ellis et al. 2008), and Southwestern Willow Flycatcher 2005 Survey and Nest Monitoring Report (English et al. 2006)
  - The Whitlow Dam site was surveyed in 1994, 1996, 1998, 2005, and 2006 (Ellis et al. 2008). Willow flycatcher detections were recorded only in 2005. The site was visited six times in 2005 between May 25 and July 6, and one willow flycatcher was recorded on each of three consecutive visits from June 3 to 19 (English et al. 2006). These detections constituted one territorial southwestern willow flycatcher.

Other surveys that have also been conducted that could also help identify where southwestern willow flycatchers could occur within the project and action areas include:

- Raptor Survey and 2008 Bird Census (WestLand 2009c)
  - In 2008, WestLand performed winter and breeding bird surveys covering 50 survey points in nine different biotic community types. The three winter surveys took place from January to February and the three breeding season surveys took place from late April to early July. No southwestern willow flycatchers were recorded during these surveys.
- 2009 Bird Census, Resolution Copper Mine Study Area (WestLand 2010b)
  - Twenty-five survey points were created in 2009 to cover portions of the Resolution parcel that were not surveyed in 2008. The survey points were located in manzanita chaparral, scrub oak chaparral, and Emory oak woodland habitats. The points were surveyed three times about 2 weeks apart. The first survey period was May 26 through 28; the second survey period was June 8 through 10; and the final survey period was June 25 through 27, 2009. Fifty-three bird species were recorded during these surveys; however, no southwestern willow flycatchers were recorded, only a single *Empidonax* sp.
- 2012 survey of Near West Analysis Area (WestLand 2014b)
  - In November and December 2012, WestLand biologists conducted a field reconnaissance of the Near West Analysis Area to evaluate the potential for special-status species. Based on their observations, WestLand concluded that the southwestern willow flycatcher has limited potential to occur within the analysis area. Their basis for this determination included that the analysis area does not contain suitable habitat; there are no extensive willow and cottonwood

riparian habitats with perennial water. WestLand stated the southwestern willow flycatcher is not likely to be breeding or foraging in the vegetation of the analysis area, but they may occur as transients during migration.

- 2013 breeding bird survey of Near West Analysis Area (WestLand 2013d)
  - WestLand conducted two sets of surveys for breeding birds in the Near West Analysis Area on May 13 and 14, 2013, and June 3 through 5, 2013. Thirty survey points were identified to conduct point count surveys and were spread out across multiple habitat types. In total, 41 avian species were documented during the May surveys, and 32 avian species were documented during the June surveys. In addition, WestLand performed a site reconnaissance in April that documented 44 avian species. No southwestern willow flycatchers were documented during the surveys or the reconnaissance.
- 2018 survey for suitable habitat of Skunk Camp (WestLand 2018d)
  - In 2018, WestLand conducted a biological evaluation of the Skunk Camp tailings storage facility in order to determine the potential of occurrence of special-status species and/or designated or proposed critical habitat in the proposed project area. WestLand stated that the southwestern willow flycatcher has no potential to occur within the project area.
- 2019 survey for suitable habitat of Skunk Camp and proposed North and South corridors (WestLand 2019b)
  - In 2019, WestLand conducted a biological evaluation of the Skunk Camp tailings storage facility and the proposed North and South corridors in order to determine the occurrence or potential occurrence of special-status species and/or designated or proposed critical habitat in the proposed project area. WestLand states that the southwestern willow flycatcher is unlikely to occur in Skunk Camp North and is potentially possible to occur in Skunk Camp South. For Skunk Creek South, WestLand goes on to say that the project area is within the geographical and elevational range of the species and contains potentially suitable habitat. The species was not detected during surveys of Mineral Creek, which led WestLand to believe the species is not expected to occur except infrequently during migration.

The southwestern willow flycatcher in this region mainly uses riparian habitat on the mainstem Gila and San Pedro Rivers for breeding and migratory activities; thus, the project footprint and associated action area would not be the main areas used by this species in this portion of their range.

In total, four willow flycatchers have been recorded within the action area that is associated with the project components. Two willow flycatchers were detected along the Boyce Thompson Arboretum transect, one in 2017 and one in 2018. Another willow flycatcher was detected in the Whitlow Ranch Dam survey area in 2018. These three individuals were observed too early in the survey season to be considered to be adult, breeding residents (i.e., southwestern willow flycatchers) (WestLand 2017b, 2018b). In 2005, a single, territorial southwestern willow flycatcher was detected near Whitlow Ranch Dam, but no evidence of a flycatcher pair was detected (English et al. 2006). During surveys in other years, no additional detections were made. Non-protocol surveys within the project and action areas in 2008, 2009, 2012, and 2013 did not detect any southwestern willow flycatchers (WestLand 2009c, 2010b, 2013d, 2014b). Thus, based on the available survey data, although surveys did not cover the entire area of suitable habitat, the southwestern willow flycatcher is considered to be an occasional migrant in the project components and most of the associated action areas and may occur infrequently as territorial individuals within specific portions of the action area. No project-related impacts are expected to occur to Queen Creek at Boyce Thompson Arboretum.

There is no designated critical habitat for the southwestern willow flycatcher in the area covered by the project components and associated action area. The nearest designated critical habitat is along the Gila River over 11 miles south of the project area (see figure 15-1). Designated critical habitat occurs within some of the mitigation areas and is addressed in section 6.7.

## **MITIGATION AREAS**

Several areas are being considered for off-site compensatory mitigation under Section 404 of the CWA. Together, they contain 172 acres of mapped riparian habitat.

- MAR-5 Wetland/Olberg Road. This area does not currently contain any breeding habitat for the southwestern willow flycatcher but could be used as migratory/foraging/stopover habitat.
- Queen Creek. The stretch of Queen Creek immediately downstream from the town of Superior provides potential migratory/stopover/foraging habitat for the southwestern willow flycatcher. Surveys of this reach in 2017 and 2018 yielded two willow flycatcher detections, which were presumed to be migrants (WestLand 2018b).
- H&E Ranch. The H&E Ranch is along the Lower San Pedro River, which is an important breeding area for the southwestern willow flycatcher (AGFD 2020a; USFWS 2013a) and provides migratory stopover locations. This area is within designated critical habitat and contains 16 acres of riparian habitat.

Resolution Copper Project and Land Exchange	Component	<ul> <li>2017 Detection</li> <li>2017 Westland</li> </ul>	And
0 1.25 2.5 5	<ul><li>Action Area</li><li>2019 Detections</li></ul>	2019 Westland	
Miles			A A A A A A A A A A A A A A A A A A A

Figure 18. Southwestern willow flycatcher surveys in the project and action areas

# 6.4.2 *Analysis of Effects*

This section outlines the analysis of effects on the southwestern willow flycatcher species from each of the proposed action components. For each of the phases (Construction, Operations and Maintenance, and Closure and Reclamation), only components that may have effects or that need explanation to rule out effects are discussed. The remaining components are grouped together under a no effects subheading because they do not contain habitat for the species.

## CONSTRUCTION

## **Underground Mining and Subsidence**

Two springs occur within the footprint of the subsidence area: the Grotto and Rancho Rio spring. The Grotto does not support riparian woodland vegetation, but Rancho Rio spring contains water and has a small amount of riparian vegetation consisting mostly of a narrow band of scattered trees, including tamarisk, Fremont cottonwood, and willows directly adjacent to the spring and for a small distance downstream in a series of bedrock tinaja pools approximately 145 meters below the spring (WestLand 2018b; WestLand and Montgomery 2018). No southwestern willow flycatchers were observed at either of these locations during previous surveys; however, Rancho Rio spring contains suitable flycatcher migratory/stopover/foraging habitat. Potential direct impacts to the southwestern willow flycatcher from the proposed action would include a permanent loss of a small amount of riparian habitat directly surrounding Rancho Rio spring. These patches of riparian habitat have not been mapped in the field. Because these patches of riparian habitat are so small, they do not show up as occurring within the riparian vegetation community using AGFD GIS data (see section 4.2) and losses of migratory/stopover/foraging habitat in these areas cannot be quantified.

Underground construction would continue throughout the life of the mine. Potential impacts from surface water and groundwater reductions associated with mine construction are discussed below.

## East Plant Site

No impacts from habitat loss are expected to the southwestern willow flycatcher as a result of construction at the East Plant Site as this location contains no suitable riparian habitat for the species.

The edge of the East Plant Site footprint is approximately 0.1 mile from a portion of Queen Creek with narrow stringers of riparian vegetation that could provide migratory/stopover/foraging habitat for southwestern willow flycatchers. This portion of Queen Creek parallels and is immediately adjacent to U.S. 60, and current noise levels along this section of Queen Creek are likely high. Flycatchers may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any flycatchers in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the East Plant Site could occur to transient flycatchers along Queen Creek, these effects are expected to be insignificant and discountable.

## West Plant Site

No impacts from habitat loss are expected to the southwestern willow flycatcher as a result of construction at the West Plant Site as this location contains no suitable riparian habitat for southwestern willow flycatcher.

Queen Creek is approximately 0.1 mile southeast of the West Plant Site project component footprint. Portions of Queen Creek contain suitable migratory/stopover/foraging flycatcher habitat, and an

individual willow flycatcher was observed in Queen Creek in 2017 and 2018 (see figure 18) (WestLand 2017b), approximately 1.2 miles southwest of the West Plant Site. This portion of Queen Creek runs between West Main Street and U.S. 60 and is surrounded by existing development; thus, existing noise levels are likely extremely high. Willow flycatchers may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any willow flycatchers in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the West Plant Site could occur to migratory southwestern willow flycatchers along Queen Creek, these effects are expected to be insignificant and discountable.

The realignment and improvement of Silver King Mine Road will result in the removal mostly of upland and xeric riparian vegetation and would not result in the loss of migratory/stopover/foraging habitat for southwestern willow flycatcher. Silver King Mine Road is distant from Queen Creek and thus no noise impacts are expected to southwestern willow flycatchers as a result of the road realignment and improvement.

## Skunk Camp Tailings Storage Facility

Construction in the Skunk Camp tailings storage facility is expected to be ongoing for the life of the project, with the facility expanding over time, and tailings remaining in the area in perpetuity. Although the specific timing for these construction impacts is not known, for purposes of this document it is assumed that the entire Skunk Camp tailings storage facility would be impacted.

Suitable riparian habitat for the southwestern willow flycatcher does not occur at the Skunk Camp tailings storage facility. Surveys completed by WestLand (2018d, 2019b) determined that the drainages within the Skunk Camp tailings storage facility were ephemeral and WestLand did not consider this area to have suitable flycatcher habitat. Although there were several tanks within the footprint of the Skunk Camp tailings storage facility, none had sufficient riparian woodland to support migratory, stopover, or foraging habitat for flycatchers. Photographs of the tanks in the area showed sparse vegetation to mesquite-dominated vegetation immediately surrounding the tank (WestLand 2019b).

In addition, several springs are within the Skunk Camp tailings storage facility area. Haley Spring and Looney Spring are outside the Skunk Camp tailings storage facility but within the proposed fence. Both Haley Spring and Looney Spring support limited riparian woodland tree species, including Fremont cottonwood and Goodding's willow; however, these trees were generally limited to immediately surrounding the spring site or a narrow stringer immediately downgradient (WestLand 2019b). For purposes of this document, the entire footprint of the tailings storage facility fence line was assumed to be impacted; however, actual disturbance would likely be less than 100 percent. Because these patches of riparian habitat are so small, they do not show up as occurring within the riparian vegetation community using AGFD GIS data (see section 4.2), and losses of migratory/stopover/foraging habitat in these areas cannot be quantified. Because these areas contain extremely limited riparian vegetation and are surrounded by ephemeral drainages with unsuitable habitat, flycatchers are not likely to use these areas. Thus, construction activity at the Skunk Camp tailings storage facility is likely to have no effect on the southwestern willow flycatcher.

## **Tailings Pipeline Corridor**

The tailings pipeline corridor (see figure 2) would cross Queen Creek and potential migratory/stopover habitat for the southwestern willow flycatcher in one location. Queen Creek would be crossed at a location that does not have perennial flow and would utilize a pipe bridge or similar structure to span Queen Creek. No disturbance would take place to the streambed or habitat along the streams in this location. Potential construction related impacts to the southwestern willow flycatcher from the crossing of

Queen Creek would be limited to those from noise during construction should that construction occur between May 1 and September 15.

Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the tailings pipeline could occur to transient flycatchers along Queen Creek, these effects are expected to unlikely to occur and would be insignificant and discountable.

#### Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

No riparian habitat along Mineral Creek or Devil's Canyon would be removed or altered during construction of the proposed collocated tailings pipeline corridor and collocated 115-kV transmission line, and the use of best management practices during construction would reduce, minimize, and possibly eliminate any potential effects on riparian vegetation from sedimentation. The tailings pipeline corridor crosses several other areas that may contain suitable migratory/stopover/foraging habitat for southwestern willow flycatcher, including along Lyons Fork, Rawhide Canyon, and Walnut Canyon. The entire 500-foot width of the corridor is assumed to be disturbed for the purposes of the BA; however, it is unlikely that the entire width would be disturbed during construction. Based on initial conceptual designs, the right-of-way for the pipeline is likely to be 150 feet wide, with only a portion of that disturbed during construction. Disturbance would consist of excavation, stockpiles, laydown areas, vegetation clearing, and structures. Permanent disturbance would primarily be associated with an access road that overlaps these rights-of-way and infrastructure like tower footings. Other disturbed areas would be reclaimed and revegetated after construction.

Potential impacts to the southwestern willow flycatcher from the tailings pipeline corridor would include a loss or degradation of migratory/stopover/foraging habitat along Lyons Fork, Rawhide Canyon, and Walnut Canyon. Riparian woodland trees (e.g., sycamore, cottonwood, Goodding's willow) occur in narrow stringers along the riparian corridor near the proposed corridor crossing at Lyons Fork, with xeric riparian vegetation occurring near the proposed corridor crossing at Rawhide Canyon and Walnut Canyon (WestLand 2019b). However, the footprint for this component has changed since the Draft EIS, and the species composition of the vegetation within each drainage that lies within the updated tailings pipeline corridor is not known. Southwestern willow flycatchers may use these drainages as movement corridors to get to nearby riparian vegetation or springs within these drainages.

Construction in the tailings pipeline corridor could increase the potential for the establishment and spread of noxious and invasive plant species. These species could reduce overall habitat quality and lead to increased fire risk. However, southwestern willow flycatchers have not been observed in or around this project component, and their infrequent use of the area is unlikely to be affected by presence of noxious weeds. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

Given the amount of additional migratory/stopover/foraging habitat in the action area and the low likelihood of individuals being present in the area of impacts along any of these drainages, it is unlikely that potential impacts to habitat would significantly affect the species and the migration portion of its life cycle. Thus, these effects would be insignificant and discountable.

Additional impacts on the species would include changes in behavior/habitat use along Devil's Canyon, Lyons Fork, Rawhide Canyon, Walnut Canyon, and Mineral Creek in the vicinity of the proposed pipeline crossing from noise associated with construction of the pipeline. The intensity of the impacts would decrease with distance from the noise source(s). These impacts could be reduced or avoided by limiting construction activities to between September 15 and May 1, while this species is not present.

These behavior impacts would be insignificant and discountable because (1) southwestern willow flycatchers have not been observed near this project component; (2) flycatchers have a low likelihood of occurring within this project component footprint; (3) the vegetation in the impacted drainages consists of migratory/stopover/foraging habitat; and (4) noise impacts would be temporary and would decrease with increasing distance from the construction.

## **MARRCO** Corridor

Much of the 200-foot-wide proposed footprint for the MARRCO corridor has been previously disturbed. It is the site of a historic mining railroad; currently contains multiple utility lines, water pipelines, and infrastructure; and private parcels along the MARRCO corridor have been developed.

The MARRCO corridor crosses Queen Creek in one location with the rest of the footprint crossing smaller drainages or occurring in upland vegetation. Although the crossing is mapped as riparian vegetation, a site photograph taken of the Queen Creek crossing in 2008 does not indicate that suitable southwestern willow flycatcher habitat occurs at this location as no trees, native or invasive, appear in the photograph (WestLand 2008). Thus, no impacts to southwestern willow flycatcher migratory/stopover/foraging habitat along Queen Creek are expected within the footprint of the proposed MARRCO corridor.

The proposed MARRCO corridor runs parallel to and near Queen Creek for a portion of its footprint. The densest riparian habitat within the action area along the MARRCO corridor occurs 0.4 mile or more from the footprint of the corridor upstream of the Boyce Thompson Arboretum (one nonresident individual found in 2017 and one in 2018) and near Whitlow Ranch Dam (one nonresident individual detected in 2018 and a territorial individual detected in 2005). The riparian vegetation near Whitlow Ranch Dam consists primarily of tamarisk, with a few large cottonwood and Goodding's willow trees occurring along the channel of Queen Creek (WestLand 2018b). The area burned in 2012 (WestLand 2016c) and is regenerating. Southwestern willow flycatchers that use Queen Creek for stopover, migration, or foraging could be affected by additional noise and human presence during construction in the MARRCO corridor. Impacts would consist of changes in behavior or habitat use. The intensity of the impacts would decrease with distance from the noise source(s). These impacts could be reduced or avoided by limiting construction activities to between September 15 and May 1, while this species is not present.

Construction of the MARRCO Corridor could increase the potential for the establishment and spread of noxious and invasive plant species. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of some weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

Effects would be insignificant and discountable because this area is unlikely to be heavily used as migratory/stopover/foraging habitat, no breeding is known to occur in this vicinity, and any noise impacts would diminish with increasing distance from the construction.

## **Electricity Supply and Transmission Lines**

#### 115-kV Transmission Line

The footprint of the 115-kV transmission line (see figure 2) is located largely within upland areas that do not contain suitable southwestern willow flycatcher habitat. The transmission line footprint crosses Queen Creek in one location, directly adjacent to U.S. 60. The proposed line would span the creek. Although no southwestern willow flycatchers have been detected near the new transmission line footprint, this species may use Queen Creek in the vicinity for migration, stopover, or foraging. Potential construction-related impacts on the southwestern willow flycatcher would include changes in behavior/habitat use along Queen Creek in the vicinity of the proposed crossing from noise associated with construction of the transmission line and the potential for the establishment and spread of noxious and invasive plant species.

Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the 115-kV transmission line could occur to transient flycatchers along Queen Creek, these effects are unlikely as the species is not reasonably certain to be present at the time of noise-producing activities. Additionally, as this portion of Queen Creek occurs directly adjacent to U.S. 60 where there is already traffic noise and disturbance, the additional potential impact from construction noise would not be expected to significantly alter flycatcher behavior above baseline conditions should the species be present at the time of construction. Thus, any noise direct effects on flycatchers would be insignificant and discountable. These impacts could be avoided by limiting construction activities to October to April while this species is not present.

Construction of the new 115-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of some weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

#### Collocated 115-kV and 230-kV Transmission Lines

The footprint of these new power lines is located largely within upland areas that do not contain suitable southwestern willow flycatcher habitat. These new power lines (and potentially new access roads, if needed) cross Queen Creek in two locations, one of which is directly adjacent to U.S. 60. The other crossing occurs in a location with no riparian vegetation. Although no southwestern willow flycatchers have been detected near the new transmission line footprint, this species may use Queen Creek in the vicinity for migration, stopover, or foraging. Thus, an extremely small portion of migratory/stopover/ foraging flycatcher habitat could be altered or removed within Queen Creek, depending on the ultimate placement of the power poles and new access road. Given the amount of additional migratory/stopover/ foraging habitat in the action area and the low likelihood of individuals being present in the area of impact at any given time, it is unlikely that potential impacts to habitat would significantly affect the species and the migration portion of its life cycle. Thus, these effects would be insignificant and discountable.

Additional impacts on the species could include changes in behavior/habitat use along Queen Creek in the vicinity of the proposed 115-kV/230-kV transmission line from noise associated with construction of the transmission line. The intensity of the impacts would decrease with distance from the noise source(s). These impacts could be reduced or avoided by limiting construction activities to between September 15 and May 1, while this species is not present. However, as this portion of Queen Creek occurs directly

adjacent to U.S. 60 where there is already traffic noise and disturbance, the additional impact from construction noise would not be expected to significantly alter flycatcher behavior. Thus, any noise direct effects on flycatchers would be insignificant and discountable.

Construction of the collocated 115-kV/230-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of some weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line is addressed above under Tailings Pipeline Corridor and Collocated 115-kV Transmission Line.

#### **Anticipated Groundwater and Surface Water Impacts**

Potential impacts from construction of the proposed action to groundwater and surface water with the exception of the Skunk Camp Tailings Facility would occur during the operations and maintenance phase of the proposed action. Those potential impacts are addressed in the operations and maintenance section while the Skunk Camp Tailings Facility is addressed here.

<u>Gila River</u>. Creation of the Skunk Camp tailings storage facility would result in a loss of stormwater runoff as a portion of the Dripping Spring Wash watershed would be cut off to contain stormwater that interacts with tailings. Because the loss in average annual volume in the Gila River downstream of Dripping Spring Wash is within the natural variation of the Gila River (estimated as 0.5 percent in the Gila River, downstream from the confluence with Dripping Spring Wash, and 0.3 percent in the Gila River at Donnelly Wash), there would be no effects on breeding, migrating, or dispersing southwestern willow flycatchers that occur within suitable riparian habitat adjacent to the Gila River.

## Project Components with No Effect on the Species from Construction

No effects on southwestern willow flycatchers would be expected as a result of construction at the following project components: Ore Conveyor/Infrastructure Corridor and Filter Plant and Loadout Facility. There is no habitat for southwestern willow flycatchers and the species is not known to occur within these areas.

## **OPERATIONS AND MAINTENANCE**

## **Underground Mining and Subsidence**

Because underground construction would continue throughout the life of the mine with subsidence impacts from panel caving occurring throughout the life of the mine, the impacts on the southwestern willow flycatcher can be found under the Underground Mining and Subsidence subheading under the Construction section.

## East Plant Site

Operations of the East Plant Site would include additional noise and human activity from the presence of workers, equipment, additional traffic along Magma Mine Road and other activities on site. However, because the Queen Creek reach nearest the East Plant Site (about 0.1 mile away) is situated in an area that already has high levels of human noise and presence, it is unlikely that the additional noise would affect any southwestern willow flycatchers using Queen Creek for migration, stopover, and foraging.

#### West Plant Site

Operations of the West Plant Site would include additional noise and human activity from the concentrator complex and other activities on-site, plus additional traffic on the realigned and improved Silver King Mine Road. However, because the Queen Creek reach nearest the West Plant Site is situated in an area that already has high levels of human noise and presence, it is unlikely that the additional noise would affect any southwestern willow flycatchers using Queen Creek for migration, stopover, and foraging.

## Skunk Camp Tailings Storage Facility

Construction of the Skunk Camp tailings storage facility is expected to occur throughout the life of the mine. Because there is no suitable migratory/stopover/foraging habitat in the area or immediate vicinity of the Skunk Camp tailings storage facility, no effects on the southwestern willow flycatcher are expected from the operations and maintenance of the Skunk Camp tailings storage facility. Effects on the southwestern willow flycatcher habitat downstream within the Gila River would not be expected since the change in flow is within the natural variation of the Gila River (see the Skunk Camp Tailings Storage Facility subsection under the Construction section). During operations, a tailings pond would be formed at the storage facility. However, it is not anticipated that this area would become suitable foraging or migratory stopover habitat as no vegetation is anticipated to form around the pond and the species is unlikely to forage over open water without riparian vegetation present (Sedgwick 2000).

## Tailings Pipeline Corridor

Potential impacts to the southwestern willow flycatcher from the operation and maintenance of the tailings pipeline corridor would include potential impacts on the species from noise related to maintenance activities and the increased potential for the establishment and spread of noxious and invasive weed species.

The presence of vehicles and equipment during maintenance activities, which are expected to occur approximately once every two weeks, could increase the potential for the establishment and spread of noxious and invasive plant species from outside the project area or within the project area. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

The tailings pipeline corridor would cross Queen Creek and potential migratory/stopover habitat for the southwestern willow flycatcher in one location that does not have perennial flow or extensive riparian vegetation. Potential impacts to the southwestern willow flycatcher from operations and maintenance would be limited to those from noise between May 1 and September 15. Although noise impacts

(e.g., avoidance or reduced foraging success) could occur to transient flycatchers along Queen Creek, these effects are expected to be unlikely to occur and would be insignificant and discountable.

## Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

Tailings piping would largely occur underground. Any booster pumps required to move the tailings would be located at the West Plant Site. There would be an increase of traffic along the access road, which could lead to behavioral changes of flycatchers using the small amount of migratory/stopover/foraging habitat that occurs along the tailings pipeline corridor. Pipeline maintenance inspections are expected to occur approximately once every two weeks, and southwestern willow flycatchers have not been observed near this project component. Impacts to southwestern willow flycatcher behavior would decrease with distance from the road. Thus, effects on any southwestern willow flycatcher that might be in the area would be insignificant and discountable.

Any maintenance activities that had to be performed on the pipeline or access roads during mine operation would be expected to have similar noise effects on southwestern willow flycatchers as those that are described in the Tailings Pipeline Corridor subsection of the Construction section, except that these impacts would occur occasionally and intermittently during mine operation.

Operation of the tailings pipeline corridor could increase the potential for establishment and spread of noxious weeds and invasive plant species. Vehicles using the access roads may bring in invasive species from other locations or spread seeds within the project area. As noted in the Tailings Pipeline Corridor subsection of the Construction section, this potential impact is unlikely to affect the southwestern willow flycatcher because the species has not been observed in or around this project component, and their infrequent use of the area is unlikely to be affected by presence of noxious weeds. Additionally, implementation of a Weed Management Plan that would require the use of certified weed-free seed and implement weed control measures would reduce, minimize, and possibly eliminate potential impacts from noxious weeds and invasive plant species.

There is some potential that individual southwestern willow flycatchers could collide with the transmission line where it crosses Devil's Canyon and Mineral Creek. This potential impact would be unlikely to occur because no southwestern willow flycatchers have been detected in the vicinity; however, line-marking devices will be used to increase line visibility to birds, thereby further reducing the potential for collisions.

## MARRCO Corridor

The MARRCO corridor would contain pump stations and groundwater wells. Depending on the ultimate placement, these facilities could generate noise that could impact southwestern willow flycatchers occurring along Queen Creek during migration, stopover, or foraging. Impacts from noise could cause changes in behavior or habitat use. The intensity of the impacts would decrease with distance from the noise source(s). Effects would be insignificant and discountable because this area is unlikely to be heavily used as migratory/stopover/foraging habitat, no breeding occurs in this vicinity, and any noise impacts would diminish with increasing distance from the pump stations or groundwater wells.

From the filter plant and loadout facility to Magma Junction, copper concentrate would be transported by railcar. Although this represents an increase of noise disturbance, no southwestern willow flycatcher habitat occurs along this portion of the MARRCO corridor, and this species would not be affected by the increase in use of the railroad during the operation of the MARRCO corridor.

## **Electricity Supply and Transmission Lines**

#### 115-kV Transmission Line

Noise associated with maintenance activities along the proposed 115-kV transmission line could result in changes in behavior/habitat use of transient southwestern willow flycatchers using riparian woodland habitat in the vicinity of the Queen Creek crossing. These impacts would occur intermittently during maintenance activities. The intensity of the impacts would decrease with distance from the noise source(s). However, as this portion of Queen Creek occurs directly adjacent to U.S. 60 where traffic noise and disturbance already occurs, the additional impact from construction noise would not be expected to significantly alter flycatcher behavior. Thus, any noise direct effects on flycatchers would be insignificant and discountable.

The presence of vehicles and equipment during maintenance activities at the 115-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species from outside the project area or within the project area. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of some weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

There is some potential that individual southwestern willow flycatchers could collide with the transmission line where it crosses Queen Creek. This potential impact would be unlikely to occur because no southwestern willow flycatchers have been detected in the vicinity; however, line-marking devices will be used to increase line visibility to birds, thereby further reducing the potential for collisions.

#### Collocated 115-kV and 230-kV Transmission Lines

Noise associated with maintenance activities along the proposed 115-kV transmission line could result in changes in behavior/habitat use of transient southwestern willow flycatchers using riparian woodland habitat in the vicinity of the Queen Creek crossing. These impacts would occur intermittently during maintenance activities. The intensity of the impacts would decrease with distance from the noise source(s). However, as this portion of Queen Creek occurs directly adjacent to U.S. 60 where traffic noise and disturbance already occurs, the additional impact from construction noise would not be expected to significantly alter flycatcher behavior. Thus, any noise direct effects on flycatchers would be insignificant and discountable.

The presence of vehicles and equipment during maintenance activities at the collocated 115-kV/230-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species from outside the project area or within the project area. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

There is some potential that individual southwestern willow flycatchers could collide with the transmission line where it crosses Queen Creek. This potential impact would be unlikely to occur because

no southwestern willow flycatchers have been detected in the vicinity; however, line-marking devices will be used to increase line visibility to birds, thereby further reducing the potential for collisions.

#### Tailings Pipeline Corridor Collocated with the 115-kV Transmission Line

The tailings pipeline corridor where collocated with the 115-kV transmission line is addressed above under Tailings Pipeline Corridor.

#### **Anticipated Groundwater and Surface Water Impacts**

All mine activities that would affect groundwater or surface water with the exception of the development of the Skunk Camp Tailings Facility are considered to be impacts from operations and maintenance and are addressed here. The Skunk Camp Tailings Facility impacts are described above in the Construction section.

<u>Devil's Canyon</u>: The subsidence area would decrease the surface watershed for Devil's Canyon by about 4,697 acres, resulting in an estimated loss of 3.5 percent of the annual storm flow volume at the mouth of Devil's Canyon. Groundwater modeling completed for the Draft EIS indicated that block-caving from underground mining was unlikely to lead to reductions in main channel groundwater inflow in Middle Devil's Canyon, and no changes in groundwater were anticipated in Lower Devil's Canyon. However, a spring (DC-6.6W) that supplies up to 5 percent of flows in Devil's Canyon would be impacted by dewatering. A loss of surface water could result in reductions in the health or extent of riparian woodland vegetation, contribute to lower humidity, and affect the number of insects and the timing of their availability. Complete drying of the downstream habitat, loss of dominant riparian vegetation, or loss of standing pools would be unlikely.

Southwestern willow flycatchers have not been detected in Devil's Canyon. A decline in riparian woodland vegetation in Devil's Canyon could lead to migrant or transient individuals expending more energy to reach suitable habitat. Because the species is not known to occur in Devil's Canyon, these impacts are expected to be insignificant and discountable.

<u>Mineral Creek</u>: Groundwater modeling that was completed for the Draft EIS indicated that no groundwater drawdowns were expected along Mineral Creek as a result of mine construction activities; thus, no effects would occur to riparian habitat along Mineral Creek.

<u>Queen Creek</u>: Groundwater modeling that was completed for the Draft EIS indicated that groundwater drawdowns were possible but unlikely along Queen Creek. However, the subsidence area would decrease the surface watershed for Queen Creek by about 1,672 acres, resulting in an estimated loss of annual volume in Queen Creek ranging from 19 percent (in Superior) to 3.5 percent (at Whitlow Ranch Dam). A loss of surface water could result in reductions in the health or extent of riparian woodland vegetation over time. Willow flycatchers are known to use riparian woodland habitats along Queen Creek during migration, though no resident southwestern willow flycatchers were detected during surveys, including at Whitlow Ranch Dam, in 2017 and 2018. The area near Whitlow Ranch Dam that supported a territorial southwestern willow flycatcher in 2005 has since been affected by a fire and may no longer provide suitable breeding habitat. A decline in riparian woodland vegetation along Queen Creek could lead to migrant or transient southwestern willow flycatchers expending more energy to reach suitable habitat. Because the species occurs infrequently along Queen Creek, these impacts are expected to be insignificant and discountable.

<u>Arnett Creek</u>: Groundwater modeling that was completed for the Draft EIS indicated that no groundwater drawdowns were expected along Arnett Creek as a result of mine construction activities; thus, no effects would occur on riparian habitat along Arnett Creek.

<u>Springs</u>: Of the springs at which groundwater drawdowns would be expected under the proposed action, Bored Spring is the only one that supports any riparian vegetation. However, owing to the general lack of water at Bored Spring, and scattered, sparse riparian trees, Bored Spring would be considered marginal migratory/stopover/foraging habitat for this species. Groundwater drawdown could lead to the death of a large Fremont cottonwood tree at the spring and other trees scattered over a 500-foot reach downstream of the spring. This decline could lead to migrant or transient southwestern willow flycatchers expending more energy to reach suitable habitat. Because the species would be expected to occur very infrequently if ever at Bored Spring, these impacts would be insignificant and discountable.

## Project Components with No Effect on Species from Operations and Maintenance

No effects on southwestern willow flycatchers would be expected as a result of operations and maintenance for the following project components: Ore Conveyor/Infrastructure Corridor and Filter Plant and Loadout Facility. There is no habitat for southwestern willow flycatchers within these areas and the species is not known to occur.

## CLOSURE AND RECLAMATION

## East Plant Site Closure and Reclamation

The edge of the East Plant Site footprint is approximately 0.1 mile from a portion of Queen Creek with narrow stringers of riparian vegetation that could provide migratory/stopover/foraging habitat for southwestern willow flycatchers. This portion of Queen Creek parallels and is immediately adjacent to U.S. 60, and current noise levels along this section of Queen Creek are likely high. Flycatchers may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any flycatchers in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from closure and reclamation of the East Plant Site could occur to transient flycatchers along Queen Creek, these effects are expected to be insignificant and discountable.

#### Water Supply Facilities and Pipelines Closure and Reclamation

The tailings pipeline is the only water supply facility or pipeline that traverses potential habitat for the southwestern willow flycatcher. No riparian vegetation would be removed or disturbed during reclamation activities. All closure and reclamation activities near Mineral Creek would occur between October 1 and May 15 (see section 5.3) and thus would be very unlikely to affect any southwestern willow flycatchers. Any flycatchers present along Queen Creek or Devil's Canyon in the vicinity of the pipeline could be affected by noise associated with closure and reclamation of the pipeline and associated roads if these activities occur between May 1 and September 15. No flycatchers have been recorded near the pipeline crossings of Queen Creek and Devil's Canyon, and flycatchers would likely be present only rarely in places where none have been detected during surveys; thus, noise impacts to flycatchers from closure and reclamation activities are expected to be insignificant and discountable.

Closure and reclamation of water supply facilities and pipelines could increase the potential for the establishment and spread of noxious and invasive plant species, which could increase fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread, and any effects on southwestern willow flycatchers from the introduction of weedy species are expected to be insignificant and discountable.

#### Power Transmission Facilities Closure and Reclamation

Power line transmission facilities would be removed unless a post-mining use is identified. Closure and reclamation of the power line that is collocated with the tailings pipeline would have effects similar to those described under the Water Supply Facilities and Pipelines Closure and Reclamation heading. Any flycatchers present along Queen Creek in the vicinity of the 115-kV or collocated 115-kV/230-kV transmission lines could be affected by noise associated with closure and reclamation of the transmission lines and associated roads if these activities occur between May 15 and September 30. Two of the three Queen Creek crossings occur at U.S. 60, and existing noise levels would likely be high. Flycatchers may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any flycatchers in the area would likely be habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from closure and reclamation of the new 230-kV transmission line could occur to transient flycatchers along Queen Creek, noise is not expected to significantly alter flycatcher behavior, and these effects are expected to be insignificant and discountable.

Closure and reclamation of transmission lines could increase the potential for the establishment and spread of noxious and invasive plant species, which could increase fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread, and any effects on southwestern willow flycatchers from the introduction of weedy species are expected to be insignificant and discountable.

Closure and reclamation of the transmission lines would benefit the southwestern willow flycatcher by removing collision risks where the transmission lines cross riparian corridors.

#### West Plant Site Closure and Reclamation

Because the West Plant Site contains no suitable habitat for the southwestern willow flycatcher and is situated in an area with existing high levels of human noise and presence, it is unlikely that any additional noise arising from the closure or reclamation (e.g., decommissioning facilities, grading and reseeding land surfaces as necessary to blend into surrounding terrain, closing contact water basins, reclaiming roads that serve no further use in reclamation or closure efforts) would affect southwestern willow flycatchers using the nearby Queen Creek for migration, stopover, and foraging, if any were to be present.

No flycatcher habitat is expected to be created as a result of this closure and reclamation.

#### MARRCO Corridor Closure and Reclamation

The closure and reclamation of the MARRCO line is undetermined. Any recontouring, revegetation, or removal of concentrate lines that occurs within or near Queen Creek would not include the southwestern willow flycatcher migratory/stopover/foraging habitat and would have no potential to impact southwestern willow flycatcher individuals. No flycatcher habitat is expected to be created as a result of closure and reclamation activities.

#### Project Components with No Effect on Species from Closure and Reclamation

No effects on southwestern willow flycatchers would be expected as a result of closure and reclamation for the following project components: Skunk Camp Tailings Storage Facility and Filter Plant and Loadout Facility. There is no habitat for southwestern willow flycatchers within these areas and the species is not known to occur. In addition, no flycatcher habitat would be created as a result of closure or reclamation in these areas.

## **CLEAN WATER ACT SECTION 404 PERMIT**

## Impacts to Waters of the U.S.

Impacts to waters of the U.S. within the tailings storage facility would have no effect on the southwestern willow flycatcher because there is no suitable habitat and flycatchers do not occur within this project component area.

The effects of impacts to waters of the U.S. as a result of construction of the pipeline/power line corridor are discussed under the Tailings Pipeline Corridor subsection under the Construction heading.

#### **Compensatory Mitigation**

For purposes of this document, it is assumed that any actions taken within mitigation areas would incorporate measures to reduce or avoid negative effects on listed species or their critical habitat as these off-site compensatory mitigation parcels are being used for conservation purposes.

The proposed action would lead to mitigation efforts in several areas.

- MAR-5 Wetland/Olberg Road. This area does not currently contain any potential habitat for southwestern willow flycatchers, and tamarisk removal would have no detrimental effects on flycatchers. Any mitigation strategies that result in the establishment and maintenance of native tree species could benefit the flycatcher by creating migration/foraging/stopover habitat or breeding habitat.
- Queen Creek. The stretch of Queen Creek immediately downstream from the town of Superior does not support breeding flycatchers but may be used intermittently by migrant or transient flycatchers. Tamarisk removal and establishment of a conservation easement could benefit the flycatcher by promoting the growth of native riparian vegetation and restricting future development.
- H&E Ranch. This area does not currently support habitat that is suitable for breeding southwestern willow flycatchers (Andresen 2020). Tamarisk removal and drainage reconstruction could benefit flycatchers by promoting the establishment and maintenance of native riparian vegetation but could also include a temporary reduction in available foraging/migratory/dispersal habitat due to removal of a single strand of vegetation along the eastern bank of the San Pedro River.

## OTHER CONSEQUENCES

Interrelated and interdependent actions, e.g., power lines, pipelines etc., were all included in the proposed action; thus, there are no additional interrelated or interdependent actions that would cause additional effects. Potential cumulative effects on the southwestern willow flycatcher would include the effects of all future non-Federal actions. As the action area and known habitat for the species is primarily found on lands managed by the TNF, it is anticipated that future activities within the action area that could impact the species would be subject to Section 7 consultation under the ESA.

The only cumulative action identified is a wildlife water source improvements project proposed by AGFD. This proposed AGFD project involves catchments on both TNF-administered lands and on private lands. Those catchments on the TNF would involve a separate environmental analysis. For those on private lands, if the AGFD is using state funds or Federal grant monies for the project, then an environmental analysis will also be completed. However, none of the catchments proposed for

improvement occur within suitable habitat for southwestern willow flycatcher, and as such, no additional cumulative effects on the species would occur.

There is the potential for impacts related to increased access within the project area and action area from project-related roadways. However, these potential impacts would be avoided through measures to limit access to administrative use only.

# 6.4.3 Determination of Effects

The proposed project would be expected to lead to loss and disturbance of riparian habitat that could be used by the southwestern willow flycatcher as migratory/stopover/foraging habitat. As such, the proposed action may affect, but is not likely to adversely affect the southwestern willow flycatcher. These effects would be insignificant and discountable, and take is not expected to occur. These determinations are based on the following:

- disturbance to up to 3.5 acres of riparian habitat within the project area, which would be about 0.2 percent of the riparian vegetation in the action area;
- changes to up to 90 acres of riparian habitat in Devil's Canyon due to changes in the upstream watershed and from groundwater pumping;
- potential behavior/habitat use changes by individuals related to increased noise during construction, operations and maintenance, and reclamation where migratory/stopover/foraging habitat occurs;
- increased collision risk where transmission lines cross Queen Creek, Devil's Canyon, and Mineral Creek;
- increased potential for invasive and noxious weed establishment and spread along Queen Creek, Devil's Canyon, and Mineral Creek where migratory/stopover/foraging habitat occurs; and
- potential beneficial impacts at multiple mitigation areas.

# 6.5 Yellow-billed Cuckoo

# 6.5.1 Species Status in Action Area

The western Distinct Population Segment (DPS) of the yellow-billed cuckoo was listed as threatened with proposed critical habitat in 2014 (USFWS 2014a). Yellow-billed cuckoos have been documented in the footprint of the project components and/or the associated action area along Queen Creek upstream of Whitlow Ranch Dam (Prager and Wise 2017; WestLand 2016c), Arnett Creek (Prager and Wise 2017), Devil's Canyon (WestLand 2015, 2019c) and Mineral Creek (WestLand 2011, 2015, 2016c, 2019c). Most detections were presumed to be of migrant or transient individuals, but survey results in 2011 suggested that up to six breeding pairs could be present along Mineral Creek (WestLand 2011). Surveys in subsequent years resulted in the detection of one possible breeding territories (WestLand 2016c). No breeding activity has been confirmed (e.g., via observation of breeding behaviors such as copulation or by finding a nest or fledgling) in the footprint of the project components or in the associated action area.

Riparian habitat (see section 4.2.7) that may be suitable for use by the species in the action area associated with the project components occurs in narrow stringers along Devil's Canyon, Mineral Creek, Queen Creek near Whitlow Ranch Dam, and Arnett Creek. Two springs (Rancho Rio and Bored Springs) also support riparian vegetation in narrow stringers or as scattered trees. Habitat in portions of these areas may

be suitable for migratory and stopover activities, while some areas may be suitable for breeding. Bored Spring has infrastructure improvements and consists of an approximately  $65 \times 25$ -foot depression with a cattle trough downstream (WestLand and Montgomery 2018). Site visits from 2002 to 2017 indicated that this site does not always contain water and often has little flow. However, a cottonwood occurs at the site, and a string on scattered riparian vegetation occurs downstream for approximately 500 feet in the vicinity of Bored Spring, including Goodding's willow, velvet mesquite, tamarisk, and African sumac (WestLand and Montgomery 2018). TNF biologist Mark Taylor noted from past site visits that water is not always present at the site and the riparian vegetation in the spring vicinity is sparse and does not contain riparian vegetation density, or a multi-canopy structure that would indicate suitable habitat for this species. In addition, Bored Spring is located directly adjacent to, and part of, a minerals material ADOT storage facility that is currently in use. Approximately 3.5 acres of riparian habitat occur in the footprint of the project components; 2.1 of these acres occur in areas where there would be no ground disturbance. An additional 27.9 acres occur in the potential mitigation areas, with an additional 1,747.51 acres in the action area (see figures 13-1 through 13-3).

Hidden, McGinnel, McGinnel Mine, Walker, Bitter, and Kane Springs all have infrastructure improvements to some degree and host relatively little riparian vegetation, although standing water and herbaceous and wetland vegetation may be present. The Grotto (spring) also does not support riparian woodland vegetation, and these areas are unlikely to provide migratory or stopover habitat for the species.

The yellow-billed cuckoos in this region mainly use riparian habitat on the mainstem Gila and San Pedro Rivers for breeding and migratory activities; thus, the project components and associated action area would not be the main areas used by this species in this portion of its range.

Surveys for the yellow-billed cuckoo within or overlapping portions of the action area have been conducted by Audubon Arizona and WestLand (accompanied by TNF). These surveys were conducting by qualified biologists using the accepted protocols (Halterman et al. 2009; Halterman et al. 2015), except as noted, and data validation was conducted by staff from TNF and SWCA. These surveys did not cover the entire project area within suitable habitat. The surveys conducted include (see figure 19 for locations):

- 2011 survey of Devil's Canyon and Mineral Creek (WestLand 2011)
  - In 2011, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol in portions of Devil's Canyon and Mineral Creek. Devil's Canyon was surveyed along approximately 1 stream mile, and 3.9 miles of Mineral Creek was surveyed starting at the western boundary of Government Springs Ranch and ending at the boundary with ASARCO property. These surveys recorded up to six individual yellow-billed cuckoos in Mineral Creek, and WestLand concluded that Mineral Creek likely supported breeding pairs. One unconfirmed sighting was recorded in Devil's Canyon, and WestLand could not conclude that yellow-billed cuckoo was present in the Devil's Canyon survey area in 2011.
- 2012 survey of Devil's Canyon and Pinto Creek (WestLand 2013b)
  - In 2012, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol in portions of Devil's Canyon and Pinto Creek. WestLand surveyed three segments of Devil's Canyon: Upper Devil's Canyon (stream mile 9.1–10.4), Middle Devil's Canyon (stream mile 4.8–5.8), and Lower Devil's Canyon (stream mile 2.6–3.4), measured from the confluence with Mineral Creek. Surveys along Pinto Creek were conducted from stream mile 1.7–3.2, measured from its confluence with Haunted Canyon. Four yellow-billed cuckoos were detected along Pinto Creek, which is outside of the action area. Two unconfirmed detections were recorded in Devil's Canyon, these unconfirmed detections did not allow WestLand to conclude that yellow-billed cuckoos were present in the Devil's Canyon survey area in 2012.

- 2015 survey of Queen and Arnett Creeks (Prager and Wise 2015)
  - In 2015, Audubon Arizona conducted yellow-billed cuckoo surveys in accordance with USFWS protocol along Lower Queen Creek (between Superior and Boyce Thompson Arboretum), Upper Queen Creek (upstream of Superior), and Arnett Creek. No yellow-billed cuckoos were detected on any of the surveys. Audubon Arizona states that their survey areas do not contain suitable cuckoo breeding habitat. Areas that Audubon Arizona thought were promising sections were the easternmost portion of the Arnett Creek transect, as well as the eastern and western portions of the Upper Queen Creek transect.
- 2015 survey of Whitlow Ranch Dam, Devil's Canyon, and Mineral Creek (WestLand 2015)
  - In 2015, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol along Queen Creek upstream of Whitlow Ranch Dam, two sections of Devil's Canyon, and Mineral Creek. One cuckoo was detected along Middle Devil's Canyon and four were detected along Mineral Creek. WestLand did not observe any yellow-billed cuckoo breeding behavior, and no possible or probable breeding territories (per Halterman et al. 2015) were detected within the survey area.
- 2016 survey of Whitlow Ranch Dam, Devils Canyon, and Mineral Creek, Pinal County, Arizona (WestLand 2016c)
  - In 2016, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol at four sites in the vicinity of the Resolution Copper Project. A total of nine yellow-billed cuckoo detections were made during the 2016 survey season. Three detections came from the Whitlow Ranch Dam transect and six from the Mineral Creek transect. It is likely that five individual cuckoos were detected along the Mineral Creek transect and one individual along the Whitlow Ranch Dam transect. One possible breeding territory was identified along Mineral Creek.
- 2016 survey of Baseline Activities Area, Pinal County, Arizona (WestLand 2016d)
  - In 2016, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol within the Baseline Activities Area. Surveys were conducted in portions of Benson Spring Canyon, Lower Roblas Canyon, Hewitt Canyon, Potts Canyon, Whitford Canyon, and Bear Tank Canyon. No yellow-billed cuckoos were detected during these surveys.
- 2017 survey of Whitlow Ranch Dam, Queen Creek, and Arnett Creek (Prager and Wise 2017)
  - In 2017, Audubon Arizona completed surveys in accordance with USFWS protocol on upper Queen Creek adjacent to the Legends of Superior Trail, Queen Creek above Whitlow Dam, and Arnett Creek upstream of the Boyce Thompson Arboretum. One cuckoo was detected on Arnett Creek, and three were detected at Whitlow Ranch Dam. All detections occurred in June and were presumed to represent migrant individuals. Of the three transects, Whitlow Ranch Dam had the highest quality habitat but was not considered to have the multi-level canopy preferred by breeding cuckoos.
- 2017 survey of Tailings Storage Facility Area, East Plant Site Area and Upper Queen Creek (WestLand 2017c)
  - In 2017, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol at the tailings storage facility area, East Plant Site area, and Upper Queen Creek. In total, 10 transects were surveyed for yellow-billed cuckoo. Transects near the tailings storage facility included: Hewitt Canyon, Lower Roblas Canyon, Bear Tank Canyon, Benson Spring Canyon, Potts Canyon, and Whitford Canyon. Transects near the East Plant Site and Upper Queen Creek included: Upper Queen Creek Tributary 1, Upper Queen Creek Tributary

2, Rancho Rio Creek, and Upper Queen Creek. WestLand did not detect any yellow-billed cuckoos during any of these surveys; however, the Queen Creek Tributary 1 and 2 transects did not qualify as full surveys as only three of the four required surveys were conducted.

- 2018 survey of East Plant Site Area and Upper Queen Creek (WestLand 2018c)
  - In 2018, WestLand conducted yellow-billed cuckoo surveys in accordance with USFWS protocol at the East Plant Site area and along Upper Queen Creek. Three transects were surveyed. No yellow-billed cuckoos were detected.
- 2018 survey of Queen Creek and Rancho Rio Creek (Prager and Wise 2018)
  - In 2018, Audubon Arizona completed yellow-billed cuckoo surveys in accordance with USFWS protocol along Queen Creek between the U.S. 60 bridge crossing and the eastern exit of the U.S. 60 tunnel and along Rancho Rio Creek southeast of Oak Flat Campground. No cuckoos were detected, and Audubon Arizona described both transects as lacking habitat suitable for breeding cuckoos.
- 2019 survey of Devil's Canyon and Mineral Creek (WestLand 2019c)
  - In 2019, WestLand completed yellow-billed cuckoos surveys in accordance with USFWS protocol along two sections of Devil's Canyon (Middle Devils Canyon and Upper Devils Canyon) and along Mineral Creek. One cuckoo detection was recorded in Middle Devils Canyon, and four detections were recorded along Mineral Creek. Each detection was determined to be a separate individual, and no possible or probable breeding territories were recorded.

Other surveys that have also been conducted that could also help identify where yellow-billed cuckoos could occur within the project and action areas include:

- Raptor Survey and 2008 Bird Census (WestLand 2009c)
  - In 2008, WestLand performed winter and breeding bird surveys covering 50 survey points in nine different biotic community types. The three winter surveys took place from January to February and the three breeding season surveys took place from late April to early July. No yellow-billed cuckoos were recorded during these surveys.
- 2009 survey of the Resolution Copper Study Area (WestLand 2010b)
  - Twenty-five survey points were created by WestLand in 2009 to cover portions of the Resolution Parcel that were not surveyed in 2008. The survey points were located in manzanita chaparral, scrub oak chaparral, and Emory oak woodland habitats. The points were surveyed three times about 2 weeks apart. The first survey period was May 26 through 28; the second survey period was June 8 through 10; and the final survey period was June 25 through 27. No yellow-billed cuckoos were recorded.
- 2012 survey of Near West Analysis Area (WestLand 2014b)
  - In November and December 2012, WestLand biologists conducted a field reconnaissance of the Near West Analysis Area to evaluate the potential for special-status species. Based on their observations, WestLand concluded that the yellow-billed cuckoo has limited potential to occur in the Near West Analysis Area. Their basis for this determination included that the analysis area does not provide suitable habitat characteristics of cottonwood-willow galleries or isolated cottonwoods intermixed with tall mesquites and dense understory. WestLand states that the yellow-billed cuckoo may occur as transients during migration but is unlikely to be breeding or foraging in the analysis area.

- 2018 survey for suitable habitat of Skunk Camp (WestLand 2018d)
  - In 2018, WestLand conducted a Biological Evaluation of the Skunk Camp tailings storage facility in order to determine the occurrence or potential occurrence of special-status species and/or designated or proposed critical habitat in the proposed project area. In the Biological Evaluation, WestLand states that the potential for the yellow-billed cuckoo to occur within the project area is possible, given the moderately dense vegetation based on review of aerial imagery. WestLand states that the project area does not provide breeding habitat for the species but could provide some potential for foraging as well as migrating.
- 2018 survey for suitable habitat of Silver King (WestLand 2018e, 2018f)
  - In 2018, WestLand conducted a Biological Evaluation of the Silver King tailings storage facility, which is north of the West Plant Site and encompasses portions of Silver King Wash and Whitford Canyon, in order to determine the occurrence or potential occurrence of special-status species and/or designated or proposed critical habitat in the proposed project area. In the Biological Evaluation, WestLand states that the yellow-billed cuckoo is unlikely to occur within the project area, explaining that the project area does not contain appropriate riparian woodland habitat; however, the species may occur as transients during migration.
- 2019 survey for suitable habitat of Skunk Camp and proposed North and South corridors (WestLand 2019b)
  - In 2019, WestLand conducted a biological evaluation of the Skunk Camp tailings storage facility and the proposed North and South corridors in order to determine the occurrence or potential occurrence of special-status species and/or designated or proposed critical habitat in the proposed project area. WestLand states that the yellow-billed cuckoo is present within Skunk Camp North and Skunk Camp South. The species has been detected along portions of Mineral Creek by previous surveys.

#### **MITIGATION AREAS**

Several areas are being considered for off-site compensatory mitigation under Section 404 of the CWA. Together, they contain 27.9 acres of mapped riparian habitat.

- MAR-5 Wetland/Olberg Road. This area does not currently contain any potential habitat for yellow-billed cuckoos.
- Queen Creek. The stretch of Queen Creek immediately downstream of the town of Superior provides potential migratory/stopover/foraging habitat for yellow-billed cuckoo. Surveys of this reach in 2015 did not yield any cuckoo detections (Prager and Wise 2015).
- H&E Ranch. The H&E Ranch is along the Lower San Pedro River, which is an important breeding area for yellow-billed cuckoo and provides migratory stopover locations (USFWS 2020a, 2020c). No recent surveys for the yellow-billed cuckoo have been completed on the H&E Ranch, but incidental detections of cuckoos have been recorded (Andresen 2020).

		A LOS OF THE REAL OF		
	Proposed Action Component	<ul> <li>2012 Westland Detections</li> </ul>	2012 Westland 2012 Audobon	1 States
Project	Action Area	<ul> <li>2013 Westland Survey Points</li> </ul>	2015 Westland	
and Land Exchange 0 1.25 2.5 5	<ul> <li>2009 Westland Survey Points</li> </ul>	2019 Westland	2017 Westland	
Miles	2011 Westland	Detections	2019 Westland	
	Detections	2011 Westland		A A A A A A A A A A A A A A A A A A A

Figure 19. Yellow-billed cuckoo surveys in the action area and vicinity

# 6.5.2 *Analysis of Effects*

This section outlines the analysis of effects on the yellow-billed cuckoo species from each of the proposed action components. For each of the phases (Construction, Operations and Maintenance, and Closure and Reclamation), only components that may have effects or that need explanation to rule out effects are discussed. The remaining components are grouped together under a no effects subheading because they do not contain suitable habitat.

## CONSTRUCTION

## **Underground Mining and Subsidence**

The only riparian vegetation within the subsidence area occurs near Rancho Rio Spring, which supports a narrow band of scattered trees, including tamarisk, Fremont cottonwood, and willows (WestLand 2018c; WestLand and Montgomery 2018). No yellow-billed cuckoos were observed along Rancho Rio Creek during surveys in 2017 or 2018, and the area lacked habitat suitable for breeding cuckoos (Prager and Wise 2017, 2018). Rancho Rio Spring contains potential migratory/stopover/foraging habitat for the yellow-billed cuckoo. Potential impacts to the yellow-billed cuckoo from the proposed action would include a permanent loss of a small amount of riparian habitat directly surrounding Rancho Rio Spring. These patches of riparian habitat have not been mapped in the field, and because the patches are so small, they do not appear as part of the riparian vegetation community in AGFD GIS data (see section 4.2); thus, these losses of migratory/stopover/foraging habitat cannot be quantified but would be insignificant and discountable.

Underground construction would continue throughout the life of the mine. Potential impacts from surface water and groundwater reductions associated with mine construction are discussed below in the Anticipated Groundwater and Surface Water Impacts subheading under the Construction heading.

## East Plant Site

No impacts from habitat loss are expected to yellow-billed cuckoos as a result of construction at the East Plant Site as this location contains no suitable riparian habitat for the yellow-billed cuckoo.

The edge of the East Plant Site footprint is approximately 0.1 mile from a portion of Queen Creek with narrow stringers of riparian vegetation that could provide migratory/stopover/foraging habitat for yellowbilled cuckoos. Construction of the East Plant Site would create additional noise and human activity from the presence of workers, equipment, additional traffic along Magma Mine Road, and other activities on site. However, because the Queen Creek reach nearest the East Plant Site is situated in an area that already has high levels of human noise and presence, it is unlikely that the additional noise would affect any yellow-billed cuckoos using Queen Creek for migration, stopover, and foraging.

## West Plant Site

No impacts from habitat loss are expected to the yellow-billed cuckoo as a result of construction at the West Plant Site as this location contains no suitable habitat for the species. Queen Creek is approximately 0.1 mile southeast of the West Plant Site project component footprint and contains suitable migratory/ stopover/foraging cuckoo habitat. This portion of Queen Creek runs between West Main Street and U.S. 60 and is surrounded by existing development; thus, existing noise levels are likely extremely high. Cuckoos may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any cuckoos in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or

reduced foraging success) from construction of the West Plant Site could occur to transient cuckoos along Queen Creek, these effects are expected to be insignificant and discountable.

The realignment and improvement of Silver King Mine Road will result in the removal of upland and xeric riparian vegetation and would not result in the loss of migratory/stopover/foraging habitat for the yellow-billed cuckoo. All portions of Silver King Mine Road are at least 0.25 mile from Queen Creek, and no noise impacts are expected to the yellow-billed cuckoo as a result of road realignment and improvement.

## Skunk Camp Tailings Storage Facility

Construction in the Skunk Camp tailings storage facility is expected to be ongoing for the life of the project, with the facility expanding over time and tailings remaining in the area in perpetuity. Although the specific timing for these construction impacts is not known, for purposes of this document it is assumed that the entire Skunk Camp tailings storage facility would be impacted.

Drainages within the Skunk Camp tailings storage facility footprint are ephemeral and do not support dense riparian vegetation (WestLand 2018d). Several springs occur in the Skunk Camp tailings storage facility area. Haley Spring and Looney Spring are outside the Skunk Camp tailings storage facility footprint of disturbance but within the proposed fence. Both springs support riparian woodland tree species including Fremont cottonwood and Goodding's willow, but riparian vegetation is restricted to the area immediately surrounding the spring site and narrow stringers immediately down-gradient (WestLand 2019b). The limited riparian vegetation within the Skunk Camp tailings storage facility footprint does not provide breeding habitat for the yellow-billed cuckoo, but foraging or migratory cuckoos could be present (WestLand 2018d). Because the patches of riparian habitat are so small, they do not appear as part of the riparian vegetation community in AGFD GIS data (see section 4.2); thus, losses of migratory/stopover/foraging habitat cannot be quantified but would be insignificant and discountable.

Yellow-billed cuckoos could occur infrequently within the Skunk Camp tailings storage facility footprint as migrants or transients, and noise associated with construction activities could cause these cuckoos to avoid the area. These effects would be insignificant and discountable.

## Tailings Pipeline Corridor

The tailings pipeline corridor (see figure 2) would cross Queen Creek and potential migratory/stopover habitat for the yellow-billed cuckoo in one location. Queen Creek would be crossed at a location that does not have perennial flow and would utilize a pipe bridge or similar structure to span the creek. No disturbance would take place to the streambed or habitat along the streams in this location. Potential construction related impacts to the species from the crossing of Queen Creek would be limited to those from noise during construction should that construction occur between May 15 and September 30 when the species may be present.

Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the tailings pipeline could occur to transient cuckoos along Queen Creek, these effects are unlikely to occur and would be insignificant and discountable.

## Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

The tailings pipeline corridor crosses areas on Devil's Canyon and Mineral Creek that contain migratory/stopover/foraging habitat for the yellow-billed cuckoo. Mineral Creek may also support breeding cuckoos (WestLand 2011, 2016c). The pipeline will be bored under Mineral Creek and will span Devil's Canyon, and no riparian habitat along Mineral Creek or Devil's Canyon would be removed or

altered during construction. The use of best management practices during construction would reduce, minimize, and possibly eliminate any effects on riparian vegetation from sedimentation.

The tailings pipeline corridor crosses several other areas that may contain suitable migratory/stopover/foraging habitat for yellow-billed cuckoos, including along Lyons Fork, Rawhide Canyon, and Walnut Canyon. The entire 500-foot width of the corridor is assumed to be disturbed for the purposes of the BA; however, it is unlikely that the entire width would be disturbed during construction. Based on initial conceptual designs, the right-of-way for the pipeline is likely to be 150 feet wide, with only a portion of that disturbed during construction. A parallel power line right-of-way would vary from 75 to 130 feet wide, with only a portion disturbed during construction. Disturbance would consist of excavation, stockpiles, laydown areas, vegetation clearing, and structures. Permanent disturbance would primarily be associated with an access road that overlaps these rights-of-way and infrastructure like tower footings. Other disturbed areas would be reclaimed and revegetated after construction.

Impacts to yellow-billed cuckoos would be minimized by avoiding construction activities during the cuckoo breeding season along Mineral Creek, where surveys have shown cuckoos to be present (see section 5.3). Cuckoos, particularly those that are migrants or transients, may not always be detected during surveys, and noise and human presence associated with construction during the cuckoo breeding season at other riparian crossings could cause cuckoos to avoid the area, possibly leading to a loss of foraging and resting opportunities. Cuckoos would likely be present only rarely in places where none have been detected during surveys; thus, impacts to cuckoos from construction activities are expected to be insignificant and discountable.

Construction in the tailings pipeline corridor could increase the potential for the establishment and spread of noxious and invasive plant species. These species could reduce overall habitat quality and lead to the increased fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce the potential for noxious and invasive weed establishment and spread in the project area and action area.

## MARRCO Corridor

The MARRCO corridor parallels Queen Creek for approximately 4 miles and crosses Queen Creek near the middle of that reach. A site photograph taken in 2008 looking upstream from the Queen Creek crossing shows no riparian woodland vegetation (WestLand 2008). Thus, no impacts to yellow-billed cuckoo habitat along Queen Creek are expected as a result of construction of the proposed MARRCO corridor.

The portion of Queen Creek that is paralleled by the proposed MARRCO corridor does not contain suitable breeding habitat for the yellow-billed cuckoo. Migratory cuckoos have been detected both downstream from and upstream of this portion of Queen Creek (at Whitlow Ranch Dam and Arnett Creek, respectively) and could occur as migrants or dispersing individuals along the portion of Queen Creek paralleled by the MARRCO corridor. Any cuckoos using the area could be affected by construction noise and human presence, which could cause cuckoos to avoid the area. The intensity of the impacts would decrease with distance from the noise source(s). These impacts could be avoided by limiting construction activities to between October 1 and May 15 while this species is not present. Any effects would be insignificant and discountable because this area is likely used infrequently as migratory/ stopover/foraging habitat, no breeding occurs in this vicinity, and any noise impacts would diminish with increasing distance from the construction.

## **Electricity Supply and Transmission Lines**

#### 115-kV Transmission Line

The footprint of the 115-kV transmission line (see figure 2) is located largely within upland areas that do not contain suitable yellow-billed cuckoo habitat. The transmission line footprint crosses Queen Creek in one location, directly adjacent to U.S. 60. The proposed line would span the creek. Although no yellow-billed cuckoos have been detected near the new transmission line footprint, this species may use Queen Creek in the vicinity for migration, stopover, or foraging. Potential construction-related impacts on cuckoos would include changes in behavior/habitat use along Queen Creek in the vicinity of the proposed crossing from noise associated with construction of the transmission line and the potential for the establishment and spread of noxious and invasive plant species.

Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the 115-kV transmission line could occur to transient cuckoos along Queen Creek, these effects are unlikely as the species is not reasonably certain to be present at the time of noise-producing activities. Additionally, as this portion of Queen Creek occurs directly adjacent to U.S. 60 where there is already traffic noise and disturbance, the additional potential impact from construction noise would not be expected to significantly alter cuckoo behavior above baseline conditions should the species be present at the time of construction. Thus, any noise direct effects on cuckoos would be insignificant and discountable. These impacts could be avoided by limiting construction activities to October 1 to May 15 while this species is not present.

Construction of the new 115-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of some weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

#### Collocated 115-kV and 230-kV Transmission Lines

These new power lines (and new access roads, if needed) cross Queen Creek in two locations, one of which is directly adjacent to U.S. 60. The other crossing occurs in a location with no riparian vegetation. Although no cuckoos have been detected along the collocated 115-kV/230-kV line corridor, this species may use Queen Creek in the vicinity for migration, stopover, or foraging. Thus, an extremely small portion of migratory/stopover/foraging cuckoo habitat could be altered or removed within Queen Creek, depending on the placement of the power poles and new access roads. Given the amount of migratory/stopover/foraging habitat in the action area and the low likelihood of individuals being present in the area of impact at any given time, it is unlikely that potential impacts to habitat would significantly affect the species and the migration portion of its life cycle. Thus, these effects would be insignificant and discountable.

Any cuckoos present along Queen Creek in the vicinity of the proposed collocated 115-kV/230-kV transmission line could be affected by noise associated with construction of the transmission line and associated roads. Current noise levels are likely high at the crossing of Queen Creek near U.S. 60. Cuckoos may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any cuckoos in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from construction of the transmission line could occur to transient cuckoos

along Queen Creek, noise is not expected to significantly alter cuckoo behavior, and these effects are expected to be insignificant and discountable.

Construction of the collocated 115-kV/230-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species, which could increase fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread along Queen Creek. In addition, no cuckoos have been detected during surveys along this portion of Queen Creek, and any effects on the yellow-billed cuckoo from the introduction of weedy species are expected to be insignificant and discountable.

## Anticipated Groundwater and Surface Water Impacts

With the exception of the development of the Skunk Camp Tailings Facility, all potential impacts to groundwater and surface water would occur during the operations and maintenance phases and are addressed there. The Skunk Camp Tailing Facility is addressed below.

<u>Gila River</u>: Creation of the Skunk Camp tailings storage facility would result in a loss of stormwater runoff as a portion of the Dripping Spring Wash watershed would be cut off to contain stormwater that interacts with tailings. Because the loss in average annual volume in the Gila River downstream of Dripping Spring Wash is within the natural variation of the Gila River (estimated as 0.5 percent in the Gila River, downstream from the confluence with Dripping Spring Wash, and 0.3 percent in the Gila River at Donnelly Wash), there would be no effect on breeding, migrating, or dispersing yellow-billed cuckoos that occur within suitable riparian habitat adjacent to the Gila River.

## Project Components with No Effect on the Species from Construction

No effects on the yellow-billed cuckoo would be expected as a result of construction at the following project components: Ore Conveyor/Infrastructure Corridor and Filter Plant and Loadout Facility. There is no habitat for yellow-billed cuckoos and the species is not known to occur within these areas.

## **OPERATIONS AND MAINTENANCE**

## **Underground Mining and Subsidence**

Underground construction would continue throughout the life of the mine with subsidence impacts from panel caving occurring throughout the life of the mine, and the impacts on the yellow-billed cuckoo from these activities are addressed under the Underground Mining and Subsidence subheading under the Construction section.

## East Plant Site

Operations of the East Plant Site would include additional noise and human activity from the presence of workers, equipment, additional traffic along Magma Mine Road and other activities on site. However, because the Queen Creek reach nearest the East Plant Site (about 0.1 mile away) is situated in an area with already high levels of human noise and presence, it is unlikely that the additional noise would affect yellow-billed cuckoos that might use Queen Creek for migration, stopover, and foraging.

#### West Plant Site

Operations of the West Plant Site would include additional noise and human activity from the concentrator complex and other activities on-site, plus additional traffic on the realigned and improved Silver King Mine Road. However, because the Queen Creek reach nearest the West Plant Site is situated in an area with already high levels of human noise and presence, it is unlikely that the additional noise would affect yellow-billed cuckoos that might use Queen Creek for migration, stopover, and foraging,.

## Skunk Camp Tailings Storage Facility

Construction of the Skunk Camp tailings storage facility is expected to occur throughout the life of the mine, and the impacts on the yellow-billed cuckoo can be found under the Skunk Camp Tailings Storage Facility subheading under the Construction section. During operations a tailings pond would be formed at the tailings storage facility; however, it is not anticipated that this area would become suitable foraging or migratory stopover habitat, as no vegetation is anticipated to form around the pond and the species is unlikely to forage over open water without riparian vegetation present (Halterman et al. 2015).

## Tailings Pipeline Corridor

Potential impacts to the yellow-billed cuckoo from the operation and maintenance of the tailings pipeline corridor would include effects from noise related to maintenance activities and the increased potential for the establishment and spread of noxious and invasive weed species.

The presence of vehicles and equipment during maintenance activities, which are expected to occur approximately once every two weeks, could increase the potential for the establishment and spread of noxious and invasive plant species from outside the project area or within the project area. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

The tailings pipeline corridor would cross Queen Creek and potential migratory/stopover habitat for the yellow-billed cuckoo in one location that does not have perennial flow or extensive riparian vegetation. Potential impacts to yellow-billed cuckoos from operations and maintenance would be limited to those from noise between May 1 and September 15. Although noise impacts (e.g., avoidance or reduced foraging success) could occur to transient cuckoos along Queen Creek, these effects are expected to be unlikely to occur and would be insignificant and discountable.

## Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

Operations and maintenance of the tailings pipeline and collocated transmission line would result in traffic along the access road approximately once every 2 weeks, which could lead to behavioral changes (e.g., flushing or avoidance of the area and missed foraging opportunities) in migratory or transient cuckoos in the vicinity of the Devil's Canyon and Mineral Creek crossings. Similar impacts could occur to breeding cuckoos along Mineral Creek. These impacts would be infrequent and temporary, and impacts to cuckoo behavior would decrease with distance from the road. Thus, effects from traffic disturbances on any yellow-billed cuckoos in the area would be insignificant and discountable.

Any maintenance activities performed on the pipeline, transmission line, or access roads during mine operation could also result in noise effects on nearby yellow-billed cuckoos similar to those described under the Construction heading. Whenever possible, maintenance activities would be completed outside of the cuckoo breeding season in locations where surveys have shown cuckoos to be present (see section 5.3), and noise disturbances to cuckoos from maintenance activities are thus expected to be insignificant and discountable.

Operations and maintenance in the tailings pipeline corridor could increase the potential for establishment and spread of noxious weeds and invasive plant species. Vehicles using the access roads may bring in invasive species from other locations. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

Cuckoos are susceptible to collisions with towers and other tall structures, particularly during migration (USFWS 2014a). Surveys of Mineral Creek have resulted in repeated detections of cuckoos and have suggested that breeding cuckoos may be present in the area; thus, the power lines that would cross Mineral Creek in two locations and parallel Mineral Creek for 0.5 mile would present a collision hazard for migratory, transient, and breeding cuckoos. In order to minimize the potential risk for bird collisions with transmission lines, the lines and structures would be designed in accordance with Reducing Avian Collision with Power Lines (APLIC 2012), and line marking devices, i.e., flight diverters, would be placed at the proposed crossings of Devil's Canyon and Mineral Creek.

## MARRCO Corridor

The portion of Queen Creek that is paralleled by the proposed MARRCO corridor does not contain suitable breeding habitat for the yellow-billed cuckoo. Migratory cuckoos have been detected both downstream of and upstream from this portion of Queen Creek (at Whitlow Ranch Dam and Arnett Creek, respectively), and could occur as migrants or dispersing individuals along the portion of Queen Creek paralleled by the MARRCO corridor. Any cuckoos using the area could be affected by noise during operations and maintenance, which could cause cuckoos to avoid the area. The intensity of the impacts would decrease with distance from the noise source(s). Any effects would be insignificant and discountable because this area is unlikely to be heavily used as migratory/stopover/foraging habitat and no breeding occurs in this vicinity.

From the filter plant and loadout facility to Magma Junction, copper concentrate would be transported by railcar. Although this represents an increase of noise disturbance, no cuckoo habitat occurs along this portion of the MARRCO corridor, and this species would not be affected by the increase in use of the railroad during the operation of the MARRCO corridor.

## Electricity Supply and Transmission Lines

#### 115-kV Transmission Line

Noise associated with maintenance activities along the proposed 115-kV transmission line could result in changes in behavior/habitat use of transient yellow-billed cuckoos using riparian woodland habitat in the vicinity of the Queen Creek crossing. These impacts would occur intermittently during maintenance activities. The intensity of the impacts would decrease with distance from the noise source(s). However, as this portion of Queen Creek occurs directly adjacent to U.S. 60 where traffic noise and disturbance already occurs, the additional impact from construction noise would not be expected to significantly alter cuckoo behavior. Thus, any noise direct effects on yellow-billed cuckoos would be insignificant and discountable.

The presence of vehicles and equipment during maintenance activities at the 115-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species from outside the project area or within the project area. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of some weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

There is some potential that individual yellow-billed cuckoos could collide with the transmission line where it crosses Queen Creek. This potential impact would be unlikely to occur because cuckoos appear to use the area only rarely; however, line-marking devices will be used to increase line visibility to birds, thereby further reducing the potential for collisions.

#### Collocated 115-kV and 230-kV Transmission Lines

Noise associated with maintenance activities along the proposed collocated 115-kV/230-kV transmission line could result in changes in behavior/habitat use of transient yellow-billed cuckoos using riparian woodland habitat in the vicinity of the Queen Creek crossings. These impacts would occur intermittently during maintenance activities. The intensity of the impacts would decrease with distance from the noise source(s). One Queen Creek crossing occurs directly adjacent to U.S. 60 where traffic noise and disturbance already occurs, and the additional impact from construction noise would not be expected to significantly alter cuckoo behavior. The other Queen Creek crossing occurs in a location with no riparian vegetation, and cuckoos are unlikely to be present. Thus, any noise direct effects on yellow-billed cuckoo would be insignificant and discountable.

The presence of vehicles and equipment during maintenance activities at the collocated 115-kV/230-kV transmission line could increase the potential for the establishment and spread of noxious and invasive plant species from outside the project area or within the project area. While these weed species would be primarily those species that occur in upland areas, there is the potential for these species to spread into suitable migratory/ stopover/foraging habitat along Queen Creek and thus reduce the overall habitat quality. The presence of weedy species could lead to the increased potential for fire along these drainages. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

There is some potential that individual yellow-billed cuckoos could collide with the transmission line where it crosses Queen Creek. This potential impact would be unlikely to occur because cuckoos appear to use the area only rarely; however, line-marking devices will be used to increase line visibility to birds, thereby further reducing the potential for collisions.

## Anticipated Groundwater and Surface Water Impacts

All mine activities that would affect groundwater or surface water with the exception of the development of the Skunk Camp Tailings Facility are considered to be impacts from operations and maintenance and are addressed here. The Skunk Camp Tailings Facility impacts are described above in the Construction section.

<u>Devil's Canyon</u>: The subsidence area would decrease the surface watershed for Devil's Canyon by about 4,697 acres, resulting in an estimated loss of 3.5 percent of the annual storm flow volume at the mouth of Devil's Canyon. Groundwater modeling completed for the Draft EIS indicated that block-caving from

underground mining was unlikely to lead to reductions in main channel groundwater inflow in Middle Devil's Canyon, and no changes in groundwater were anticipated in Lower Devil's Canyon. However, a spring (DC-6.6W) that supplies up to 5 percent of flows in Devil's Canyon would be impacted by dewatering. A loss of surface water could result in reductions in the health or extent of riparian woodland vegetation, contribute to lower humidity, and affect the number of insects and the timing of their availability. Complete drying of the downstream habitat, loss of dominant riparian vegetation, or loss of standing pools would be unlikely.

Cuckoos have been detected intermittently in Devil's Canyon, but no evidence of breeding territories has been recorded. A decline in riparian woodland vegetation in Devil's Canyon could lead to migrant or transient cuckoos expending more energy to reach suitable habitat. Because cuckoos occur infrequently in Devil's Canyon, these impacts are expected to be insignificant and discountable.

<u>Mineral Creek</u>: Groundwater modeling that was completed for the Draft EIS indicated that no groundwater drawdowns were expected along Mineral Creek as a result of mine construction activities; thus, no effects would occur on habitat for the yellow-billed cuckoo along Mineral Creek.

<u>Queen Creek</u>: Groundwater modeling that was completed for the Draft EIS indicated that groundwater drawdowns were possible but unlikely along Queen Creek. However, the subsidence area would decrease the surface watershed for Queen Creek by about 1,672 acres, resulting in an estimated loss of annual volume in Queen Creek ranging from 19 percent (in Superior) to 3.5 percent (at Whitlow Ranch Dam). A loss of surface water could result in reductions in the health or extent of riparian woodland vegetation over time. Cuckoos have been detected near Whitlow Ranch Dam, but no evidence of breeding territories has been recorded. A decline in riparian woodland vegetation along Queen Creek could lead to migrant or transient cuckoos expending more energy to reach suitable habitat. Because cuckoos occur infrequently along Queen Creek, these impacts are expected to be insignificant and discountable.

<u>Arnett Creek</u>: Groundwater modeling that was completed for the Draft EIS indicated that no groundwater drawdowns were expected along Arnett Creek as a result of mine construction activities; thus, no effects would occur on habitat for the yellow-billed cuckoo along Arnett Creek.

<u>Springs</u>: Of the springs at which groundwater drawdowns would be expected under the proposed action, Bored Spring is the only one that supports any riparian vegetation. However, owing to the general lack of water at Bored Spring, and scattered, sparse riparian trees, Bored Spring would be considered marginal migratory/stopover/foraging habitat for this species. Groundwater drawdown could lead to the death of a large Fremont cottonwood tree at the spring and other trees scattered over a 500-foot reach downstream of the spring. This decline could lead to migrant or transient cuckoos expending more energy to reach suitable habitat. Because cuckoos would be expected to occur very infrequently at Bored Spring, these impacts are expected to be insignificant and discountable.

# Project Components with No Effect on the Species from Operations and Maintenance

No effects on the yellow-billed cuckoo would be expected as a result of operations and maintenance at the following project components: Ore Conveyor/Infrastructure Corridor and Filter Plant and Loadout Facility. There is no habitat for yellow-billed cuckoos within these areas and the species is not known to occur.

## CLOSURE AND RECLAMATION

## East Plant Site Closure and Reclamation

The edge of the East Plant Site footprint is approximately 0.1 mile from a portion of Queen Creek with narrow stringers of riparian vegetation that could provide migratory/stopover/foraging habitat for yellowbilled cuckoos. This portion of Queen Creek parallels and is immediately adjacent to U.S. 60, and current noise levels along this section of Queen Creek are likely high. Cuckoos may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any cuckoos in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from closure and reclamation of the East Plant Site could occur to transient cuckoos along Queen Creek, these effects are expected to be insignificant and discountable.

## West Plant Site Closure and Reclamation

Queen Creek occurs approximately 0.1 mile southeast of the West Plant Site project component footprint and contains suitable migratory/stopover/foraging cuckoo habitat. This portion of Queen Creek runs between West Main Street and U.S. 60 and is surrounded by existing development; thus, existing noise levels are likely extremely high. Cuckoos may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any cuckoos in the area are likely habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from closure and reclamation of the West Plant Site could occur to transient cuckoos along Queen Creek, these effects are expected to be insignificant and discountable.

All portions of Silver King Mine Road are greater than 0.25 mile from Queen Creek, and no noise impacts are expected to the yellow-billed cuckoo as a result of closure and reclamation of the roadway.

## MARRCO Corridor Closure and Reclamation

The portion of Queen Creek that is paralleled by the proposed MARRCO corridor does not contain suitable breeding habitat for the yellow-billed cuckoo. Migratory cuckoos have been detected both downstream of and upstream from this portion of Queen Creek (at Whitlow Ranch Dam and Arnett Creek, respectively), and could occur as migrants or dispersing individuals along the portion of Queen Creek paralleled by the MARRCO corridor. Noise associated with reclamation and closure could cause cuckoos to avoid the area. The intensity of the impacts would decrease with distance from the noise source(s). Any effects would be insignificant and discountable because this area is unlikely to be heavily used as migratory/stopover/foraging habitat and no breeding occurs in this vicinity.

## Water Supply Facilities and Pipelines Closure and Reclamation

The tailings pipeline is the only water supply facility or pipeline that traverses potential habitat for the yellow-billed cuckoo. No riparian vegetation would be removed or disturbed during reclamation activities. All closure and reclamation activities near Mineral Creek would occur outside the cuckoo breeding season (see section 5.3) and would not result in any noise impacts to cuckoos. Any cuckoos present along Queen Creek or Devil's Canyon in the vicinity of the pipeline could be affected by noise associated with closure and reclamation of the pipeline and associated roads if these activities occur between May 15 and September 30. No cuckoos have been recorded near the pipeline crossings of Queen Creek and Devil's Canyon, and cuckoos would likely be present only rarely in places where none have been detected during surveys; thus, noise impacts to cuckoos from closure and reclamation activities are expected to be insignificant and discountable.

Closure and reclamation of water supply facilities and pipelines could increase the potential for the establishment and spread of noxious and invasive plant species, which could increase fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread, and any effects on the yellow-billed cuckoo from the introduction of weedy species are expected to be insignificant and discountable.

## Power Transmission Facilities Closure and Reclamation

Closure and reclamation of the power line that is collocated with the tailings pipeline would have effects similar to those described under the Water Supply Facilities and Pipelines Closure and Reclamation heading. Any cuckoos present along Queen Creek in the vicinity of the 115-kV or collocated 115-kV/230-kV transmission lines could be affected by noise associated with closure and reclamation of the transmission lines and associated roads if these activities occur between May 15 and September 30. Two of the three Queen Creek crossings occur at U.S. 60, and existing noise levels would likely be high. Cuckoos may avoid this area, preferring to use quieter reaches of Queen Creek in the vicinity, and any cuckoos in the area would likely be habituated to high noise levels. Although noise impacts (e.g., avoidance or reduced foraging success) from closure and reclamation of the new 230-kV transmission line could occur to transient cuckoos along Queen Creek, noise is not expected to significantly alter cuckoo behavior, and these effects are expected to be insignificant and discountable.

Closure and reclamation of transmission lines could increase the potential for the establishment and spread of noxious and invasive plant species, which could increase fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread, and any effects on the yellow-billed cuckoo from the introduction of weedy species are expected to be insignificant and discountable.

Closure and reclamation of the transmission lines would benefit the yellow-billed cuckoo by removing collision risks where the transmission lines cross riparian corridors.

## Project Components with No Effect on the Species from Closure and Reclamation

No effects on the yellow-billed cuckoo would be expected as a result of closure and reclamation at the following project components: Skunk Camp Tailings Storage Facility and Filter Plant and Loadout Facility. There is no habitat for yellow-billed cuckoos within these areas and the species is not known to occur.

## **CLEAN WATER ACT SECTION 404 PERMIT**

#### Impacts to Waters of the U.S.

Impacts to waters of the U.S. within the tailings storage facility would have no effect on the yellow-billed cuckoo because there is no suitable habitat and cuckoos do not occur within this project component area.

The effects of impacts to waters of the U.S. as a result of construction of the pipeline/power line corridor are discussed under the Tailings Pipeline Corridor subsection under the Construction heading.

## **Compensatory Mitigation**

For purposes of this document, it is assumed that any actions taken within mitigation areas would incorporate measures to reduce or avoid negative effects on listed species or their proposed critical habitat as these off-site compensatory mitigation parcels are being used for conservation purposes.

The proposed action would lead to mitigation efforts in several areas.

- MAR-5 Wetland/Olberg Road. This area does not currently contain any potential habitat for yellow-billed cuckoo, and tamarisk removal would have no detrimental effects on cuckoos. Any mitigation strategies that result in the establishment and maintenance of native tree species could benefit the cuckoo by creating migration/foraging/stopover habitat or breeding habitat.
- Queen Creek. The stretch of Queen Creek immediately downstream of the town of Superior does not support breeding cuckoos but may be used intermittently by migrant or transient cuckoos. Tamarisk removal and establishment of a conservation easement could benefit the cuckoo by promoting the growth of native riparian vegetation and restricting future development.
- H&E Ranch. The H&E Ranch is along the Lower San Pedro River, which is an important breeding area for the yellow-billed cuckoo and provides migratory stopover locations (USFWS 2020a, 2020c). No recent surveys for the yellow-billed cuckoo have been completed on the H&E Ranch, but incidental detections of cuckoos have been recorded (Andresen 2020). Drainage reconstruction could benefit cuckoos by promoting the establishment and maintenance of native riparian vegetation. Mitigation efforts could also include a temporary reduction in available foraging/migratory/dispersal habitat due to removal of a single strand of vegetation along the eastern bank of the San Pedro River

## **OTHER CONSEQUENCES**

Interrelated and interdependent actions, e.g., power lines, pipelines, etc., were all included in the proposed action; thus, there are no additional interrelated or interdependent actions that would cause additional effects.

Potential cumulative effects on the western DPS of the yellow-billed cuckoo would include the effects of all future non-Federal actions. As the action area and known habitat for the species is primarily found on lands managed by the TNF, it is anticipated that future activities within the action area that could impact the species would be subject to Section 7 consultation under the ESA. The only cumulative action identified is a wildlife water source improvements project proposed by the AGFD. This proposed AGFD project involves catchments on both TNF-administered lands and on private lands. Those catchments on the TNF would involve a separate environmental analysis. For those on private lands, if the AGFD is using state funds or Federal grant monies for the project, then an environmental analysis will also be completed. However, none of the catchments proposed for improvement occur within habitat for the yellow-billed cuckoo within the analysis area and as such, no additional cumulative effects on the species would occur.

There is the potential for impacts related to increased access within the project area and action area from project-related roadways. However, these potential impacts would be avoided through measures to limit access to administrative use only.

# 6.5.3 Determination of Effects

The proposed project would be expected to lead to disturbance of and a reduction in the extent of riparian habitat that the yellow-billed cuckoo could use as migratory/stopover/foraging habitat and could also lead to a reduction in the extent of breeding habitat. These effects would be insignificant and discountable, and take is not expected to occur. The proposed project could also benefit cuckoos through the establishment and growth of riparian vegetation in mitigation areas. As such, the proposed action, which includes conservation measures for the species, may affect, but is not likely to adversely affect the western DPS of the yellow-billed cuckoo. This determination is based on the following:

- possible changes to riparian habitat in Devil's Canyon (which provides migratory/stopover/foraging habitat) from changes in the upstream watershed due to subsidence and from groundwater pumping;
- no anticipated hydrological impacts to Mineral Creek, which is the only riparian area within the footprint of the mine components that likely provides breeding habitat for the cuckoo;
- potential behavioral/habitat use changes along Mineral Creek due to intermittent, increased noise levels during operations and maintenance;
- increased collision risks from powerlines crossing Mineral Creek, Devil's Canyon, and Queen Creek;
- increased potential for invasive and noxious weed establishment and spread along Mineral Creek; and
- potential beneficial impacts at multiple mitigation areas.

# 6.6 Yellow-billed Cuckoo Proposed Critical Habitat

# 6.6.1 Status in Action Area

The project components overlap 14.2 acres of proposed critical habitat for the yellow-billed cuckoo in Unit 30: AZ 28 Mineral Creek this includes the underground pipeline crossing of Mineral Creek (9.5 acres) as well as the 115-kV transmission line (4.7 acres). This unit covers 380 acres along a 7-mile-long continuous segment of Mineral Creek in Pinal and Gila Counties (see figures 15-1 and 15-2). Approximately half (198 acres) of the unit falls under State ownership, 1 acre is federally owned, and the remainder is in other ownership (i.e., private, city, county, or undetermined). Unit 30 is part of the core area of proposed critical habitat and also provides a movement corridor and migratory stopover habitat. Threats identified to this proposed critical habitat area include surface water diversions, groundwater extraction, commercial development, mining, and vehicular traffic and associated noise. The USFWS considered this unit as occupied by cuckoos at the time of listing (USFWS 2020a, 2020c; see section 6.5 for details on the status of the yellow-billed cuckoo within the action area).

The H&E Ranch overlaps 265 acres of proposed critical habitat in Unit 17: AZ 15 Lower San Pedro and Gila Rivers. This unit covers 23,400 acres along the Lower San Pedro and Gila Rivers, extending along the San Pedro River from above the town of Mammoth downstream to the Gila River confluence and along the Gila River from the San Carlos Reservoir downstream beyond the town of Kearny. Approximately 2,957 acres are in Federal ownership; 2,282 acres are in State ownership; 729 acres are in Tribal ownership; and 17,431 acres are in other ownership. The unit is an important breeding area for yellow-billed cuckoos and is consistently occupied during the breeding season. The unit also provides a movement corridor and migratory stopover location for cuckoos moving farther north. The action area overlaps a total of 971.5 acres of proposed critical habitat across Units 17 and 30.

The proposed critical habitat units provide all the physical and biological features (also known as PCEs) identified as being essential for the conservation of the species (USFWS 2020a, 2020c):

- Riparian woodlands, mesquite woodlands (mesquite-thorn-forest), and Madrean evergreen woodland drainages;
- Prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies, moth larvae, spiders), lizards, and frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas; and
- Hydrologic processes, in natural or altered systems, that provide for maintaining and regenerating breeding habitat.

# 6.6.2 Analysis of Effects

## CONSTRUCTION

This section outlines the analysis of effects on the yellow-billed cuckoo proposed critical habitat from each of the proposed action components. For each of the phases (Construction, Operations and Maintenance, and Closure and Reclamation), only components that may have effects on critical habitat or that need explanation to rule out effects are discussed individually. The remaining components are grouped together under a no effects subheading because they do not contain proposed critical habitat, and no effects are expected as a result of project activities.

## Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

The tailings pipeline corridor and the transmission line corridor cross proposed critical habitat for the yellow-billed cuckoo along Mineral Creek. The pipeline would be bored beneath the creek, all power poles would be placed outside proposed critical habitat, and no new access roads would be created within proposed critical habitat. Therefore, no proposed critical habitat would be disturbed or removed at the Mineral Creek crossing.

Construction in the tailings pipeline corridor could increase the potential for the establishment and spread of noxious and invasive plant species. These species could reduce overall habitat quality and lead to the increased fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

## Anticipated Groundwater and Surface Water Impacts

Groundwater modeling that was completed for the Draft EIS indicated that no groundwater drawdowns were expected along Mineral Creek as a result of mine construction activities; thus, no effects would occur on proposed critical habitat for the yellow-billed cuckoo along Mineral Creek. In addition, Mineral Creek would not be impacted by the subsidence crater as it occurs in a separate watershed.

Creation of the Skunk Camp tailings storage facility would result in a loss of stormwater runoff as a portion of the Dripping Spring Wash watershed would be cut off to contain stormwater that interacts with tailings. Because the loss in average annual volume in the Gila River downstream of Dripping Spring Wash is within the natural variation of the Gila River (estimated as 0.5 percent in the Gila River, downstream from the confluence with Dripping Spring Wash, and 0.3 percent in the Gila River at Donnelly Wash), there would be no measurable effects on proposed critical habitat or its features essential for the conservation of the species along the Gila River.

# Project Components with No Effect on Proposed Critical Habitat from Construction

No effects on the yellow-billed cuckoo proposed critical habitat would be expected as a result of construction at the following project components: Underground Mining and Subsidence, East Plant Site, Ore Conveyor/Infrastructure Corridor, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV transmission line collocated with the tailings pipeline corridor, which is discussed above). There is no yellow-billed cuckoo proposed critical habitat within these areas, and no effects are expected as a result of project activities.

## OPERATIONS AND MAINTENANCE

## Tailings Pipeline Corridor and Collocated 115-kV Transmission Line

Operations and maintenance of the tailings pipeline corridor would not result in any ground disturbance beyond what is described under the Construction section. Pipeline maintenance inspections are expected to occur approximately once every two weeks. Operation of the tailings pipeline corridor could increase the potential for establishment and spread of noxious weeds and invasive plant species. Vehicles using the access roads may bring in invasive species from other locations. These species could reduce overall habitat quality and lead to the increased fire risk. Implementation of the Noxious Weed and Invasive Species Management Plan (Resolution Copper 2019) would reduce, minimize, and possibly eliminate the potential for noxious and invasive weed establishment and spread in the project area and action area.

#### Anticipated Groundwater and Surface Water Impacts

Analysis completed for the Draft EIS indicated that no groundwater drawdowns are expected along Mineral Creek as a result of mine operation activities, and no surface water impacts are expected as it occurs in a different watershed than the subsidence crater. Thus, no there would be no effects on proposed critical habitat for the yellow-billed cuckoo along Mineral Creek.

Operation of the Skunk Camp tailings storage facility would result in a loss of stormwater runoff as a portion of the Dripping Spring Wash watershed would be cut off to contain stormwater that interacts with tailings. Because the loss in average annual volume in the Gila River downstream of Dripping Spring Wash is within the natural variation of the Gila River (estimated as 0.5 percent in the Gila River, downstream from the confluence with Dripping Spring Wash, and 0.3 percent in the Gila River at Donnelly Wash), there would be no measurable, indirect effects on proposed critical habitat along the Gila River.

# Project Components with No Effect on Proposed Critical Habitat from Operations and Maintenance

No effects on yellow-billed cuckoo proposed critical habitat would be expected as a result of operations and maintenance at the following project components: Underground Mining and Subsidence, East Plant Site, Ore Conveyor/Infrastructure Corridor, West Plant Site, Skunk Camp Tailings Storage Facility, MARRCO Corridor, and Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV transmission line collocated with the tailings pipeline corridor, which is discussed above). There is no yellow-billed cuckoo proposed critical habitat within these areas, and no effects are expected as a result of project activities.

## CLOSURE AND RECLAMATION

## Skunk Camp Tailings Storage Facility Closure and Reclamation

No proposed critical habitat for the yellow-billed cuckoo is present within the footprint of the Skunk Camp tailings storage facility. The land would be contoured so that all drainage remains in the Dripping Spring Wash watershed, and closure of the tailings facility would thus not result in any changes to surface water or groundwater along Mineral Creek and would have no effect on proposed critical habitat along Mineral Creek. Closure and reclamation of the tailings facility would result in the eventual return of stormwater runoff to Dripping Spring Wash. The change in average annual volume in the Gila River downstream of Dripping Spring Wash would be within the natural variation of the Gila River, and there would be no measurable effects on proposed critical habitat along the Gila River.

#### Water Supply Facilities and Pipelines Closure and Reclamation

The tailings pipeline is the only water supply facility or pipeline that traverses proposed critical habitat for the yellow-billed cuckoo. The pipeline would be bored beneath proposed critical habitat, and no proposed critical habitat would be altered during reclamation activities.

#### Power Transmission Facilities Closure and Reclamation

#### New 115-kV Transmission Line Collocated with Tailings Pipeline Corridor

All power poles would be placed outside of proposed critical habitat, and decommissioning and removal of the transmission line would not result in the alteration of any proposed critical habitat.

## Project Components with No Effect on Proposed Critical Habitat from Closure and Reclamation

No effects on yellow-billed cuckoo proposed critical habitat would be expected as a result of closure and reclamation at the following project components: East Plant Site, West Plant Site, MARRCO Corridor, and Filter Plant and Loadout Facility, and Electricity Supply and Transmission Lines (with the exception of the new 115-kV transmission line collocated with the tailings pipeline corridor, which is discussed above). There is no yellow-billed cuckoo proposed critical habitat within these areas, and no effects are expected as a result of project activities.

## **CLEAN WATER ACT SECTION 404 PERMIT**

#### Impacts to Waters of the U.S.

Impacts to waters of the U.S. within the tailings storage facility would have no effect on proposed critical habitat for the yellow-billed cuckoo because there is no proposed critical habitat within this project component area.

The effects of impacts to waters of the U.S. as a result of construction of the pipeline/power line corridor are discussed under the Tailings Pipeline Corridor subsection under the Construction heading.

## **Compensatory Mitigation**

For purposes of this document, it is assumed that any actions taken within mitigation areas would incorporate measures to reduce or avoid negative effects on listed species or their critical habitat as these off-site compensatory mitigation parcels are being used for conservation purposes.

The proposed action would lead to mitigation efforts in several areas.

- MAR-5 Wetland/Olberg Road. This area does not overlap proposed critical habitat for the yellow-billed cuckoo, and mitigation actions here would have no effect on proposed critical habitat.
- Queen Creek. This area does not overlap proposed critical habitat for the yellow-billed cuckoo, and mitigation actions here would have no effect on proposed critical habitat.
- H&E Ranch. The H&E Ranch encompasses 265 acres of proposed critical habitat for the yellowbilled cuckoo along the Lower San Pedro River. Proposed mitigation efforts at the H&E Ranch include drainage reconstruction to reconnect abandoned agricultural land on floodplain terraces to the active river channel. These abandoned agricultural lands are outside the area of proposed critical habitat. A single strand of riparian vegetation within proposed critical habitat along the eastern bank of the San Pedro River could be removed by drainage reconstruction. Drainage reconstruction and subsequent planting of native species could benefit proposed critical habitat by promoting the establishment and maintenance of native riparian vegetation.

## **OTHER CONSEQUENCES**

Interrelated and interdependent actions, e.g., power lines, pipelines, etc., were all included in the proposed action; thus, there are no additional interrelated or interdependent actions that would cause additional effects. Potential cumulative effects within the action area on proposed critical habitat for the yellow-billed cuckoo would include the effects of all future non-Federal actions. As the action area is primarily found on lands managed by the TNF, it is anticipated that future activities within the action area that could impact proposed critical habitat would be subject to Section 7 consultation under the ESA.

## 6.6.3 Determination of Effects

The proposed action may affect but is not likely to adversely affect proposed critical habitat for the yellow-billed cuckoo. This determination is based on the following:

- No alteration of proposed critical habitat along Mineral Creek;
- potential for an increase in the physical and biological features identified as being essential for the conservation of the species within the compensatory mitigation parcels; and
- no hydrologic impacts for proposed critical habitat along Mineral Creek or along the Gila River, about 11 miles south of the project area.

# 6.7 Southwestern Willow Flycatcher Designated Critical Habitat

## 6.7.1 Status in Action Area

Within the action area, the only portion of the proposed action that has designated critical habitat for the southwestern willow flycatcher is the compensatory mitigation lands at H&E Ranch (288 acres) (see figure 15-2). The critical habitat in this area occurs along the San Pedro River, within the Middle Gila/San Pedro Management Unit (USFWS 2013a). The Middle Gila/San Pedro Management Unit had recent breeding territories detected and was known to be occupied at time of listing.

PCEs associated with the southwestern willow flycatcher designated critical habitat (USFWS 2013a) include:

- Riparian vegetation. Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is composed of trees and shrubs (that can include Goodding's willow, coyote willow, Geyer's willow (*Salix exigua*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), yewleaf willow (*S. taxifolia*), pacific willow (*S. lucida*), boxelder (*Acer negundo*), tamarisk, Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus* spp.), cottonwood, stinging nettle (*Urtica* sp.), alder (*Alnus* spp.), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry, seep willow (*Baccharis salicifolia*), oak (*Quercus* spp.), rose (*Rosa* spp.), sycamore, false indigo (*Baptisia* spp.), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus parvifolia*), and walnut) and some combination of:
  - (a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 feet). Lower stature thickets (2 to 4 m or 6 to 13 feet tall) are found at higher elevation riparian forests, and tall-stature thickets are found at middle and lower elevation riparian forests;
  - (b) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 feet) above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
  - (c) Sites for nesting that contain a dense (about 50 to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
  - (d) Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 hectare (0.25 acre) or as large as 70 hectares (175 acres).
- (2) Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Order Hymenoptera); dragonflies (Order Odonata); flies (Order Diptera); true bugs (Order Hemiptera); beetles (Order Coleoptera); butterflies, moths, and caterpillars (Order Lepidoptera); and spittlebugs (Order Homoptera).

## 6.7.2 Analysis of Effects

The only part of the proposed action that would have potential effects on designated critical habitat for the southwestern willow flycatcher is actions associated with the off-site compensatory mitigation. Those

actions include the establishment of a conservation easement for the H&E Ranch mitigation parcel and the proposed drainage reconstruction and reconfiguration and removal of tamarisk at the H&E Ranch mitigation parcel.

The establishment of a conservation easement would provide beneficial effects on designated critical habitat for the southwestern willow flycatcher by having a portion of critical habitat preserved in perpetuity. Proposed mitigation efforts at the H&E Ranch include drainage reconstruction to reconnect abandoned agricultural land on floodplain terraces to the active river channel. These abandoned agricultural lands are outside the area of designated critical habitat. A single strand of riparian vegetation within designated critical habitat along the eastern bank of the San Pedro River could be temporarily removed by drainage reconstruction. Drainage reconstruction and subsequent planting of native species could benefit designated critical habitat by reestablishing natural runoff and promoting the establishment and maintenance of native riparian vegetation.

## 6.7.3 Determination of Effects

The proposed action may affect but is not likely to adversely affect designated critical habitat for the southwestern willow flycatcher. This determination is based on the following:

- the establishment of a conservation easement would provide beneficial effects on designated critical habitat for the southwestern willow flycatcher by having a portion of critical habitat preserved in perpetuity;
- the proposed drainage reconstruction and reconfiguration and removal of tamarisk actions would be planned and conducted in a manner that minimizes any adverse effects on listed species and critical habitat; and
- the result of the proposed drainage reconstruction and reconfiguration and removal of tamarisk actions would provide beneficial effects on designated critical habitat for the southwestern willow flycatcher by reestablishing natural runoff and promoting the establishment and maintenance of native riparian vegetation.

## 6.8 Northern Mexican Gartersnake

## 6.8.1 Species Status in Action Area

Within the action area, the only portion of the proposed action area where northern Mexican gartersnake has potential to occur is the off-site compensatory mitigation lands, specifically H&E Ranch (see figure 15-2). The northern Mexican gartersnake is thought to exist in low-density populations along the San Pedro River (USFWS 2013b, 2014b, 2014c). Although no recent occurrences have been detected along the lower San Pedro River (north of Interstate 10), this stretch of the San Pedro River has had only 11 person-search hours since 1996. The lower San Pedro River hosts robust populations of lowland leopard frogs (*Lithobates yavapaiensis*) and longfin dace, prey species for the northern Mexican gartersnake. On April 28, the USFWS published a revision to the proposed rule on proposed critical habitat for the northern Mexican gartersnake occurred within the action area, including in the off-site CWA compensatory mitigation parcels.

## 6.8.2 Analysis of Effects

The only part of the proposed action that would have potential effects on northern Mexican gartersnake are from actions associated with the off-site compensatory mitigation, the establishment of a conservation easement for the H&E Ranch mitigation parcel.

The establishment of a conservation easement and contribution of funds would provide beneficial effects on the northern Mexican gartersnake by having a portion of suitable habitat for the species and its native prey preserved in perpetuity. As described in Section 3.2.6, mitigation activities are split into three areas (figure 9-2) each with specific planned mitigation activities. Earthwork is planned in Area A, planting and reseeding is planned for Areas A and B, and no restoration activities are planned for Areas C. Work would not occur during flycatcher and cuckoo breeding seasons (May 1-September 30). Northern Mexican gartersnakes have the potential to occur within the H&E parcels. Earthwork at the H&E parcels will be limited to Area A, which contains highly disturbed, upland areas away from the current San Pedro River channel that this species would be unlikely to use for hunting, basking, dispersal, or hibernation. Thus, individual gartersnakes would not be expected to be injured or killed as a result of restoration activities at the H&E parcels. Any northern Mexican gartersnake that occurs within the H&E parcels or surrounding action area during restoration activities could experience minor behavior changes from increased noise, disturbance, or human presence resulting from restoration activities (earthwork at Area A, planting and reseeding at Areas A and B). Individual snakes would be expected to move away from restoration activities toward adjacent areas of suitable habitat temporarily until project activities ceased. Thus, effects to northern Mexican gartersnake would be insignificant and discountable.

## 6.8.3 Determination of Effects

The proposed action may affect but is not likely to adversely affect the northern Mexican gartersnake. This determination is based on the following:

- the establishment of a conservation easement would provide beneficial effects on for the northern Mexican gartersnake by having a portion of suitable habitat preserved in perpetuity;
- the proposed restoration activities would occur outside of the active San Pedro river channel, and earthmoving would only occur in Area A, which is a highly disturbed, upland portion within the H&E parcels where this species would not be expected to use; thus no mortality or injuries would be expected; and
- during restoration activities, any individuals that are present in the action area could experience minor effects; snakes would be expected to avoid the vicinity and move to other patches of suitable habitat when restoration activities occur.

## 6.9 Other Species

The Cave Creek and Mesa Districts of the TNF joined and signed on to the Sonoran desert tortoise (*Gopherus morafkai*) Candidate Conservation Agreement (CCA) that was finalized on May 27, 2015 (USFWS and Arizona Interagency Desert Tortoise Team 2015). Since Sonoran desert tortoise is known to and is likely to occur in portions of the action area and therefore may impact individuals but is not likely to result in a trend toward federal listing or loss of viability,<sup>11</sup> for potions of the project area that fall under the TNF's administration, they will ensure that this project follows the portions of the CAA that were specific to the TNF. In addition, lands within the project area administered by the ASLD will also ensure

<sup>&</sup>lt;sup>11</sup> A detailed analysis for the Sonoran desert tortoise can be found in the Forest Service Biological Evaluation and the EIS.

that this project follows the CAA that they signed on to, as well. The CCA was also referenced in appendix J of the DEIS. These include:

- The land and resource management plan: Plan components in the form of desired conditions, objectives, and standards and guidelines can provide for the conservation of the Sonoran desert tortoise and its habitat on public lands.
- Forest Service Manual (FSM) 2670: Through the biological evaluation process (FSM 2670.32) for land and resource management activities, project level effects on sensitive species are evaluated for conformance with the viability directives contained in the FSM. Other direction relevant to Sonoran desert tortoise in the FSM and the land and resource management plans include, but are not limited to:
  - FSM Objectives: 2670.22 Sensitive Species
    - Develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.
    - Maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on NFS lands.
    - Develop and implement management objectives for populations and/or habitat of sensitive species.
  - FSM Policy: 2670.32 Sensitive Species
    - Assist States in achieving their goals for conservation of endemic species.
    - Review programs and activities as part of the NEPA process through a biological evaluation, to determine their potential effect on sensitive species.
    - Avoid or minimize impacts to species whose viability has been identified as a concern.
    - Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
    - Establish management objectives in cooperation with the States when projects on NFS lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for Federal candidate species, in cooperation with the USFWS and the States.
  - Conservation Measures for the Main Sonoran Desert Tortoise Stressors on the Units (See appendix A of the CCA document for specifics on these items):
    - Inventory and map invasive plant infestations and prioritize treatments in Sonoran desert tortoise habitat. Work with partners (Arizona Interagency Desert Tortoise Team, local volunteers, and organizations) to control or eradicate invasive plant species.
    - Routes that conflict with maintaining desert tortoise habitat will be mitigated. Mitigation
      will include, but will not be limited to, the following: route closure, seasonal restrictions,
      rerouting, vehicle type restrictions, speed restrictions, etc.
    - Implement grazing management practices to achieve or make significant progress toward meeting desired conditions within Sonoran desert tortoise habitat.

If a Sonoran desert tortoise is encountered during project activities, handling guidelines developed by AGFD (2014) will be followed to reduce impacts to tortoises (appendix G).

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## **APPENDIX A**

List of Acronyms

## ACRONYMS AND ABBREVIATIONS

°C	degree(s) Celsius
°F	degree(s) Fahrenheit
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
АНС	Arizona hedgehog cactus
amsl	above mean sea level
APLIC	Avian Power Line Interaction Committee
APP	Aquifer Protection Permit
ASLD	Arizona State Land Department
AWBM	Australian Water Balance Model
AZPDES	Arizona Pollutant Discharge Elimination System
BA	Biological Assessment
BGC Engineering	BGC Engineering USA Inc.
BLM	U.S. Department of the Interior Bureau of Land Management
CCA	Candidate Conservation Agreement
CWA	Clean Water Act
DCH	Designated Critical Habitat
DPS	Distinct Population Segment
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
forest plan	Tonto National Forest Land and Resource Management Plan
Forest Service	U.S. Department of Agriculture Forest Service
FSM	Forest Service Manual
GDE	groundwater-dependent ecosystems
GIS	geographic information system
GPO	General Plan of Operations
HDD	horizontal directional drill
IPaC	Information for Planning and Consultation
kV	kilovolt(s)
m	meter(s)
MARRCO	Magma Arizona Railroad Company

Montgomery	Montgomery and Associates Inc.
MSHA	Mine Safety and Health Administration
MWEPA	Mexican wolf experimental population area
NDAA	the Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015
NEPA	National Environmental Policy Act of 1969, as amended
NFS	National Forest System
NMIDD	New Magma Irrigation and Drainage District
NPAG	non-potentially acid generating
Oak Flat Withdrawal Area	Oak Flat Picnic and Campground Withdrawal Area
PAG	potentially acid generating
PCE	primary constituent element
РСН	Proposed Critical Habitat
PNVT	Potential Natural Vegetation Types
project	Resolution Copper Project and Land Exchange
Resolution Copper	Resolution Copper Mining, LLC
SMA	Special Management Area
SRP	Salt River Project
SSA	Species Status Assessment
SWCA	SWCA Environmental Consultants
SWReGAP	Southwest Regional Gap Analysis Project
TNF	Tonto National Forest
U.S.	United States
U.S. 60	U.S. Route 60
USFWS	U.S. Fish and Wildlife Service
WestLand	WestLand Resources Inc.

## **APPENDIX B**

Official IPaC Species List



## United States Department of the Interior

FISH AND WILDLIFE SERVICE Arizona Ecological Services Field Office 9828 North 31st Ave #c3 Phoenix, AZ 85051-2517



#c3 Phoenix, AZ 85051-2517 Phone: (602) 242-0210 Fax: (602) 242-2513 <u>http://www.fws.gov/southwest/es/arizona/</u> <u>http://www.fws.gov/southwest/es/EndangeredSpecies\_Main.html</u>

March 13, 2020

In Reply Refer To: Consultation Code: 02EAAZ00-2020-SLI-0553 Event Code: 02EAAZ00-2020-E-01231 Project Name: Resolution Copper Mine-Skunk Camp

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The Fish and Wildlife Service (Service) is providing this list under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The list you have generated identifies threatened, endangered, proposed, and candidate species, and designated and proposed critical habitat, that may occur within one or more delineated United States Geological Survey 7.5 minute quadrangles with which your project polygon intersects. Each quadrangle covers, at minimum, 49 square miles. In some cases, a species does not currently occur within a quadrangle but occurs nearby and could be affected by a project. Please refer to the species information links found at:

http://www.fws.gov/southwest/es/arizona/Docs\_Species.htm

http://www.fws.gov/southwest/es/arizona/Documents/MiscDocs/AZSpeciesReference.pdf .

The purpose of the Act is to provide a means whereby threatened and endangered species and the habitats upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of Federal trust resources and to consult with us if their projects may affect federally listed species and/or designated critical habitat. A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, we recommend preparing a biological evaluation similar to a Biological Assessment to determine whether the project may

affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If the Federal action agency determines that listed species or critical habitat may be affected by a federally funded, permitted or authorized activity, the agency must consult with us pursuant to 50 CFR 402. Note that a "may affect" determination includes effects that may not be adverse and that may be beneficial, insignificant, or discountable. You should request consultation with us even if only one individual or habitat segment may be affected. The effects analysis should include the entire action area, which often extends well outside the project boundary or "footprint." For example, projects that involve streams and river systems should consider downstream effects. If the Federal action agency determines that the action may jeopardize a proposed species or adversely modify proposed critical habitat, the agency must enter into a section 7 conference. The agency may choose to confer with us on an action that may affect proposed species or critical habitat.

Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend considering them in the planning process in the event they become proposed or listed prior to project completion. More information on the regulations (50 CFR 402) and procedures for section 7 consultation, including the role of permit or license applicants, can be found in our Endangered Species Consultation Handbook at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF.

We also advise you to consider species protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) and the Bald and Golden Eagle Protection Act (Eagle Act) (16 U.S.C. 668 et seq.). The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the Service. The Eagle Act prohibits anyone, without a permit, from taking (including disturbing) eagles, and their parts, nests, or eggs. Currently 1026 species of birds are protected by the MBTA, including species such as the western burrowing owl (Athene cunicularia hypugea). Protected western burrowing owls are often found in urban areas and may use their nest/burrows year-round; destruction of the burrow may result in the unpermitted take of the owl or their eggs.

If a bald eagle (or golden eagle) nest occurs in or near the proposed project area, you should evaluate your project to determine whether it is likely to disturb or harm eagles. The National Bald Eagle Management Guidelines provide recommendations to minimize potential project impacts to bald eagles:

https://www.fws.gov/migratorybirds/pdf/management/ nationalbaldeaglenanagementguidelines.pdf https://www.fws.gov/birds/management/managed-species/eagle-management.php.

The Division of Migratory Birds (505/248-7882) administers and issues permits under the MBTA and Eagle Act, while our office can provide guidance and Technical Assistance. For more information regarding the MBTA, BGEPA, and permitting processes, please visit the following: https://www.fws.gov/birds/policies-and-regulations/incidental-take.php. Guidance for minimizing impacts to migratory birds for communication tower projects (e.g. cellular, digital television, radio, and emergency broadcast) can be found at:

https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/communication-towers.php.

Activities that involve streams (including intermittent streams) and/or wetlands are regulated by the U.S. Army Corps of Engineers (Corps). We recommend that you contact the Corps to determine their interest in proposed projects in these areas. For activities within a National Wildlife Refuge, we recommend that you contact refuge staff for specific information about refuge resources.

If your action is on tribal land or has implications for off-reservation tribal interests, we encourage you to contact the tribe(s) and the Bureau of Indian Affairs (BIA) to discuss potential tribal concerns, and to invite any affected tribe and the BIA to participate in the section 7 consultation. In keeping with our tribal trust responsibility, we will notify tribes that may be affected by proposed actions when section 7 consultation is initiated.

We also recommend you seek additional information and coordinate your project with the Arizona Game and Fish Department. Information on known species detections, special status species, and Arizona species of greatest conservation need, such as the western burrowing owl and the Sonoran desert tortoise (Gopherus morafkai) can be found by using their Online Environmental Review Tool, administered through the Heritage Data Management System and Project Evaluation Program https://www.azgfd.com/Wildlife/HeritageFund/.

For additional communications regarding this project, please refer to the consultation Tracking Number in the header of this letter. We appreciate your concern for threatened and endangered species. If we may be of further assistance, please contact our following offices for projects in these areas:

Northern Arizona: Flagstaff Office 928/556-2001 Central Arizona: Phoenix office 602/242-0210 Southern Arizona: Tucson Office 520/670-6144

Sincerely, /s/ Jeff Humphrey Field Supervisor

Attachment

Attachment(s):

Official Species List

## **Official Species List**

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

#### **Arizona Ecological Services Field Office**

9828 North 31st Ave #c3 Phoenix, AZ 85051-2517 (602) 242-0210

## **Project Summary**

Consultation Code:	02EAAZ00-2020-SLI-0553
Event Code:	02EAAZ00-2020-E-01231
Project Name:	Resolution Copper Mine-Skunk Camp
Project Type:	MINING
Project Description:	Resolution Copper has submitted a Mining Plan of Operation to the Tonto National Forest (Tonto). The project is located on private, state, Forest Service lands in Pinal and Gila Counties. The National Environmental Policy Act (NEPA) process is in process and the Skunk Camp alternative has been selected as the proposed action. SWCA Environmental Consultants is assisting the Tonto with preparing the Biological Assessment for the project. This is an updated IPaC with a new shapefile for the previous submittal under Consultation Code 02EAAZ00-2020- SLI-0104 and Event Code 02EAAZ00-2020-E-00233.

#### Project Location:

Approximate location of the project can be viewed in Google Maps: <u>https://www.google.com/maps/place/32.802416715955985N110.68677931146993W</u>



Counties: Gila, AZ | Pinal, AZ

## **Endangered Species Act Species**

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries<sup>1</sup>, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

#### Mammals

NAME	STATUS
Gray Wolf <i>Canis lupus</i>	Proposed
Population: Mexican gray wolf, EXPN population	Experimental
No critical habitat has been designated for this species.	Population,
	Non-
	Essential
Ocelot Leopardus (=Felis) pardalis	Endangered
No critical habitat has been designated for this species.	
Species profile: <u>https://ecos.fws.gov/ecp/species/4474</u>	
Sonoran Pronghorn Antilocapra americana sonoriensis	Experimental
Population: U.S.A. (AZ), Mexico	Population,
No critical habitat has been designated for this species.	Non-
Species profile: <u>https://ecos.fws.gov/ecp/species/4750</u>	Essential

## Birds

NAME	STATUS
Southwestern Willow Flycatcher <i>Empidonax traillii extimus</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/6749</u>	Endangered
Yellow-billed Cuckoo Coccyzus americanus Population: Western U.S. DPS There is <b>proposed</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/3911</u>	Threatened

## Reptiles

NAME	STATUS
Northern Mexican Gartersnake Thamnophis eques megalops	Threatened
There is <b>proposed</b> critical habitat for this species. Your location overlaps the critical habitat.	
Species profile: <u>https://ecos.fws.gov/ecp/species/7655</u>	

## Fishes

NAME	STATUS
Gila Chub <i>Gila intermedia</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/51</u>	Endangered
Gila Topminnow (incl. Yaqui) <i>Poeciliopsis occidentalis</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/1116</u>	Endangered
Loach Minnow <i>Tiaroga cobitis</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/6922</u>	Endangered
Spikedace <i>Meda fulgida</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/6493</u>	Endangered

## **Flowering Plants**

NAME	STATUS
Acuna Cactus <i>Echinomastus erectocentrus var. acunensis</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/5785</u>	Endangered
Arizona Hedgehog Cactus <i>Echinocereus triglochidiatus var. arizonicus</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/1702</u>	Endangered

## **Critical habitats**

There are 4 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Gila Chub Gila intermedia https://ecos.fws.gov/ecp/species/51#crithab	Final
Northern Mexican Gartersnake <i>Thamnophis eques megalops</i> <u>https://ecos.fws.gov/ecp/species/7655#crithab</u>	Proposed
Southwestern Willow Flycatcher <i>Empidonax traillii extimus</i> https://ecos.fws.gov/ecp/species/6749#crithab	Final
Yellow-billed Cuckoo Coccyzus americanus https://ecos.fws.gov/ecp/species/3911#crithab	Proposed

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## **APPENDIX C**

Consultation, Coordination, and Meeting Information

## **Meeting Minutes**

To: Project Record

From: Donna Morey, SWCA

Engineering/Minerals Tonto National Forest Phoenix, AZ

#### Re: Resolution Kick Off Meeting with USFS/USACE/USFWS/SWCA 1/24/2020

#### Attendees:

USFS: Mary Rasmussen, Drew Ullberg, Mike Martinez, Mark Taylor, Lee Ann Atkinson SWCA: Chris Garrett, Donna Morey, Eleanor Gladding, Jeff Johnson USACE: Mike Langley USFWS: Greg Beatty, Kathy Robertson

## Handouts:

Agenda (1pg) Maps and Project overview handouts (6pg)

## Discussion:

Introduction and Safety moment to kick off discussions between USFWS, USFS, USACE on the Resolution Copper Project.

Discussion Topics:

 Non-Federal Representation – USFWS has received the letter and USFWS agrees that is all is needed for SWCA to be included in the conversations. No response is necessary to finalize the process. Forest will remain in the room for meetings, provides a guidance role to SWCA, but SWCA is allowed to contact USFWS for specific questions or logistics. Primary contact is Mary Rasmussen, request cc: to Mary Rasmussen, Chris Garrett, Donna Morey on any emails as they will ensure communications are distributed as needed to the rest of the group.

Proposed Action Overview/Overview of Project -

- Initial map shows the proposed action (Near West) as it was given to the Forest for the initial General Plan of Operations (GPO). After the GPO was submitted, a Land Exchange was added to the project thru the NDAA legislation. The Draft EIS analyzed the GPO as well as the Land Exchange, although there is no Forest decision on the land exchange.
- Second map shows the alternatives analyzed in the Draft EIS. At this time we have coded the comments receive during the Draft EIS and have a Preferred Alternative Alternative 6 Skunk Camp North Pipeline Option.
- In the past 6 months, the Forest has engaged with SRP and other landowners to discuss updated routes for the pipelines and powerlines that may have less impacts to resources. Maps 3 and 4 show the most recent version of a less impactful alignment.
- Construction and Operations Phase. The EIS overestimated impacts by assuming everything within the corridor would be impacted. This would not be the case but allows further design refinements within the corridor for construction. SRP is concerned with the overestimation as it

would be much smaller for powerline towers and access. SRP has an existing BO that covers the maintenance and operations (O&M) of their lines with USWFS. SRP asked that we include the conservation measures from that agreement in this BA.

• The EIS was written to include the project with and without the Land Exchange (LEX) as Resolution may cancel the exchange per the NDAA. The Federal government may not cancel the LEX so we assume for this consultation that the Land Exchange will not be part of the BA as there is not a federal decision. Once the lands are exchanged the federal agencies (USFS TNF and CNF along with BLM) will need to include the land in a land management action with its own consultation.

### Uncertainties

- Reroutes or modifications Discussed above, there are routes that impact less species/habitat/ and other features being considered. The BA will provide the most likely alignment for USFWS consideration.
- Mitigations outside of the Proposed Mining project -
  - Based on 404-permitting for WOTUS at Skunk Camp, there will be compensatory mitigations necessary. At this time Resolution has proposed 5 different on the ground compensatory mitigation locations into the project. The San Pedro ILF does not need to be part of this discussion as it has already undergone consultation with AGFD. Site specific plans will be developed over the next few months, they will likely include removal of invasive species, reconnection of floodplains, and other ground disturbing activities.
    - H&E ranch, Granite Reef, GRIC Mar5 and Olberg Rd, Queen Creek, Government Springs

**Question:** How would the USFWS ask for mitigation? Do they ask USFS to tie to approval of a GPO or the Special Use Permit (SUP) or another agency that has a permit/approval?

Species to be addressed and impacts on species/habitats -

- Ground disturbance from subsidence and the project as well as water withdrawal. Impacts expected in Mineral Creek and Devils Canyon which are migratory stopover habitat for YBCC and Gila Chub critical habitat at Mineral Creek. Subsidence crater and linear routes would cross AHC habitat and AHC. No impacts reach the Gila so no SWFL or YBCC for critical habitat.
  - Gila Chub critical habitat will be considered as occupied per recent USFWS guidance.
- Groundwater pumping is occurring presently to dewater the mine workings, it is done legally and on private land at the East Plant Site. The EIS does predict a number of springs will dry up or be directly impacted regardless if the mine is approved or not. There are higher number of impacts if the mine is approved. The flow in Devils Canyon is not modeled to dry up, but one spring along DC does show that it might be impacted.
  - Kathy noted the uncertainty about water modeling in the DEIS and is supportive of a large monitoring program.
- Mexican Spotted Owl does occur north of Skunk Camp, but should not be impacted by the project as an initially proposed northern access road has been dismissed from further consideration.

- Desert Tortoise do occur along the MARRCO and the EIS has some measures such as to clear out tortoise before subsidence occurs, speed limits, and worker training. There is a proposed mitigation measure in DEIS Appendix J – CA-191.
  - Need to confirm if this was already agreed to by Resolution as the Forest is unable to require across other jurisdictions.
- A fire near Whitlow Ranch Dam burned the brush used as SWFL habitat, but there are occasional surveys showing them in the area.
- AGFD is interested in the portion of Queen Creek fed by water treatment plant and another mine's dewatering for fish. Water in that area is complicated with inputs from wastewater treatment plant, mine pit discharge pumping and a possible groundwater component.
- Arnett Creek and Telegraph Creek have riparian areas and water. Arnett has long fin dace and AGFD reintroduced top minnow but was later lost and not restocked per Kathy. Both areas are outside of the project impacts.

USFWS biggest concern is defining the action area and understanding the effects

- Kathy as lead of the AHC group is most concerned with this species. Would like any plants that would be impacted replanted immediately on Forest land rather than on private lands. Mark feels there are 20-30 plants in the subsidence zone area.
  - Resolution has been doing work with AHC including germinating 2,000-3,000 plants and have included children on projects at the JI Ranch (just east of Oak Flat). Mark is aware of the work done but does not have data or report on this to provide.
  - What do we feel the population of AHC could be? Mark Taylor uses information by Baker. Kathy does not have a plant count. Many of the GPS points are not the correct identification, may have more than one plant per area, and do not include metadata. The plants removed from US 60 have not been updated in HDMS so that count is not accurate. Kathy focuses on DBG for their genetic work – the distribution goes up into the Superstitions and along US 60. The ones at El Capitan are a mix and that needs to be resolved. Mark has heard of AHC in Dripping Springs but feels it is mis-identification.
    - Mark and Kathy will consider ideas that could be included as conservation measures for the species.
    - Mark suggests a survey for AHC, group unsure how to get access easily on ALSD land. Jeff J stated there have been some surveys along pipeline, but not sure how far they extended.
    - Season of survey is March April to see flower blooms.

ESA rule changes/terms -

- USFWS must return their BO with new language, but it is not necessary to change BA to match. Greg finds the old language easier to connect the dots.
- They still are looking at effects by proposed action later in time, "but for" the proposed action. Kathy feels this could be caused by the water or tailings.
- Activities reasonably certain to occur hydrology modeling. USFWS may need additional talks when it comes to model to work thru the uncertainties and what that means to each species. Greg shared language from the Federal Register – "clarify" "clean and substantial" "best

scientific data available" "not a certain numerical amount of data, but solid information" "not required to guarantee"

• There have been years of meetings involving an multi agency/stakeholder working group for water modeling. SWCA can create a summary of the working group, assumptions, data, etc that may assist with understanding the process. The group stated it could be included in the BA or referenced in BA and as a separate document.

### Timeframes -

Final EIS is likely to be published in late 2020

USFWS can expect a Draft BA in late February or March 2020

### Action Items:

- 1. USFWS consider if they should get legal opinion on including the Land Exchange parcels.
- 2. SWCA/Chris G create a summary of water modeling process
- 3. SWCA finish Draft BA including offsite mitigation areas and most likely linear routes; include a statement for USACE role in the BA
- 4. SWCA/Forest verify if CA-191 is agreed upon by Resolution as a voluntary applicant committed mitigation measure
- 5. Ask Resolution for data/reports on AHC work they have done.
- 6. Forest and USFWS to consider AHC mitigation ideas



WELCOME Please Sign In

Resolution Copper Project and Land Exchange Environmental Impact Statement

Print Name	Organization	Email/Phone
Mary Rugmussen	USA Friegt Survice	Mzry. rasmussin e vsda. gov
Anna Morey	SWCA	dmorey esura.com
Greg Reath	USFU S	gres-beatty Etus. Sov
CHRIS CAPILED	Swert	Open of a Such Com
Michael Cangley	U SACE	Michael. W. langley @ usece. a my mil
Kathy Robertson	USF WS	Kathy- reburtsar @ fws. gar
Drew Ullber	USDA FS	drew, ullberg e-USDA. Gov
Ler Ann Attimen	US DAT FS	l'eeunn.att.moon @ Usda zer
LOFF HUNSON	SWCA	jeffjohnsen Oswca: com
Mike Martinez	USFS	michael . a. martinez @ Usda. gov
Location: USFWS Phoenix Date	X Date 1/24/2020	Page <u>7</u> of <u>A</u>

.



# WELCOME Please Sign In

Resolution Copper Project and Land Exchange Environmental Impact Statement

Print Name	Organization	Email/Phone
Eleanor Slodding	such On Phone	egladding @ swca.com
Mark Taylor	vers On Phone	mark.e.taylor @ usda.gov
Location: <u>USFWS Proenix</u> Date	L Date 1/34/2020	Page <u></u> of <u></u>

Engineering/Minerals Tonto National Forest Phoenix, AZ

### DRAFT Agenda

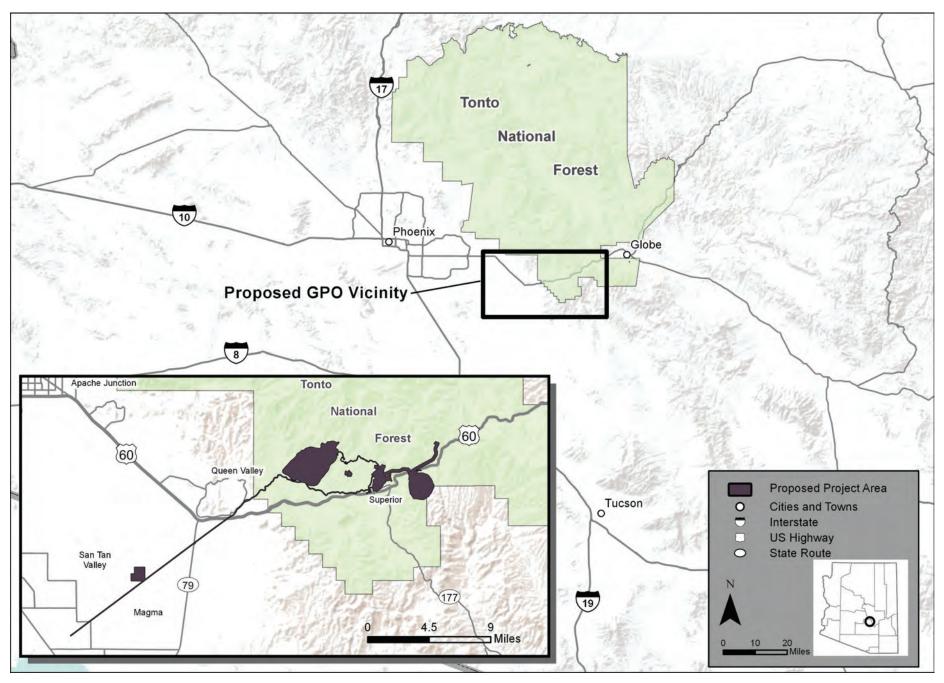
To: Attendees, Project File From: Donna Morey, SWCA CC: Date: 1/24/2020

### Re: Resolution Copper Mine – Introductory Section 7 meeting 1/24/2020

Attend In Person: USFWS Office – 9828 North 31wt Ave #C3, Phoenix

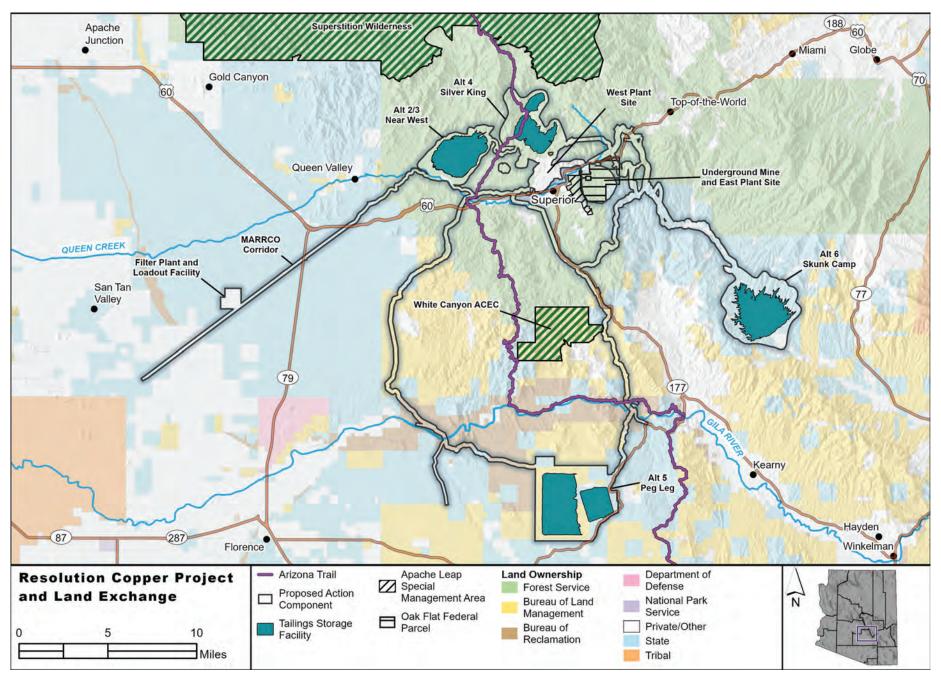
Attend by phone: 866-803-2146 Participant code: 41465568

- 1. Housekeeping
  - a. Non-Federal Representative
- 2. Proposed Action
  - a. Phases construction and operations
  - b. Land Exchange
- 3. Uncertainties
  - a. Reroutes or modifications
  - b. Mitigation lands
- 4. Species to be addressed
- 5. ESA rule changes/terms



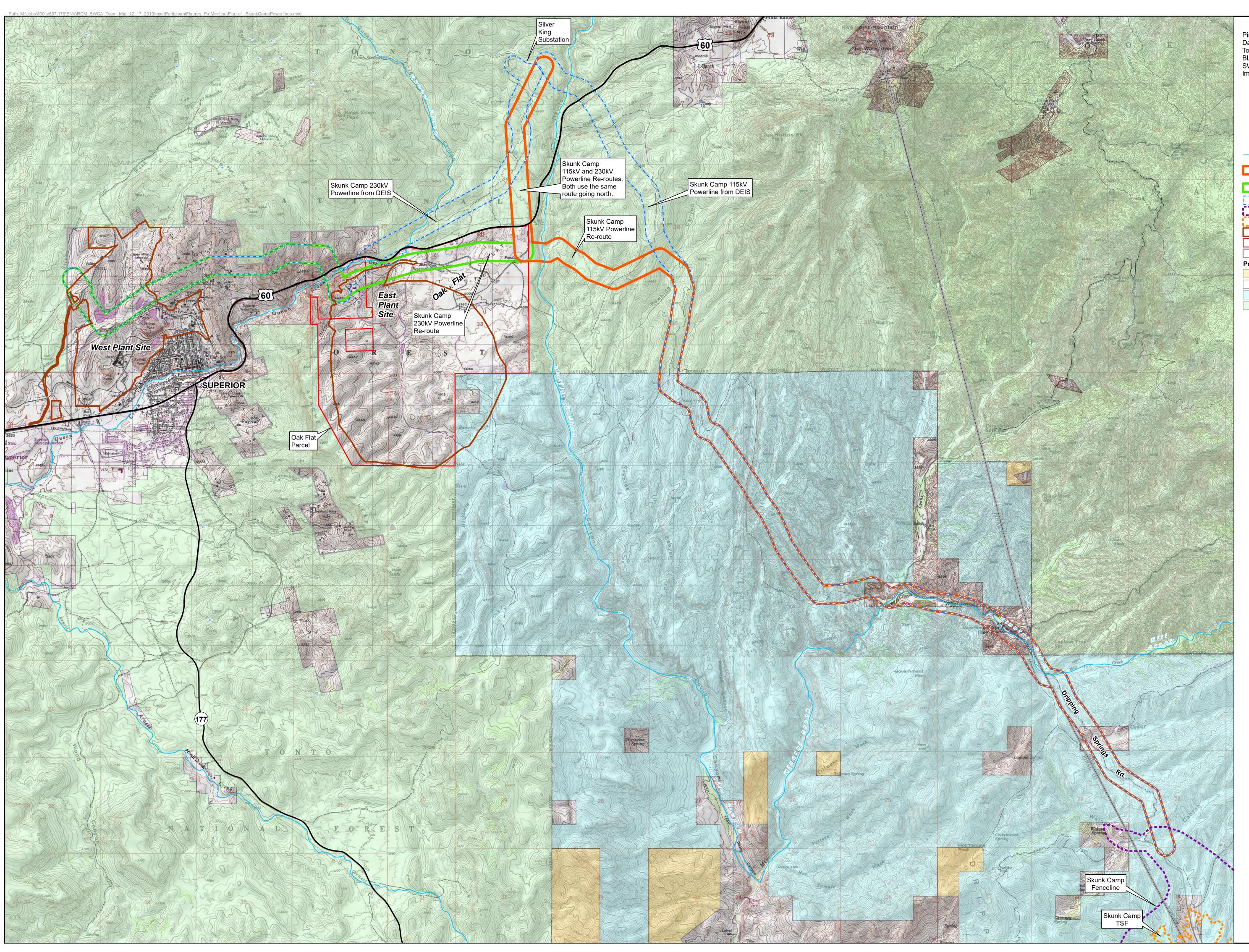
**Resolution Copper Project and Land Exchange project vicinity** 

Current as of August 2019



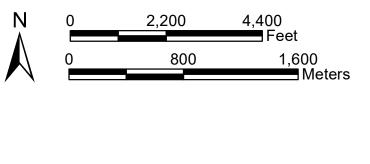
**Resolution Copper Project and Land Exchange project overview** 

Current as of August 2019



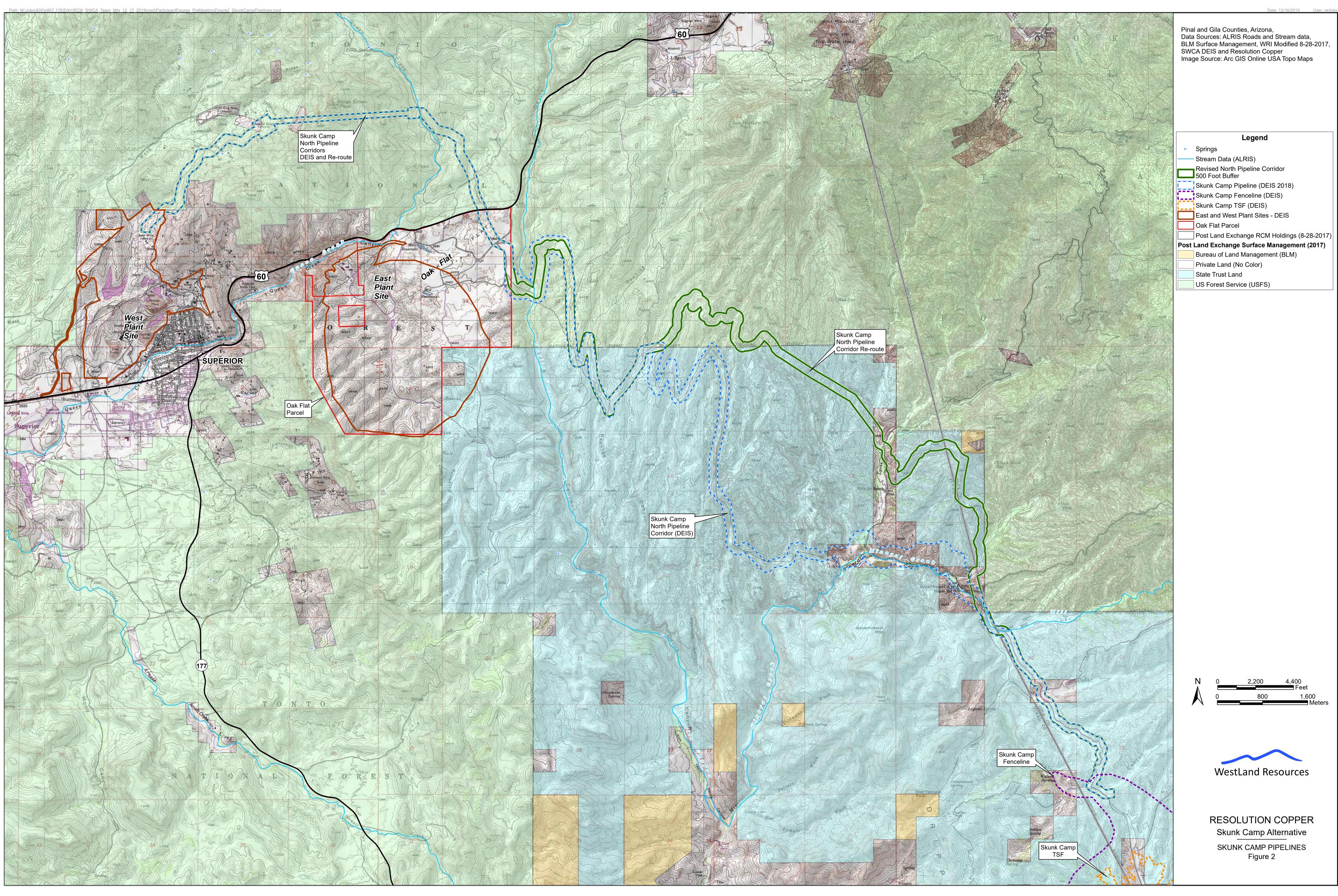
Pinal and Gila Counties, Arizona, Data Sources: ALRIS Roads, Springs and Stream data, Tonto National Forest Roads, BLM Surface Management, WRI Modified 8-28-2017, SWCA DEIS and Resolution Copper Image Source: Arc GIS Online USA Topo Maps

### Legend Springs — Stream Data (ALRIS) Skunk Camp 115kV Powerline Re-route (1000 Foot Corridor) Skunk Camp 230kV Powerline Re-route (1000 Foot Corridor) Skunk Camp Powerlines (DEIS 2018) Skunk Camp Fenceline (DEIS) Skunk Camp TSF (DEIS) East and West Plant Sites - DEIS Oak Flat Parcel Post Land Exchange RCM Holdings (8-28-2017) Post Land Exchange Surface Management (2017) Bureau of Land Management (BLM) Private Land (No Color) State Trust Land US Forest Service (USFS)





RESOLUTION COPPER Skunk Camp Alternative SKUNK CAMP POWER LINES Figure 1



RESOLUTION COPPER
Skunk Camp Alternative
SKUNK CAMP PIPELINES Figure 2



Tonto National Forest

### **Resolution Project at a Glance**

The mine plan was submitted to the Tonto National Forest in November 2013 by Resolution Copper. The ore body lies roughly one mile below Oak Flat, just east of Apache Leap and the Town of Superior.

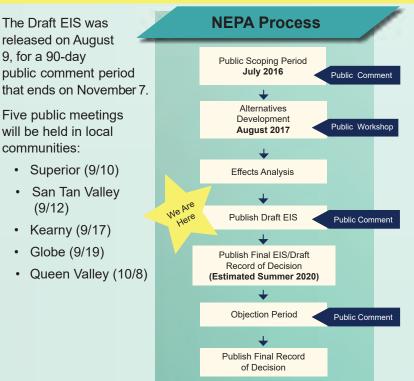
In December 2014, Congress approved a land exchange as part of the National Defense Authorization Act, exchanging 2,400 acres of Forest Service land at Oak Flat for 5,300 acres of private land elsewhere in Arizona, becoming effective 60 days after the Final EIS.

- Copper and molybdenum
- Proposed 40-to-50-year mine life
- 1.4 billion tons of ore to be removed
- 40 billion pounds of copper to be produced
- Uses a "block-cave" mining method
- All mining is done underground, but removing the ore causes the ground surface to collapse, creating a subsidence crater
- Processing would take place at the old Magma Mine site in Superior
- The tailings storage facility and associated pipeline corridors would occupy from 5,000 to 12,000 acres. The tailings embankment could be as high as 520 feet

### Action Alternatives at a Glance

Alternative 2 Near West Proposed Action	Alternative 3 Near West Ultrathickened	Alternative 4 Silver King	Alternative 5 Peg Leg	Alternative 6 Skunk Camp
Thickened tailings	Ultra- thickened tailings	Filtered tailings	Thickened tailings	Thickened tailings
Modified centerline dam	Modified centerline dam	Dry-stack, no dam needed	True centerline dam	True centerline dam
Length = 10 miles	Length = 10 miles	No dam	Length = 7 miles	Length = 3 miles
PAG cell within NPAG	PAG cell within NPAG	Separate PAG cell	Separate "lined" PAG cell	Separate "lined" PAG cell
USFS	USFS	USFS	BLM; State Trust; Private	State Trust; Private

### Release of the Draft of the Environmental Impact Statement



## **Alternative 6** – Skunk Camp is the Forest Service Preferred Alternative

- Needs consent for sale of Arizona State Trust lands
  - Involves a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers

### **Socioeconomic Benefits and Costs**

- On average, 1,500 direct employees, with \$134 million per year in compensation
- The mine would support a total of 3,700 jobs (direct, indirect, and induced)
- Purchases of \$546 million per year in goods and services
- \$1 billion in annual economic value added to Arizona
- \$88 to \$113 million per year in State and local tax revenues
- Increased infrastructure costs for Superior and Pinal County
- · Loss of hunting revenue
- · Property values may decline near tailings facility

Resolution proposes mitigation for a number of these project-related impacts.

### **Key Project Impacts at a Glance**

### **Tribal and Cultural Concerns**

- The project is opposed by the Tribes
- The subsidence crater causes irreversible damage to Oak Flat (a Traditional Cultural Property), sacred springs, and undiscovered burials
- All alternatives would require data recovery for archaeological sites (prehistoric and historic)

### Subsidence

- Crater starts to appear in year 6 of active mining
- Subsidence crater would be 800 to 1,100 feet deep and about 1.8 miles across
- · No damage is anticipated for
  - Apache Leap,
  - · Devil's Canyon, or
  - US HWY 60

### **Tailings Safety**

- "Upstream" dams have been eliminated from all alternatives
- Tailings dam design parameters meet or exceed all federal guidance, Arizona guidance, and international best practices
- All alternatives are designed to the same safety standards; the Preferred Alternative design appears to be the most robust (true centerline dam, shortest length, low downstream population)
- Forest Service will require a Failure Modes and Effects Analysis before the Final EIS, including involvement by EPA and state cooperating agencies



### Water Quality

- ADEQ would likely need to issue
  - 401 Certification for the 404 permit
  - AZPDES permit
  - Aquifer Protection Permit
- Tailings seepage represents a water quality concern; stormwater runoff does not represent a water quality concern
- Forest Service analysis of tailings seepage suggests:
  - Problematic water quality for Alternatives 2, 3, and 4
  - Water quality appears acceptable for Alternatives 5 and 6

### **Air Quality**

- Air quality standards (NAAQS) are met at the fenceline
- Pinal County would issue an Air Permit
- Visibility impacts (haze) would be most prominent for visitors to Superstitions Wilderness—a hiker looking out towards the mine would perceive a plume 5% of the time
- Due to public concerns, a separate health assessment for metals in dust was conducted; no thresholds were exceeded (cancer and non-cancer illnesses)

### Groundwater-Dependent Ecosystems (GDEs) and Water Supplies

- Overall, impacts are anticipated at 14 to 16 GDEs. Some impacts occur whether the mine is built or not. Causes include:
  - Ongoing pumping from the mine workings (aquifer dewatering)
  - The footprint of the subsidence crater and tailings facility (direct disturbance, and reduction in surface runoff)
- Resolution has proposed mitigation to partially offset these impacts, as well as any private wells impacted.
- For the mine water supply, up to 590,000 acre-feet over the mine life would be pumped from the East Salt River Valley; about half of this water is offset by recharge credits

### Recreation

- Loss of world-class bouldering and climbing areas, OHV routes, and Oak Flat Campground
- Impact to hunting areas
- Resolution has proposed mitigation to partially offset recreation impacts specifically new OHV routes and trails, climbing areas, and campground

### Wildlife

- Large acreage of habitat loss
- Loss and fragmentation of movement and dispersal habitats
- Successful reclamation likely
   would only partially restore habitat
- Threatened and endangered species to be assessed include Arizona hedgehog cactus, western yellow-billed cuckoo, and Gila chub

A panoramic view of Oak Flat



2324 East McDowell Road Phoenix, AZ 85006 602-225-5200 TDD: 602-225-5395 Fax: 602-225-5295

**File Code:** 2670; 1950 **Date:** 

Mr. Jeff Humphrey Field Supervisor DOI-U.S. Fish and Wildlife Service Arizona Ecological Services Field Office 9828 North 31st Avenue #C3 Phoenix, Arizona 85051-2517

Submitted via email to incomingazcorr@fws.gov

Dear Mr. Humphrey:

With this cover letter, the Tonto National Forest is submitting a Biological Assessment (BA) for the Resolution Copper Project in Pinal and Gila Counties, Arizona, and request that the formal Section 7 consultation process begin as specified under the Endangered Species Act (ESA).

As noted in the BA, our analysis has concluded that the project may affect several species, designated critical habitat, and proposed critical habitat, as outlined in the following table.

Species (Common and Scientific Name)	Status under the ESA	Effect Determination	Section 7 Consultation Request
Arizona hedgehog cactus Echinocereus triglochidiatus var. arizonicus	Endangered without Critical Habitat	The proposed project may affect and is likely to adversely affect the Arizona hedgehog cactus.	Formal consultation.
Gila chub Gila intermedia	Endangered	The proposed project may affect, but is not likely to adversely affect the Gila chub.	Informal consultation.
Gila chub designated critical habitat	Designated Critical Habitat	The proposed project may affect, but is not likely to adversely affect Gila chub designated critical habitat.	Informal consultation.
Northern Mexican garter snake Thamnophis eques megalops	Threatened	The proposed project may affect but is not likely to adversely affect the northern Mexican garter snake.	Informal consultation.
Southwestern willow flycatcher Empidonax traillii extimus	Endangered	The proposed project may affect, but is not likely to adversely affect the southwestern willow flycatcher.	Informal consultation.
Southwestern willow flycatcher designated critical habitat	Designated Critical Habitat	The proposed project may affect, but is not likely to adversely affect southwestern willow flycatcher designated critical habitat.	Informal consultation.
Yellow-billed cuckoo (Western Distinct Population Segment) Coccyzus americanus	Threatened	The proposed project may affect, but is not likely to adversely affect the yellow-billed cuckoo.	Informal consultation.





Species (Common and Scientific Name)	Status under the ESA	Effect Determination	Section 7 Consultation Request
Yellow-billed cuckoo proposed critical habitat	Proposed Critical Habitat	The proposed project may affect, but is not likely to adversely affect yellow- billed cuckoo proposed critical habitat.	Conference Opinion.

As this submittal begins our Section 7 consultation process, we understand that within 30 days you will respond on the completeness of the BA and whether it is adequate for your use to complete consultation and prepare a Biological Opinion, including a Conference Opinion, for the Section 7 process, which may take up to 135 days total. Please let us know if this schedule will be sufficient for your effort or if you may need additional time, so that we can take that into account for the Project's environmental review and permitting schedule.

The BA document itself is a large file, and will be sent separately to *incomingazcorr@fws.gov*. For additional clarification or information about this consultation submittal, please contact the Forest Service project manager, Mary Rasmussen, by phone at (480) 710-7304 or by email at mary.rasmussen@usda.gov.

Sincerely,

X

NEIL BOSWORTH Forest Supervisor

cc: mary.rasmussen@usda.gov; greg\_beatty@fws.gov; cgarrett@swca.com

### **Meeting Minutes**

To: Project Record

From: Donna Morey, SWCA

### Re: Resolution Copper Section 7 kick off meeting 5/20/2020

### Attendees:

**USFS:** Mary Rasmussen, Drew Ullberg, Mike Martinez, Mark Taylor, Kathy Kennedy **SWCA:** Chris Garrett, Donna Morey, Eleanor Gladding, Jeff Johnson **USFWS**: Kathy Robertson, Greg Beatty, Julie Crawford, Ryan Gordan

### Handouts:

Agenda Project overview PPT (3pg)

### Discussion:

Background/Introductions

- An pre application meeting occurred prior to COVID with the BA submitted on May 8<sup>th</sup>, 2020 for the Resolution Copper Project.
- USACE and EPA along with many others are cooperating agencies for the NEPA project. The BA
  also includes the lands that may have ground disturbing activities as needed for the 404permitting process. The BA document was designed to cover ground disturbing activities under
  the USFS approving the proposed mine, SRP for powerline easement, and USACE for 404 permit
  and mitigation approval.
- The purpose of today is to support the consultation process and help the USFWS understand the large project, BA approach, and help answer questions.
- The USFWS team has begun to review the large document.
- Resolution was not part of todays call as they did not seek applicant status.

### Project Overview

- The project has been envisioned for quite a while, with various work ongoing such as
  reclamation at the old Magma mine since 2009. The initial mine plan was submitted in 2013,
  prior to the land exchange being approved. The NDAA allowing the land exchange was
  authorized by Congress the 2015 funding bill. While the NDAA requires one EIS to consider the
  project and the land exchange, the land exchange is not a discretionary action of the
  government and already approved by Congress.
- Differences between NEPA and BA
  - Only the agency preferred alternative was analyzed in the BA Alternative 6 Skunk Camp North alignment option

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- All land impacted by the mine was included in the BA regardless of current/future ownership. A large part of the subsidence area is currently federally managed, but will be exchanged to Resolution Copper 60 days after the FEIS is published.
- Includes impacts from ground disturbance, dewatering, air emissions, noise, light, traffic, etc.
- Includes compensatory mitigation parcels being developed at this time as part of Section 404 permitting action, the San Pedro ILF parcel is not part of the action area as Resolution would only be providing funding at this location, not actions.
- Does not include the 8 offered land parcels coming into Federal ownership, not a discretionary action.
- Assumption for work done at 404 mitigation lands, will include survey prior to invasive species removal, implement conservation measures while doing the invasive species removal, and improvement of terraces, washes, floodplains. The parcels are meant to be a conservation and benefit to the species. We are still expecting additional information with more detail on the specific tasks and conservation at each parcel.
  - Greg concerned for the temporal effects of the broad action that could influence the effects determination. The details would be an important part to include for the USFWS consultation including what species are currently using the invasives that are to be removed.
  - The work anticipated and assumed for 404 permitting in the BA at Queen Creek is just for the 404 mitigation (invasive species removal). There are possibilities that other mitigation such as campground, trails, economic development could all occur in this area.
- Problem with considering the offered lands is what information we have for the offered lands. The NDAA states they will be managed by the agency and plan in place at the time of exchange. We do not know how the lands will be managed, we can anticipate they would be managed for conservation, but we don't know.
- Pipeline/Powerline route
  - What is shown in the BA is revised from the DEIS to be a collocated pipeline/powerline corridor that reduces impacts to species and habitat. This change limits occurrence on ASLD and eliminates BLM land.
  - Refinements that are ongoing but not reflected in the BA right now include changes to the powerline that move towers out from AHC habitat, complete underground boring to avoid SWFL and YBCC habitat at crossings.
  - Kathryn Kennedy is interested to review the BA discussion on fragmentation of habitat. The BA does speak to this topic, but Eleanor is open to any comments once reviewed.
  - The approach taken in the BA and EIS has been to overestimate impacts at the corridor to allow flexibility with future design and micro siting later.
    - The entire corridor will not be fully disturbed during construction or operations but the full width of the 500' corridor is used for the calculations of impact shown in the BA.
  - Kathy did not see what the USFWS can gain for suitable AHC habitat loss in her cursory review, looking for mitigations to offset the loss of habitat.

- What is on the table now in the BA is what Resolution has offered for mitigations. Appendix D is a catch all listing other mitigations from other resources or information that SRP has asked to be included based on other BOs they have on how to construct and manage powerlines.
  - We understand there will be additional work to reconcile the SRP mitigations, they are a good starting point.
- Resolution had previously considered using JI ranch as a possible mitigation for the project and it is within AHC habitat. This could be an offset to the impact of habitat removal as species transplanting is not guaranteed to be successful.
- Things we know are in flux at this moment
  - Fine tuning of pipeline and powerline corridor to further limit impacts on species and habitat.
  - Further detail forthcoming from 404 process on actions that would be taken on mitigation parcels for consideration
  - Recreation mitigation concepts being considered in and around the Superior area that might have additional disturbance.
  - Reconciliation of SRP and RCM conservation approaches
- How would the USFWS envision these changes being incorporated into the BA?
  - Greg feels the affects determinations cannot be nailed down yet with the missing information and critical to moving the process forward, if information cannot be received soon, a pause on the timeline may occur.
    - The actions at the 404 mitigations may have impact on YBCC or SWFL.
    - Kathy would like to see the salvage and transport plan now to consider impacts to AHC, not at a later time as currently stated in the BA.
  - The USFWS is open to considering the offset that may be available to AHC habitat, not just moving of species. The amount and quality of lost habitat is an important consideration.
    - Options for mitigation Receive clear compensation of AHC habitat such as JI ranch
  - Kathryn Kennedy is concerned the Forest is not the final responsible party for implementation, but it is clearly documented that Resolution would be the responsible party for offsetting compensation, habitat, or specific plans.
  - Discussion on plant species level of unacceptable take.
    - 247 plants would be removed per BA and it is known that during vegetation clearing with other projects, it is typical that there are usually additional plants found that need to be also salvaged.
    - Not all salvaged plants may survive, and caging of plants does not always
      provide the best option to eliminate impacts to a plant. Monitoring should occur
      more often than currently shown as this is a 56-year project. Julie mentioned
      that it is typical to monitor 3 times in the first 3 years, let alone after that time.
      What are they doing for seed banking, seed collection should occur before plant
      removal, concern for where replanting would occur. Needs to be on federal land
      for protection, and away from other hazards for the plants and pollinators
      (traffic, dust, emissions).

- Mary asked USFWS for more specifics on what is missing and needed to help with their analysis.
  - The 404-mitigation action plan and more AHC plan information would be helpful. Additional information on habitat quality, even if older data.
  - USFWS will provide specific details as part of their 30-day review.
- o Next Steps
  - Forest to fill some holes for missing information on 404 or recreation mitigation, or corridor fine tuning.
  - Kathy R offered to provide some initial feedback prior to 30 days that could be useful in discussions with Resolution.
  - Group will meet again prior to 30 days to discuss status
  - FYI Arizona passed a new law that ESA surveys on private land has to be kept private from the agency
- Other conversations to happen
  - Applicant status for resolution to consider
  - What it means to get a BO between USFWS and USFS and the conservation measures being done by Resolution – to explore internally
  - Should we set a touch point before 30 days to see where we are at.
  - Eleanor offered for specific calls based on species lead either now or at a later portion of the review process.

### Action Items:

- 1. Eleanor check for broad actions anticipated of 404 mitigation work in the BA.
- 2. SWCA to check if there are any AHC on Apache Leap land exchange parcel if so, consider including the offered lands in a future discussion
- 3. Kathy K to forward an older report on habitat quality she thought may be of use
- 4. Donna to send doodle poll for week of June 1-5 for a status check in call with this group.

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### DRAFT Agenda

To: Attendees, Project File From: Donna Morey, SWCA CC: Date: 5/20/2020

### Re: Resolution Copper Mine – Section 7 Kickoff meeting 5/20/2020

Call-in Number: +1 (669) 900 6833

Meeting ID:

Meeting URL: https://swca.zoom.us

- 1. Introductions and purpose
- 2. Overview of Biological Assessment [SWCA]
  - a. Proposed Action (Forest Service Preferred Alternative, with refinements)
    - i. Project footprint
    - ii. Mitigation lands included
  - b. Approach for conservation measures included in BA
  - c. Approach for assessing impacts along corridor
  - d. BA effects conclusions
- 3. Discussion of refinements along powerline and pipeline corridor and at EPS [RCM]
- 4. Anticipated next steps in process (open discussion)
  - a. BA review
  - b. Time frames
  - c. Supplemental information to be submitted

# **PROCESS TO DATE**

- Nov 2013 Mine plan submitted to Tonto NF
- Dec 2014 Congress authorizes a land exchange
- March 2016 Tonto NF publishes Notice of Intent to prepare an EIS...which Congress said must be a single EIS for all decisions and Federal actions related to the mine
- August 2019 Draft EIS released

# **PROPOSED ACTION IN THE BA**

- Reflects the Tonto's Preferred Alternative: Alternative 6 – Skunk Camp, North Pipeline
- Includes all areas impacted by the mine, regardless of land ownership or jurisdiction
- Includes impacts anticipated from ground disturbance, dewatering, air emissions, noise, light, traffic, etc...
- Includes compensatory mitigation parcels being developed under the Section 404 permit
- Does NOT include the 8 "offered land" parcels Congress said "thou shalt", so these do not represent a discretionary action for any Federal agency

# **POSSIBLE CHANGES DURING CONSULTATION**

- Fine-tuning of powerline and pipeline corridor
- Further detail on what activities will actually take place on 404 mitigation parcels
- Disturbance associated with additional recreation mitigation areas
- Reconciliation of SRP and RCM conservation approaches



2 June 2020

Via email to: mary.rasmussen@usda.gov

Ms. Mary Rasmussen Project Manager TONTO NATIONAL FOREST 2324 E. McDowell Rd. Phoenix, Arizona 85006

### **RE: PARTICIPATION IN ENDANGERED SPECIES ACT SECTION 7 CONSULTATION PROCESS FOR THE RESOLUTION COPPER PROJECT**

Dear Ms. Rasmussen:

Pursuant to 50 CFR § 402, U.S. Fish and Wildlife Service (USFWS) regulations provide an applicant the opportunity to participate in discussions between the lead agency and USFWS associated with the Section 7 process. Resolution Copper has baseline information as well as project related technical information that may facilitate an efficient exchange of information. As such, Resolution Copper requests "applicant status" to participate with the Tonto National Forest (TNF) and U.S. Fish and Wildlife Service (USFWS) in the Endangered Species Act Section 7 consultation process for the Resolution Copper Project.

We look forward to the opportunity to work with the TNF and USFWS in the Section 7 process.

Sincerely,

Vicky here

Vicky Peacey Senior Manager, Permitting and Approvals; Resolution Copper Company, as Manager of Resolution Copper Mining LLC

### **Meeting Minutes**

To: Project Record

From: Donna Morey, SWCA

### Re: Resolution Section 7 Status Check discussion 6/2/2020

### Attendees:

**USFS**: Mary Rasmussen, Mike Martinez, Mark Taylor **SWCA**: Chris Garrett, Donna Morey, Jeff Johnson, Eleanor Gladding **USFWS**: Kathy Robertson, Greg Beatty, Ryan Gordan,

### Handouts:

none

### Discussion:

Since the last meeting, the Forest has met with Resolution and talked through some key points that we heard based on the kick-off meeting.

- Uncertainties will be finalized, known, and described in the BA moving forward for USFWS review.
  - o Details on mitigation lands will be known and details included in the document
  - o Pipeline and powerline route will be finalized and mapped
  - Conservation measures we anticipate the BA will include the full suite of measures provided by Resolution.

Ryan is providing comments on Gila Chub and Kathy will be providing comments on AHC later today. Greg's comments on birds have already been sent.

### Further discussion of USFWS review:

Gila Chub -

- USFWS would like more information, the BA has vagueness with the actions and location of the corridor crossing through Mineral Creek which is considered as occupied habitat.
- Should the entire reach of Mineral Creek be included in the proposed action? Would reduction of flow cause an impact before mitigation can be put into place? Sedimentation was considered but not expected to go out that far. Chris G said the analysis does not anticipate any impact to mineral creek in the DEIS. No impacts are expected below Big Box Dam. Can include further discussion that none of the 87 sensitivity runs showed changes to the creek.
- The BA/BO does not address catastrophic dam failure.
- Crossing of Mineral Creek would include the pipeline placed underground no surface disturbance
  within the existing/proposed habitat. The powerline pole structures will still occur above ground but
  planned to be outside of the habitat and OHWM, they will be shown on the updated maps. Action
  will include the general vegetation management as anticipated based on other BOs. If specific veg
  mgmt direction is needed, we hope it will be provided out of this consultation.

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- Gila Chub over time, while they have not seen GC since other mine spill in 90s, they do not have enough survey information to reach the benchmark to extirpate the species. The population is considered low and still needs to be considered as occupied at some level throughout the project.
- Road/Vehicle stream crossings will be further discussed in BA, use of existing road for powerline at trenchless crossing. Need to know where it aligns with the creek, how many times it would cross the creek; project related trips on road per day and how many times the road would need maintenance that could move sediment into the stream. BA can incorporate the newest pipeline protection and maintenance plan.

### Other Concerns -

What is the federal action being considered and who/how will the authorization be issued?

The Forest is approving pipeline and powerline corridors across TNF by authorization of a SUP under 251 regulations.

The USACE will issue a 404 permit that would authorize mitigation of impacts to WOTUS and ephemeral washes on the mitigation parcels. Does the 404 mitigation plan cover the same duration as the SUP issued by the Forest?

### Next Steps –

Revise and submit BA by June 26<sup>th</sup>. Showing the meetings from the last month are ok as information consultation in the record.

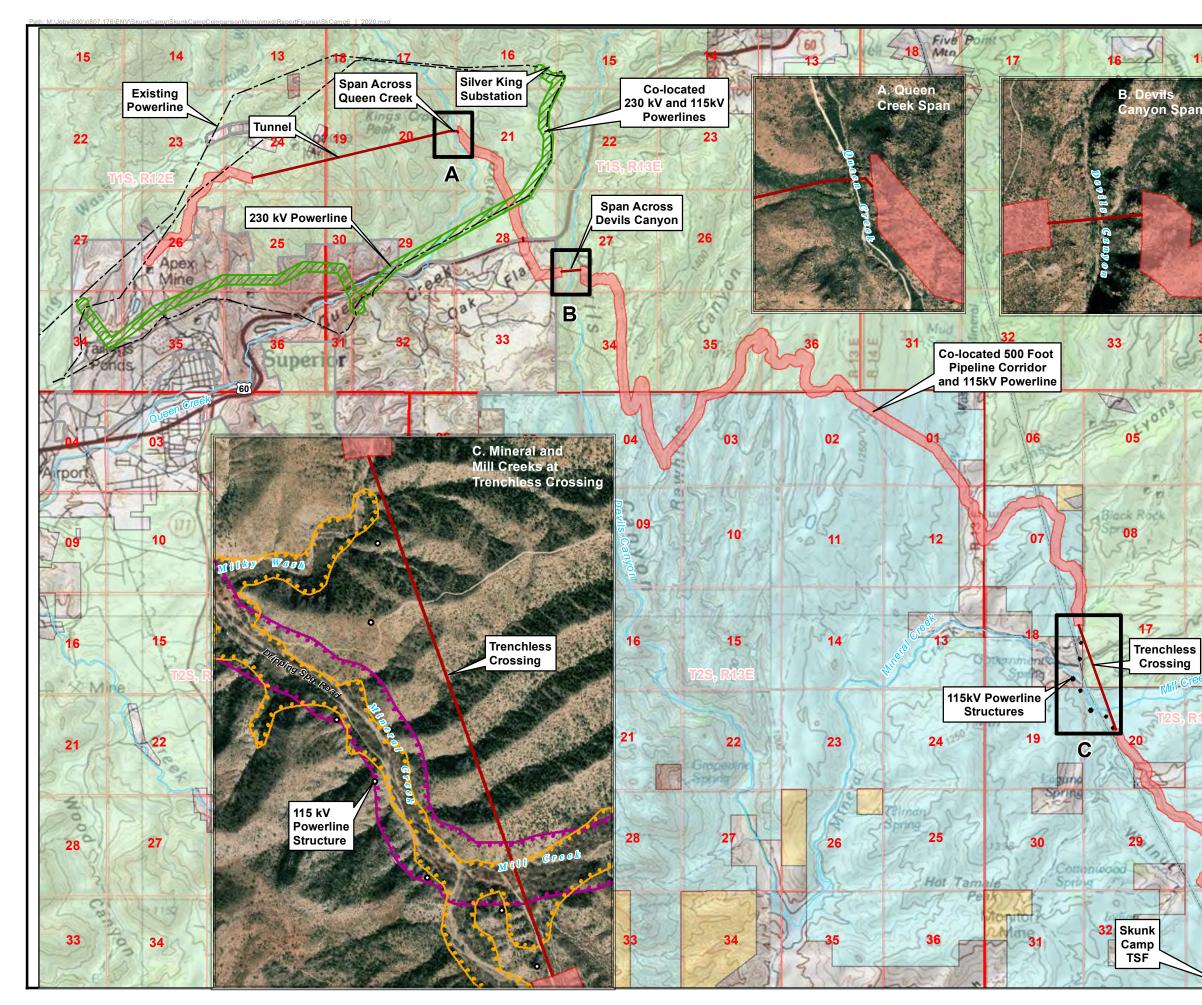
30 day notice will be issued by the USFWS next week.

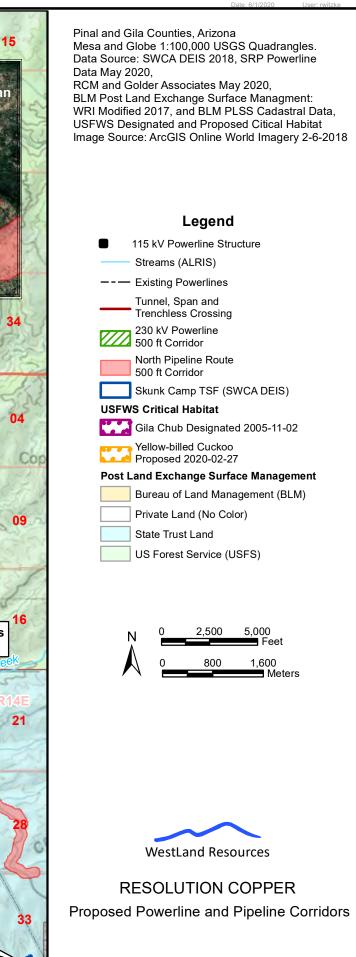
USFS and USFWS will continue to work together to ensure the process is done in an expedited schedule. When the BA is resubmitted, point out changes to minimize the initial review.

The forest is making every effort to make the FEIS completed this fall based on departmental guidance.

### Action Items:

- 1. USFWS to provide AHC & GC comments via email (bird comments received earlier)
  - a. Some of the topics were discussed today
  - b. Please feel free to call Kathy or Ryan to help with any questions on comments you may not understand.
- 2. USFWS to issue a 30-day letter stating the BA is insufficient, but also note that the agencies are working together collaboratively to fix issues and consider schedule.







**Tonto National Forest** 

2324 East McDowell Road Phoenix, AZ 85006 602-225-5200 TDD: 602-225-5395 Fax: 602-225-5295

 File Code:
 2670

 Date:
 June 4, 2020

Mr. Jeff Humphrey Field Supervisor DOI-U.S. Fish and Wildlife Service Arizona Ecological Field Services Office 9828 North 31st Avenue #C3 Phoenix, Arizona 85051-2517

Dear Mr. Humphrey:

This letter is to inform you that the Tonto National Forest, a unit of the USDA Forest Service, has granted "applicant status" to Resolution Copper Mining, LLC (Resolution Copper) at their request to participate directly in the Endangered Species Act (ESA) Section 7 consultation process for the Resolution Copper Project. My determination is consistent with the interagency cooperation and consultation procedures found in the ESA implementation regulations at 50 CFR §402.

My determination is based on the following considerations:

- Resolution Copper Mining, LLC (Resolution Copper) has submitted a proposal to conduct mining operations affecting lands administered by the Tonto National Forest, the Arizona State Land Department, and lands under private ownership near Superior, Pinal County, Arizona, based on a draft General Plan of Operations.
- The proposed mining operations are complex consisting of five locations: East Plant Site, West Plant Site, Magma Arizona Railroad Company (MARRCO) corridor, Filter Plant/Loadout Facility, and tailings storage facility with associated pipeline/power corridors; the project involves several implementation phases including final project design, permitting, construction, operation, closure, reclamation and monitoring that spans several decades.
- The Forest Service is the lead agency conducting an environmental review of all federal actions associated with the proposed mine plan of operations. The Forest Service will require Resolution Copper to obtain a special use authorization for the project activities ultimately approved to occur on National Forest System lands. Additional permits and authorizations may be required by other federal and State agencies.
- In the Draft Environmental Impact Statement (August 2019), the Forest Service identified Alternative 6 Skunk Camp, as the preferred action. As this preferred action would discharge fill materials into waters of the U.S., particularly at the tailings storage facility, Resolution Copper requested authorization from the U.S. Army Corps of Engineers (Army Corps) under Section 404 of the Clean Water Act.
- The Forest Service and Army Corps have been working cooperatively with Resolution Copper to address project impacts relevant to our respective agency permitting authorities for the proposed actions identified in the preferred alternative.





- On May 8, 2020, the Tonto National Forest submitted a draft Biological Assessment (BA) for the Resolution Copper Project and requested initiation of formal Section 7 consultation with the Fish and Wildlife Service (FWS) as specified under the Endangered Species Act.
- Since May 8, 2020, informal discussions held between the FWS, Tonto National Forest, and our non-federal agent, SWCA Consultants, have underscored the need to include the project applicant and their subject-matter experts to facilitate an efficient exchange of baseline and technical information.
- Resolution Copper submitted a written request for applicant status on June 2, 2020.

The Forest Service recognizes that successful consultation under Section 7 of the ESA hinges on strong communications and full information exchange between the FWS, the Forest Service, and Resolution Copper. This is especially true for a project of this complexity. There is much to contemplate with respect to understanding the numerous details of the proposed action, the anticipated effects to species and habitat, and feasibility of modifying project activities to avoid those effects.

Consistent with the ESA implementing regulations, Resolution Copper is expected to heed the following guidelines in fulfilling their role as project applicant during the consultation process:

- Resolution Copper is entitled to submit information for consideration during ESA Section 7 consultation; applicant submittals will be directed to the Forest Service and not to the FWS;
- Resolution Copper must concur with any extension of formal consultation of more than 60 days (beyond the normal 90-day period);
- Resolution Copper is entitled to review draft Biological Opinions (BO), and to provide comments on the draft BO to the Forest Service;
- Resolution Copper is entitled to have the FWS discuss the basis of the ESA Section 7 determination with them and to have the FWS seek the applicants' expertise in identifying reasonable and prudent alternatives to the action if jeopardy or adverse modification of critical habitat is likely; and
- Resolution Copper is entitled to have the FWS provide them with a copy of the final BO.

I look forward to a successful consultation process. Please contact my Project Manager, Mary Rasmussen, if you have any questions or project-related concerns. During normal telework hours, she can be reached by phone at 480-710-7304 or by email at <u>mary.rasmussen@usda.gov</u>.

Sincerely,

х

NEIL BOSWORTH Forest Supervisor

cc: Greg\_Beatty@fws.gov, Kathy\_Robertson@fws.gov



**United States Department of the Interior Fish and Wildlife Service Arizona Ecological Services Office** 9828 North 31<sup>st</sup> Avenue, Suite C3 Phoenix, Arizona 85051 Telephone: (602) 242-0210 Fax: (602) 242-2513



**In reply refer to:** AESO/SE 02EAAZ00-2020-F-0822

June 8, 2020

Neil Bosworth, Forest Supervisor Tonto National Forest 2324 East McDowell Road Phoenix, Arizona 85006

RE: Resolution Copper Mine Project

Dear Mr. Bosworth:

Thank you for your May 8, 2020, letter and accompanying biological assessment (BA) requesting formal section 7 consultation under the Endangered Species Act (16 U.S.C. 1531-1544), as amended (ESA), which we received the same day. At issue are effects that may result from the proposed Resolution Copper Mine (RCM), in Pinal County, Arizona, to the endangered Arizona hedgehog cactus (*Echinocereus arizonicus*); the endangered Gila chub (*Gila intermedia*) and southwestern willow flycatcher (*Empidonax traillii extimus*) and their designated critical habitat; threatened yellow-billed cuckoo (*Coccyzus americanus*) and proposed critical habitat; and the threatened northern Mexican gartersnake (*Thamnophis eques megalops*).

Your project team and SWCA Environmental Consultants (SWCA) met with us via conference call on May 20 and June 2, 2020, to discuss the proposed action and effects determinations. In addition to our meetings and direct phone calls, we provided written BA reviews in late May and early June. We concluded that the current BA describes uncertainties associated with powerline and pipeline routes and lacks specific project implementation information for Army Corps of Engineers (Corps) Clean Water Act mitigation actions. The lack of these details leaves uncertainty with effects determinations to species and critical habitat, and therefore we are unable to adequately evaluate the proposed project.

Based upon the need for further project and species specific information, we are unable to initiate formal consultation at this time. At the conclusion of our most recent meeting, the Forest Service and Fish and Wildlife Service acknowledged the need for further information, which was estimated to take approximately three weeks. SWCA identified they were still receiving new information from RCM and the Corps. We appreciate your coordination and collaboration, understand your urgency, and are working with you closely to help meet your project objectives. If you have any questions or concerns, please contact Kathy Robertson (602) 889-5957 or Greg Beatty at (602) 242-0210.

Sincerely,

Jeffrey A. Humphrey

Field Supervisor

cc (electronic) w/o attachment:

Forest Project Lead, Tonto National Forest, Phoenix, AZ (Attn: Mary Rasmussen)
Ecosystem Staff Officer, Tonto National Forest, Phoenix, AZ (Attn: M, Martinez, D. Ulberg, M. Taylor)
SWCA Environmental Consultants, Tucson, AZ (Attn: C. Garrett, D. Morey, E. Gladding)
Assist Field Supervisor, US Fish and Wildlife Service, Tucson, AZ (Attn: Susan Sferra, Jeff Servoss)
Fish and Wildlife Biologist, US Fish and Wildlife Service, Phoenix, AZ (Attn. Ryan Gordon)

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

Chairman, Hopi Tribe, Kykotsmovi, AZ

Chairperson, Hualapai Tribe, Peach Springs, AZ

Chairman, Mescalero Apache Tribe, Mescalero, NM

Chairman, San Carlos Apache Tribe, San Carlos, AZ

Chairperson, Tonto Apache Tribe, Payson, AZ

Chairman, White Mountain Apache Tribe, Whiteriver, AZ

Chairman, Yavapai Apache Nation, Camp Verde, AZ

Director, Cultural Preservation Office, Hopi Tribe, Kykotsmovi, AZ

Program Manager, Tribal Historic Preservation Office, Hualapai Tribe, Peach Springs, AZ

Program Manager, Resource Management and Protection, Mescalero Apache Tribe, Mescalero, NM

Director, Tribal Historic Preservation Office, San Carlos Apache Tribe, San Carlos, AZ

Botanist, Forestry Department, San Carlos Apache Tribe, San Carlos, AZ

Director, Cultural Resources Department, Tonto Apache Tribe, Payson, AZ

Director, Cultural Resources Department, White Mountain Apache Tribe, Whiteriver, AZ

Director, Cultural Preservation Program, Yavapai Apache Nation, Camp Verde, AZ

The Sparks Law Firm, Scottsdale, AZ

Executive Director, Intertribal Council of Arizona, Phoenix, AZ

Environmental Specialist, Environmental Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ

Tribal Liaison, Southwest Region, Fish and Wildlife Service, Albuquerque, NM (ARD-EA)

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### **Meeting Minutes**

To: Project Record

From: Donna Morey, SWCA

### Re: Resolution Section 7 Mitigation discussion 6/9/2020

### Attendees:

USFS: Mary Rasmussen, Mike Martinez
SWCA: Chris Garrett, Donna Morey, Eleanor Gladding, Jeff Johnson
USACE: Mike Langley
USFWS: Kathy Robertson, Greg Beatty
Resolution & subcontractors: Vicky Peacey, Brian Lindenlaub, Stacey McClure, Tom Klimas, Aaron Graham, Raya Treiser

### Handouts:

Agenda(1pg) and PowerPoint(22pg)

### Discussion:

Applicant status was given to Resolution yesterday and acknowledged by the USFWS.

The BA was provided in May and provided a 30-day incomplete letter yesterday by USFWS. The Forest goal is to revise and resubmit the BA with all needed information by June 26.

- Actual route still need to confirm powerline corridor, access routes around spans & powerline.
- AHC conservation measure information to be added
- 404 mitigation parcels baseline of parcels, what parcels are included, activities anticipated to occur on those lands.

Mike Langley want to be clear on the mitigation parcels as that is a work in progress and not a final mitigation plan.

Resolution is open to hearing any and all feedback today and would like to be as helpful as possible to come up with solutions to move forward.

#### Westland presentation

The concept plan shown in the DEIS has been advanced and will be presented today.

The 404 permit will only cover the portion of the pipeline in the Gila watershed and the Skunk Camp TSF, the rest of the area is non jurisdictional. The group is aware of possible changes to WOTUS rule on 6/22 and Resolution wishes to mitigate for all ephemeral drainages regardless of ruling to allow for certainty in the future. The plan currently includes the following areas:

• Mar5/Olberg – contiguous to each other in location along the Gila River main stem on Gila River Indian Community lands.

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- Queen Creek on Queen Creek proper in the Town of Superior
- Lower San Pedro ILF on San Pedro proper near Mammoth
- H&E Farm on San Pedro proper near Mammoth

**H&E Farm** - 590-acre property owned by the The Nature Conservancy, almost contiguous to the San Pedro ILF and just south (upstream) is the San Pedro Land Exchange parcel to allow for landscape level changes in the area. Parcel has been used for agriculture and cattle since at least the 50s. To the north end of the property the TNC has previously restored 2 channels with a USACE permit. The soils across the site up on terrace are compacted and causing earth fissures and sink holes in the property that will continue if no intervention occurs on the terraces. Earthwork towards the south end of parcel are problematic with elevation difference between terrace and river channel and less of a change in the middle to northern portion of the parcel. Propose to grade as alluvial fans in the southern portion to provide for tree growth which is similar to other side of San Pedro river off-parcel.

Activities planned for mitigation:

- Area A earthwork to reconnect historic tributaries; Planting & seeding native species
- Area B planting & seeding native species, no removal
- Area C preservation no work
- > YBC critical habitat is within areas B&C which have no earthwork or vegetation removal planned.
- Most of the area is fenced currently, will include maintenance of fencing and moving cattle out of any area that is being revegetated or areas of preservation.
- > The entire parcel would be placed under a conservation easement
- Gartersnake has not been seen on the parcel, biologists consider it too far from a perennial water source to occur.
- > Westland has no survey data on this parcel to provide.

**Lower San Pedro Wildlife Area ILF** – AGFD owned 677 acres for an ILF program, the advanced credits were already sold. AGFD will be the one to do activities and is ongoing thru a separate consultation process to get approval to sell additional credits, but they are not available now. It was shown to provide landscape context, but not part of Resolution's Action area, Section 7 or Section 106 consultations.

Activities anticipated to occur: Tamarisk removal, planting with native vegetation, and expanding an existing wetland area.

This should be removed from BA as not part of the project at this time. Can note it exists as a future possibility depending on timing and need and would be contiguous to other mitigaiton parcels. Eleanor will remove from BA and include statement that future federal actions were not included.

**Queen Creek** – 79 acres, multiple landowners (Resolution and BHP), many years of surveys. The survey last fall noted invasive species and debris in channel.

Activities planned:

 Area A – minimal tamarisk removal (currently sparsely present), planting & seeding native species

- Area B selective debris removal, seeding native species
- Area C preservation and conservation easement to limit development and provide
- > The BHP and Resolution parcels would have a conservation easement.
- Several YBCC and SWFL surveys done in area with none detected, area does not include critical habitat, but could be used during migration. All work would be done outside of breeding season to reduce potential for any impacts.
- > There are multiple years of survey for this area and they have been provided.

**Mar 5 Project/Olberg Road Restoration Site (ORRS)** – Mar 5 is 123 acres wetted area for recharge that Resolution has helped with funding and existing activity to be continued. ORRS is 23 acres adjacent to Mar5 with dense scrubby tamarisk supplied by agriculture overflow on an intermittent basis.

Activities planned: On Mar5- discharge of water (no more than 2,000 ac/ft year) and vegetation removal. Resolution would purchase the water from GRIC to supply for release and pay for GRIC crew to remove invasive vegetation by hand. On ORRS – invasive vegetation control by GRIC crew and paid for by Resolution.

- No critical habitat on site. Westland has 2017 general avian surveys with no occurrences and 4 years of vegetation surveys.
- USFWS has been to site with GRIC to discuss a safe harbor agreement, it is not in place but still in consideration separate than Resolution's undertaking.

### **Government Springs**

Resolution has obtained a ROW through Government Springs private parcel based on the alignment change from DEIS. Resolution is in talks to purchase property but not far enough into those negotiations to include in this plan. If Resolution obtains the parcel, they would look to put a conservation easement on the southern portion of parcel with the perennial reach.

#### Summary of presentation

- H&E, Queen Creek, Mar5/Olberg parcels to be included in the BA. Only one with critical habitat is H&E; with others just having degrees of marginal use habitat.
- Baseline information has nothing at H&E, many surveys at QC, and minimal at Mar5/Olberg.
- Modification of vegetation of habitat something will occur at QC & Olberg but not H&E with removal within habitat, only planting within habitat.

### **Corridor Alignment**

Tunnel is 100% underground, no road or surface disturbance along tunnel. The entrance/exit are within corridor. Three could be AHC in area. The BA will provide supporting data if we choose not to include that stretch of underground corridor as action area.

Bridges will be above ground to span Queen Creek and Devil's Canyon. No birds are expected in the area and AHC survey has occurred.

Resolution is open to using diverters in the crossing sections and not just specific to critical habitat to help avoid impacts of birds flying past.

Trenchless crossing has no surface distrubance and is underground. The entrance/exit of the pipeline is within the corridor that is outside of the OHWM and outside of critical/proposed critical habitat. No new road is needed for pipeline. Powerline structures will be outside of critical habitat, road access will be on existing Dripping springs road. Previous discussion noted the BA needs to look at the existing road for crossings and additional sedimentation that could occur along with vegetation management under the lines.

Provide descriptions and pictures of crossing locations and describe the various methods (tunnel/span/trenchless crossing)

### Other items

Vicky spoke with Eleanor and is open to adding additional requests such as a test of seed collection/propagation and longer duration of surveys.

The cages over AHC were added based on previous project, they are no longer the preferred method and should be modified to be a range of options for protection. Depending on individual circumstances – fencing, biology monitors, cages, or transplanting.

JI Ranch and AHC propagation. Resolution working with AGFD and others who requested access across parcel in addition to the requested conservation of AHC habitat. While it is not ready to add to BA yet, they are working toward some conservation areas on JI Ranch for AHC. WestLand is finishing a report with propagation information and site locations for previous work they have done on JI Ranch and will provide.

Tortoise concerns where pipe is not buried and along raised railroad corridor. RCM is open to adding tortoise crossings where needed; weed management in corridor; and providing regular reporting to USFWS & AGFD as a conservation measure regardless of land ownership.

#### Next steps:

- BA revised and submitted by June 26<sup>th</sup>
- JI ranch information– later this week
- Mill/Mineral Creek information today
- AHC habitat quality analysis this week
- Desert Tortoise mitigations this week
- Updated GIS this week
- Open to call on AHC concerns (Kathy, Eleanor, and Mary R at minimum)
- Provide PPT from today's meeting for notes
- Confirm all surveys have been provided for use

Engineering/Minerals Tonto National Forest Phoenix, AZ

### Agenda

To: Attendees, Project File

From: Donna Morey, SWCA

CC:

Date: 6/9/2020

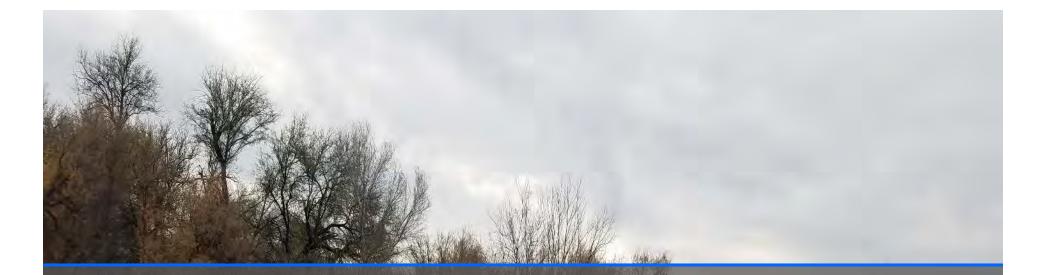
Re: Resolution Copper Project, Section 7 Meeting re: Mitigation 6/9/2020

Call-in Number: +1 (669) 900 6833

Meeting ID:

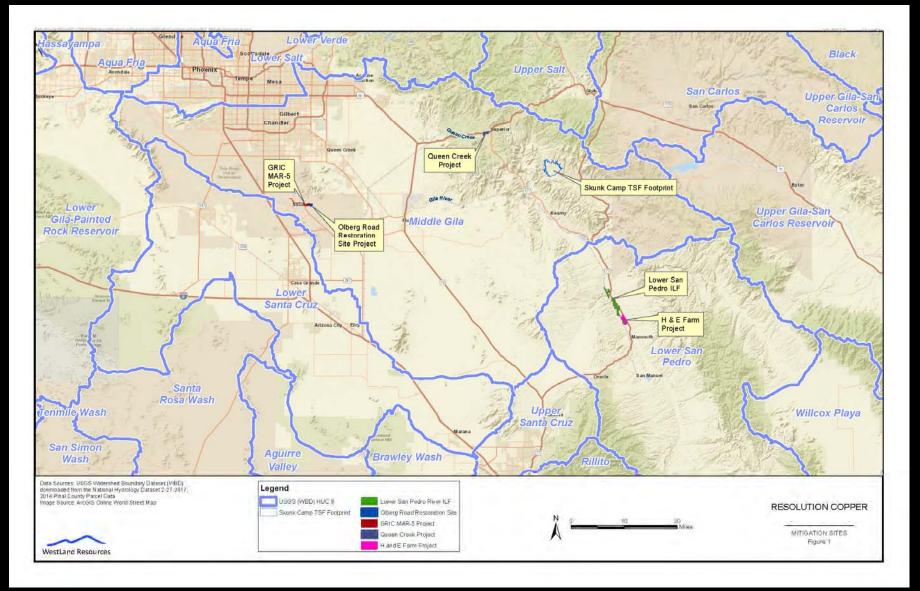
Meeting URL: https://swca.zoom.

- 1. Roll call and introductions
- 2. Overview of focused data needs Biological Assessment (SWCA)
- 3. Overview of Section 404 mitigation parcels (RCM)
  - a. Anticipated mitigation portfolio
  - b. Available data concerning T&E occurrence
  - c. Anticipated activities
- 4. Status of additional information needed, not yet in hand
  - a. AHC information
  - b. Additional conservation measures
  - c. Final shapefiles for corridor
  - d. Habitat assessments for Mill and Mineral Creek
  - e. Tortoise conservation measures
- 5. Next steps



### Resolution Copper Project Clean Water Act Section 404 MITIGATION OPPORTUNITIES



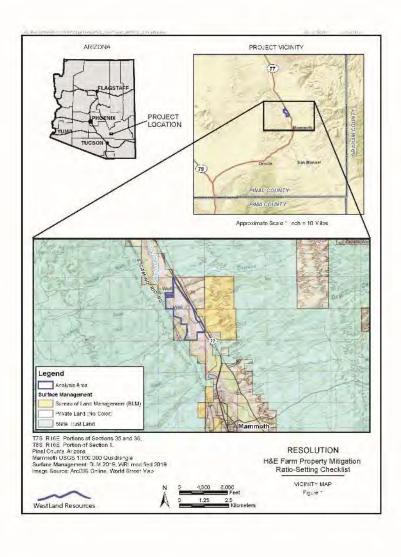


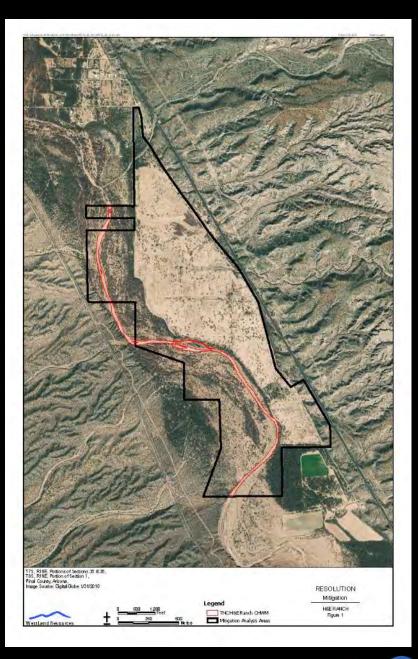
Resolution Copper | 404 Mitigation Opportunities











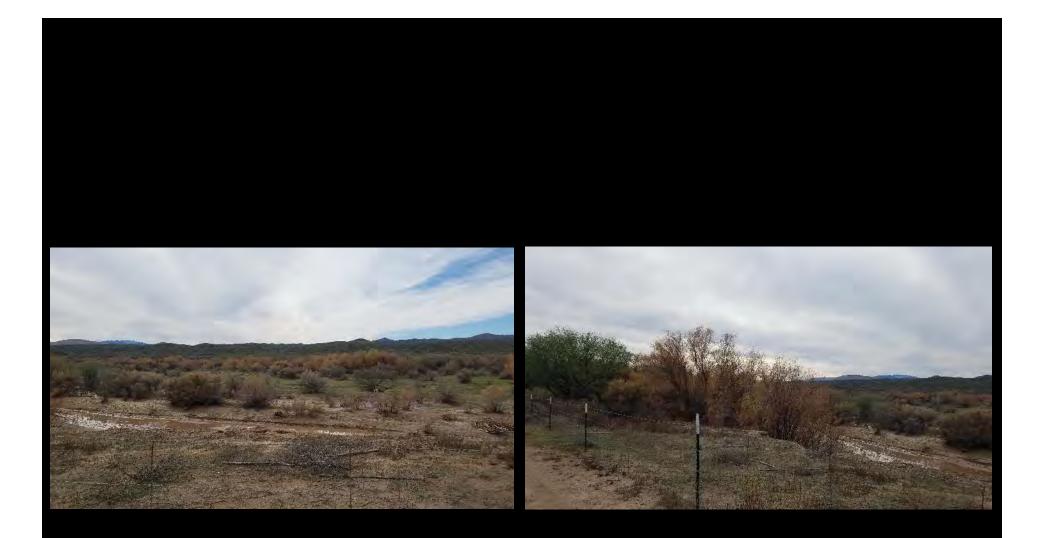
H&E Farm 590 Acres





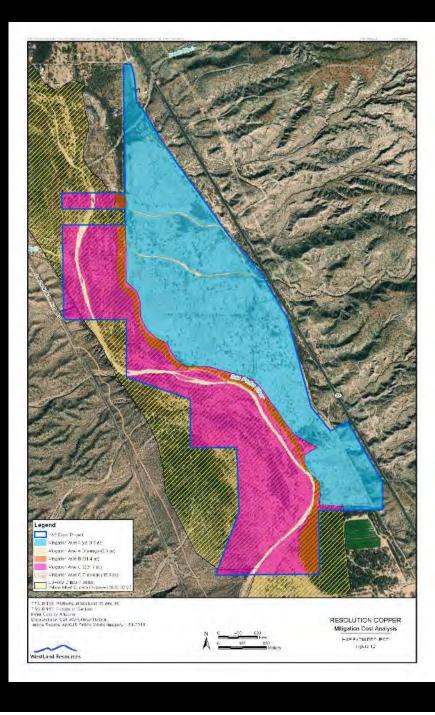
H&E Farm | Existing Conditions





H&E Farm | Existing Conditions





## **H&E Farm** Mitigation Activities

Mitigation Area A

- Earthwork to reconnect historic tributaries
- Planting & seeding native species

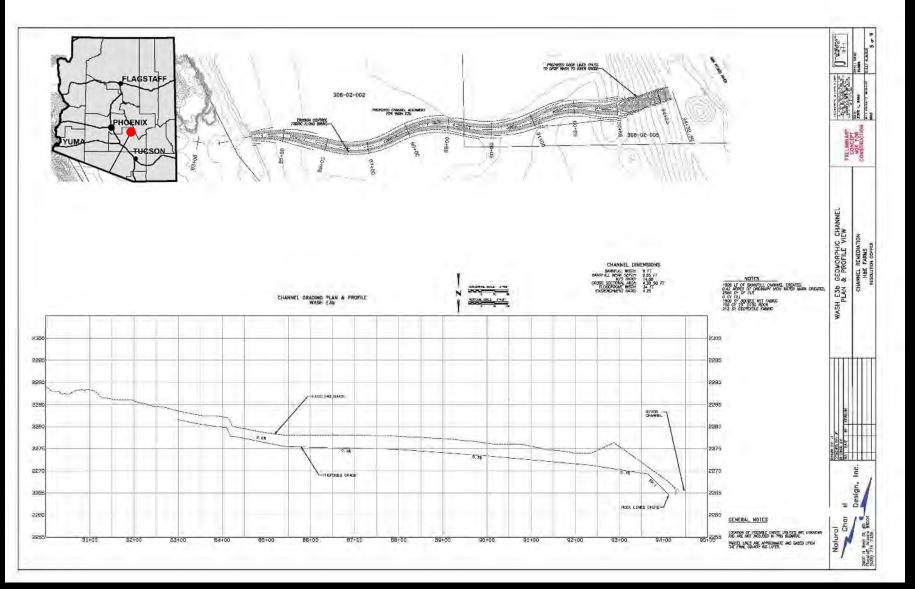
#### Mitigation Area B

• Planting & seeding native species

#### Mitigation Area C

Preservation – no work



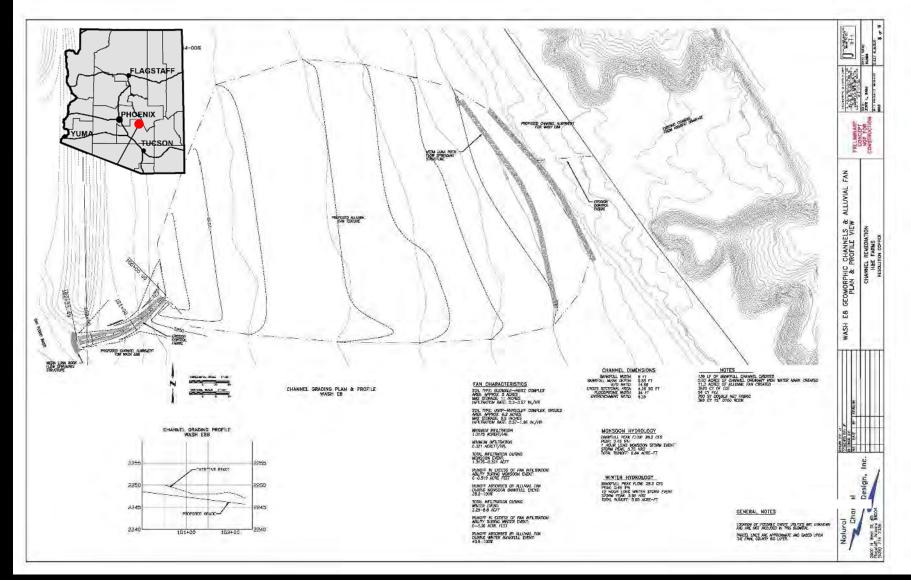


H&E Farm | Example Channel Reconstruction





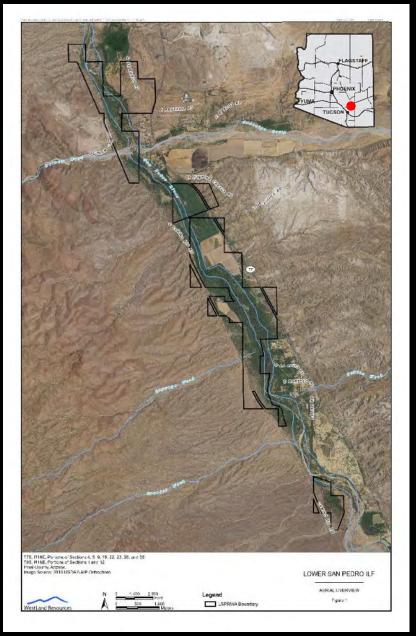
#### H&E Farm | Example Alluvial Fan Reconstruction



# Lower San Pedro River Wildlife Area

In-Lieu Fee

WestLand Resources

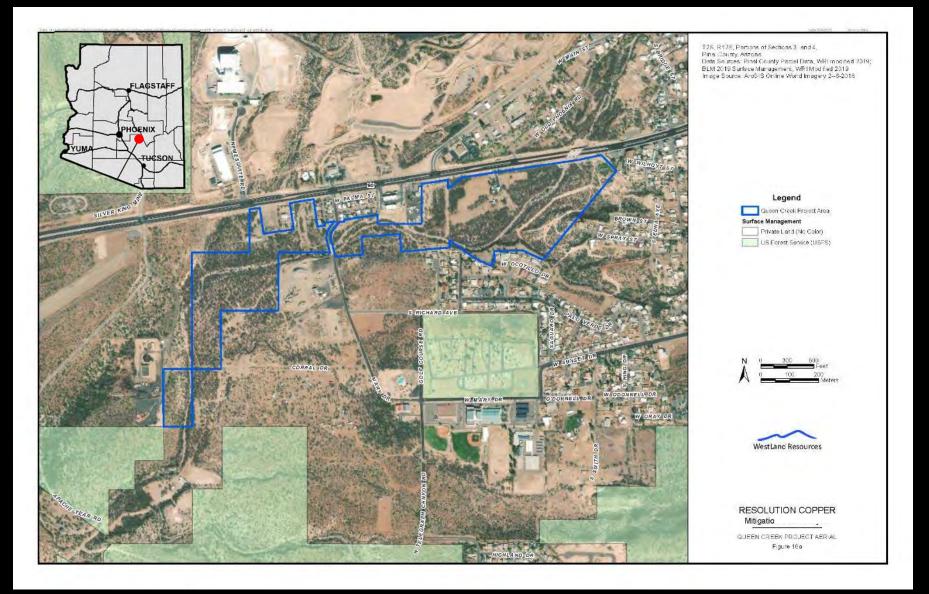


**LSPWA ILF** 677 Acres



# Queen Creek Project

WestLand Resources



Queen Creek 79 Acres





Queen Creek | Ephemeral Reach





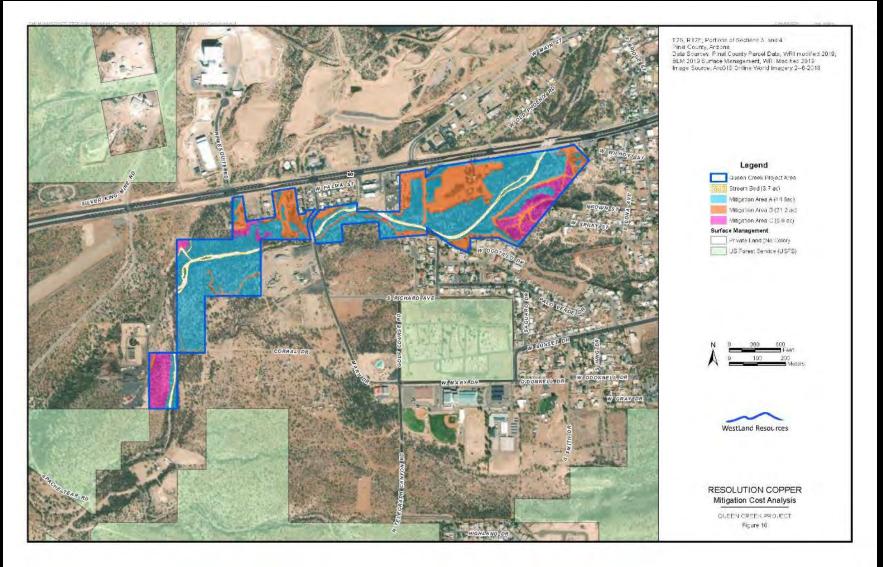
Queen Creek | Upland





Queen Creek | Exotic Species + Anthropogenic Disturbances





## **Queen Creek** Mitigation Activities

Mitigation Area A

- Minimal exotic removal and treatment
- Planting & seeding native species
- Mitigation Area B
  - Selective debris removal
  - Seeding native species
- Mitigation Area C
  - Preservation



## Gila River Indian Community MAR-5 Project

# Olberg Road Restoration Site



## GRIC MAR-5 + Olberg Road Restoration Site [ORRS] GRIC MAR-5: 123 acres wetted











GRIC MAR-5 PROJECT | 2020





Olberg Road Restoration Site | Existing Conditions



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### APPENDIX D

**Additional Conservation Measures** 

## SOILS AND VEGETATION CONSERVATION MEASURES

- 1. Road embankment slopes will be graded and stabilized with vegetation or rock as practicable to prevent erosion.
- 2. During construction and operations, diversions will be constructed around the affected areas to minimize erosion. A number of best management practices, including check dams, dispersion terraces, and filter fences, also will be used during construction and operations.
- 3. Newly reclaimed areas on the TNF will be monitored for weeds and invasive plants for the first 5 years after reclamation. Infestations of invasive species would be treated as soon as they are identified, or as soon as weather conditions are appropriate for treatment.
- 4. Additionally, in the Baseline EA Decision Notice, Resolution Copper stipulated that on NFS lands, seed mixes used in reclamation will be certified free of seeds listed on the Forest Service's noxious weed list and contain only species native to the project area. Seed mixes will be developed from a native species seed list approved by the Forest Service.
- 5. Resolution Copper has also prepared a *Noxious Weed and Invasive Species Management Plan on National Forest System Lands* (Resolution Copper 2019), which is included as the last item in this appendix. Resolution Copper further agreed to prepare reports 2 years after construction begins and every 5 years during operation to provide an update on surveys, control, and activities related the noxious and invasive weed management to the TNF and USFWS.

## NOISE CONSERVATION MEASURES

1. Mining activities, primary crushing and conveying, will take place underground, and exhaust fans will be equipped with silencers for noise reduction. Milling will take place within a fully enclosed building.

## TRANSPORTATION CONSERVATION MEASURES

- 1. A number of best management practices for road construction and maintenance were identified in the GPO (Resolution Copper 2016c):
  - a. To the extent practicable, vegetation will not be removed except from those areas to be directly affected by road reconstruction activities.
  - b. Cut-and-fill slopes for road reconstruction will be designed to prevent soil erosion.
  - c. Drainage ditches with cross drains will be constructed where necessary. Disturbed slopes will be revegetated, mulched, or otherwise stabilized to minimize erosion as soon as practicable following construction.
  - d. Road embankment slopes will be graded and stabilized with vegetation or rock as practicable to prevent erosion.
  - e. Runoff from roads will be handled through best management practices, including sediment traps, settling ponds, berms, sediment filter fabric, wattles, etc. Design of these features will be based on an analysis of local hydrologic conditions.
  - f. Off-road vehicle travel will generally be avoided.
  - g. During construction and operations, diversions will be constructed around affected areas to minimize erosion. A number of best management practices, including check dams, dispersion terraces, and filter fences, also will be used during construction and operations.

## AIR QUALITY CONSERVATION MEASURES

1. Dust control on roads, including regular watering, road base maintenance and dust suppression, paving of select access roads to the East Plant Site and West Plant Site with asphalt, and setting of reasonable speed limits on access roads within the operational footprint.

Dust control at the tailings storage facility, including delivering tailings to the storage facility via distribution pipelines and continuously wetting the tailings during active deposition. During non-active periods, dust emissions would be managed by wetting inactive beaches and embankment surfaces with sprinkler systems, and treatment with chemical or polymer dust suppressants, if necessary as well as progressive reclamation on the outer embankment.

- 2. Dust control at the East Plant Site, including periodic water and/or chemical dust suppressant, normal mining controls such as wet drilling and the wetting of broken rock, application of water suppression spray to control dust ore conveyance, dedicated exhaust ventilation systems and/or enclosures for crushers and transfer points underground, performing primary crushing and conveying underground, and saturating underground exhaust ventilation.
- 3. Dust control at the West Plant Site, including housing main active ore stockpiles in fully covered buildings, applying water suppression spray to control dust ore conveyance, processing ore in a new enclosed building, and enclosing conveyor transfer points within the concentrator building.
- 4. Dust control during shipping, including bagging molybdenum concentrate at the concentrator facility before shipping and enclosing loadout building and storage shed.

## GROUNDWATER AND SURFACE WATER QUALITY CONSERVATION MEASURES

 At no point during construction, operation, closure, or post-closure would stormwater coming into contact with tailings, ore, or processing areas be allowed to discharge downstream. After closure, precipitation falling on the tailings facilities would interact with the soil cover, not tailings. The seepage collection ponds represent a long-term commitment for managing seepage and stormwater but eventually would either become passive systems fully evaporating collected water or would be removed after demonstrating that collected water is of adequate quality to discharge.

## SURFACE WATER QUANTITY CONSERVATION MEASURES

In the GPO, Resolution Copper has committed to various measures to reduce impacts on surface water quantity:

- 1. To the extent practicable, stormwater flows upgradient of the facilities would be diverted around the disturbed areas and returned to the natural drainage system;
- 2. As much water as possible would be recycled for reuse;
- 3. Permanent diversion channels would be designed for operations and closure; and
- 4. Runoff from roads, buildings, and other structures would be handled through best management practices, including sediment traps, settling ponds, berms, sediment filter fabric, wattles, etc.

## WILDLIFE CONSERVATION MEASURES

In the GPO, Resolution Copper has committed to a variety of measures to reduce potential impacts on wildlife, including those outlined in Section 4.7 of the EIS, Wildlife, and Appendix X of the GPO, Wildlife Management Plan, and is also incorporated below in this appendix (Resolution Copper 2016b).

- 1. Electric power transmission and distribution line towers (power poles) that serve the Resolution Copper Project facilities will be designed and constructed to avoid raptor electrocutions.
- 2. Some additional hazing devices to deter and disperse wildlife from the PAG tailings, non-contact and contact stormwater catchment basins, and process water ponds may also be considered and could include the following:
  - a. Plastic ball covers, vehicle lights and horns, motion-sensor lights, flags, perch deterrents, shell crackers, bird bangers, screamers, distress cries/electronic noise systems, bird scare balloons, propane cannons, and mylar scare tape.
  - A bird hazing protocol would be developed for Resolution Copper employees and would include a combination of harassment techniques. Additional hazing techniques may be adjusted or added as necessary based on field observations and ongoing research efforts. The protocol would include an inspection schedule, acceptable harassment techniques, a field log procedure, and incident reporting procedures. Resolution Copper staff responsible for implementing the bird hazing program would be trained on the protocol prior to its initiation.
- 3. Vegetation growth within the contact and non-contact stormwater catchment basins and process water ponds would be managed and periodically removed as often as necessary to further discourage the presence of wading birds.

Other applicant-committed environmental protection measures by Resolution Copper to reduce impacts on wildlife include measures adapted from previous investigations on the TNF:

- 1. Conduct pre-construction surveys for Sonoran desert tortoise (*Gopherus morafkai*) and Gila monster (*Heloderma suspectum*) before surface ground-disturbing activities start in areas containing suitable habitat for the species. A biological monitor would monitor for Sonoran desert tortoise and Gila monster during construction activities. The monitor would flag Sonoran desert tortoise and Gila monster shelter sites/burrows. These flagged areas would be inspected, and any Gila monsters and tortoises discovered would be relocated outside project activity areas.
- 2. Inform project crews of the potential to encounter Sonoran desert tortoise and Gila monster within the surface project area. Work crews would be instructed to check below equipment prior to moving, and to cover and/or backfill holes that could potentially entrap these species. If these species are observed, work crews would stop work until the biological monitor has relocated these species out of harm's way.
- 3. Establish tortoise crossings, as needed and applicable, for concentrate and tailings pipeline corridors, as well as the railroad tracks within the MARCCO corridor within areas containing suitable habitat.

## PUBLIC HEALTH AND SAFETY CONSERVATION MEASURES

- 1. Pipelines would be buried where feasible, given the geological setting, and where buried they would be externally coated.
- 2. Any vegetation cleared from the site would be temporarily stored on-site at a location with minimal fire risk, well within a cleared area away from ignition sources. Handheld and large equipment (e.g., saws, tractors) used for vegetation clearing would be equipped with working spark arresters.

Resolution Copper would take additional precautions if work is to be conducted during the critical dry season, which may include larger amounts of extinguishing agents, shovels, and possibly a fire watch.

3. Parking will be prohibited on vegetated areas outside the designated construction footprint and proper disposal of smoking materials will be required. All surface mine vehicles would be equipped with, at a minimum, fire extinguishers and first aid kits.

## SCENIC RESOURCES CONSERVATION MEASURES

Applicant-committed environmental protection measures by Resolution Copper include those outlined in the dark skies analysis (Dark Sky Partners LLC 2018):

- 1. Implement an outdoor lighting plan that would reduce potential impacts from artificial night lighting.
- 2. Reduce illumination levels where appropriate while still meeting MSHA requirements for lighting sufficient to provide safe working conditions.
- 3. Adhere to the Pinal County Outdoor Lighting Code.
- 4. Use control systems that can turn off lights at particular times of night or are activated by detecting motion while still meeting MSHA requirements for lighting sufficient to provide safe working conditions.

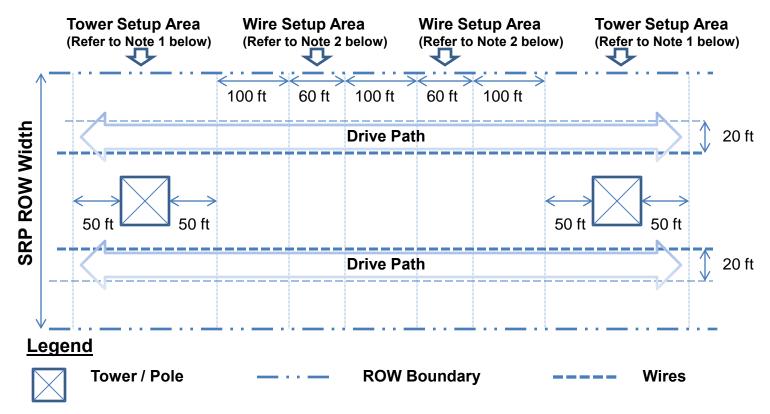
Additional applicant-committed environmental protection measures by Resolution Copper include the following:

- 1. Bury concentrate pipelines to the extent practicable. Concentrate pipelines will have approximately 3.3 feet (1 meter) of cover over buried sections.
- 2. Bury tailings and other pipelines to the extent practicable.
- 3. Perform concurrent reclamation of tailings embankment beginning at approximate year 10 of tailings operations.
- 4. Use a reclamation seed mix of weed-free native species consistent with surrounding vegetation.

## SRP'S POWER LINE CONSTRUCTION PRACTICES AND GUIDANCE

Salt River Project (SRP) would be the ultimate responsible party for construction and maintenance of the various powerline corridors. The following information is provided with this Biological Assessment to reflect the typical measures that SRP follows. It is recognized that there are likely areas of overlap with these typical measures with conservation measures described in Section 5 or included above in Appendix D, and it is anticipated that clarifying the measures to be undertaken along the powerline corridors would be part of the Section 7 consultation process.

## SRP TRANSMISSION ROW MAINTENANCE SETUP AREAS Applicable to 115KV, 230KV & 500KV



### <u>Notes</u>

- 1. Tower / Pole Setup Areas are defined as a rectangular area 50 ft on each side of the outside tower legs or face of pole by the width of the easement. Unobstructed "high and dry" access is required 24/7.
- 2. Wire Setup Areas are defined as a rectangular area 60 ft long by the width of easement, repeating every 100 ft between the Tower / Pole Setup Areas.
- 3. Wire and Pole Setup Areas must be clear of above grade improvements with a 20:1 max slope.
- 4. Below Grade improvements within Setup Areas are reviewed on a case by case basis. Prior written Consent by SRP is required.
- 5. SRP requires an unobstructed "high and dry" equipment drive path, 20ft wide with a 20:1 max slope, running parallel to the wires for the entire length of the easement on both sides of the Towers / Poles.
- 6. Refer to SRP Design Guidelines for Proposed Improvement in Transmission ROW for more details, including requirements for Point Load Calculations and Pole Stability Study submittals to SRP.



### General Design Guidelines for Proposed Improvements in SRP Transmission Easement/ROW

Date: Revised January 2016

Any improvements within Salt River Project's Transmission easement/ ROW must have written approval which is given by SRP in the form of the *Consent to Use Agreement*. A SIGNED *CONSENT TO USE AGREEMENT* / APPROVAL LETTER IS REQUIRED PRIOR TO BEGINNING CONSTRUCTION.

To obtain a *Consent to Use Agreement,* plans must be submitted to the SRP Land department where they will undergo a process of review, revision (if necessary), and approval. The review process should begin early in the design process to obtain approval of plans prior to construction. Upon approval of the final plans, a *Consent to Use Agreement* will be drafted by the SRP Land Department and sent to the Landowner for signature. The *Consent to Use Agreement* including an exhibit will be recorded at the County Recorder's Office. The approved plans are retained by SRP.

General guidelines for the Consent to Use Agreement process are as follows:

1. All plans submitted to SRP must be drawn "to scale". Plans should be submitted to:

http://www.srpnet.com/about/land/default.aspx

- 2. All plans must show SRP easement / ROW boundaries.
- 3. All plans must show SRP facilities, including poles and overhead wire locations.
- 4. Plans must show all proposed improvements within SRP ROW / easement, including utilities, paving, grading, drainage, lighting, landscaping, etc.

- 5. Lighting structures must meet SRP electrical clearances with respect to our overhead conductors and towers/poles. In general, lighting structures 12 ft. high or less adhere to SRP electrical clearances. Proposed lighting plans need to be reviewed and approved by SRP. SRP may require the land owner to provide a Survey of SRP wires and structures as part of calculating clearances and approving lighting within the easement/ ROW. (Please contact SRP to obtain a copy of, *Information Required for SRP Electrical Clearance Calculations*, prior to survey of SRP transmission line.) The lighting consultant must submit Electrical Clearance calculations (sealed by an Arizona licensed Engineer) to SRP for review to verify that all electrical clearances are acceptable. Contact SRP to obtain conductor sag data. Also the lighting consultant shall consider OSHA clearances on the property owner's / municipalities' behalf. SRP will not take outages on our transmission lines to allow lights to be maintained.
- In general, trees are prohibited within SRP easement / ROW. In special cases some landscaping, including low growing type trees, may be allowed provided it does not interfere with the maintenance of existing or future transmission lines. All proposed landscaping in SRP ROW plans need to be reviewed and approved. (Please contact SRP to obtain a copy of *SRP Approved Trees* and *SRP Approved Groundcover* Lists.)
- 7. SRP does not allow occupied buildings or other structures, dumpsters, or drywells within SRP easements / ROW.
- 8. Retention basins will need to be designed by the customer to adhere to *SRP Storm Water Retention Basin Design Guidelines* and site-specific comments from SRP. (Please contact SRP to obtain a copy of the *SRP Storm Water Retention Basin Design Guidelines*.)
- 9. In general, SRP requires maintenance roads (with a maximum slope of 20:1) along the length of our easement / ROW, parallel to the transmission line. Multiple maintenance roads may be required to maintain multiple wires / circuits. The appropriate offset for the maintenance road with respect to each of the transmission line wires is determined by SRP. The roads are generally 20 ft. wide, not including the width required for setup areas at poles / towers and at specific intervals along the wires. SRP maintenance roads must be accessible from public ROW. Due to the complexity of issues involved, maintenance roads will need to be designed by the landowner's consultants based upon input from SRP. Please contact SRP to obtain a copy of the 69KV Transmission ROW Maintenance Setup Areas and/or the EHV Transmission ROW Maintenance Setup Areas. (The SRP Storm Water Retention Basin Design Guidelines drawing also contains general design information for maintenance roads.)

- 10. Maintenance equipment / crane setup areas (with a maximum slope of 20:1) are required at towers / poles and at intervals parallel to the wires. The setup area at a pole / tower differs depending upon the voltage of the line. The EHV (115KV, 230KV and 500KV) pole/tower setup area is generally defined as, a length of approximately 50 ft. in each direction from the pole, by the width of the ROW. The 69KV pole setup area is generally defined as, a length of approximately 30 ft. in each direction from the pole, by the width of approximately 30 ft. in each direction from the pole, by the width of the ROW. Depending upon the transmission line voltage, the distance between setup areas along the wires and the size of the setup areas will vary. Due to the complexity of issues involved, pole setup areas and wire setup areas will need to be designed by the landowner's consultants based upon input from SRP. Please contact SRP to obtain a copy of the 69KV Transmission ROW Maintenance Setup Areas and/or the EHV Transmission ROW Maintenance Setup Areas. (The SRP Storm Water Retention Basin Design Guidelines drawing also contains general design information for pole and wire setup areas.)
- 11. Parking lots are an acceptable use of SRP easement / ROW. There are specific requirements for orientation with respect to traffic flow. Maintenance paths and crane setup areas will need to be incorporated into the parking lot design based upon input from SRP.
- 12. All pipes, manholes, or other proposed facilities to be located at or below grade in SRP easement / ROW must be designed to withstand a minimum of 320 psi on a 27 inch diameter outrigger pad. Load calculations sealed by an Arizona licensed Civil Engineer must be provided to SRP for review.
- 13. NO GRADE CHANGES/ CUT OR FILL PERMITTED WITHIN SRP EASEMENT/ ROW WITHOUT PRIOR WRITTEN APPROVAL. Changes in elevation near power structures (cuts and fill) can endanger pole or tower foundation stability because of the loss of support soil. A detailed engineering analysis is required to determine the impact of excavations on adjacent SRP poles, towers, and facilities. It is the applicant's responsibility to provide and pay for this engineering analysis. The analysis must be performed by an Arizona Licensed Engineer and the Engineer must provide a sealed report to SRP. Depending on workload, SRP may perform this engineering analysis for a fee. Please contact SRP if you desire to pursue this option. You will also need to obtain a copy of *General Analysis Guidelines for Excavations Adjacent to SRP Electric Power Poles.* Please contact SRP to obtain a copy of, *Information Required for SRP Electrical Clearance Calculations*, prior to survey of SRP transmission line.
- 14. Public Utility Easements (PUE) shall not be platted and approved in SRP Transmission Easement.

- 15. For Transmission pole bracing, pole relocations, conductor warning device placements or transmission line conflict checks, please contact Transmission Line Support at 602-236-3080.
- 16. For further instructions on how to submit plans, please copy and paste / click on the link below and follow instructions;

http://www.srpnet.com/about/land/default.aspx

#### SALT RIVER PROJECT

#### **TECHNICAL SPECIFICATION**

<u>FOR</u> ROCK REMOVAL BY BLASTING (SRP TS02225)

#### TABLE OF CONTENTS

SECTION	TITLE	PAGE
1.0	GENERAL	1
1.1	Work Specified Herein	1
1.2	Exclusions	1
2.0	REQUIRED SUBMITTALS	2
2.1	Pre-Blast Survey	2
2.2	Blasting Plan	2
2.3	Event Report	3
3.0	MONITORIG OF SRP FACILITIES	4
3.1	Monitoring Equipment and Set-Up	4
3.2	Limits for Blast Induced Ground Vibration and Air Overpressure	5
4.0	SRP BLASTING REQUIREMENTS NEAR SRP FACILITIES	6
	INCLUDING OVERHEAD CONDUCTOR	6
5.0	SRP RIGHT TO DELAY OR CANCEL BLASTING WORK	7
6.0	SRP NOTIFICATION	8
6.1	SRP Representatives and Submittal Confirmation	8
6.2	Notification Schedule	8

Prepared By:\_\_\_\_\_ Reviewed By:\_\_\_\_\_

\_\_\_\_

#### SALT RIVER PROJECT

#### TECHNICAL SPECIFICATION FOR ROCK REMOVAL BY BLASTING (RESOLUTION COPPER PROJECT) (SRP TS02225)

#### 1.0 GENERAL

#### 1.1 Work Specified Herein

This Technical Specification states Salt River Project (SRP) requirements for rock removal by blasting. This specification is to be integrated into Project Documents issued by Owner or Owner's Representative (OWNER).

#### 1.2 Exclusions

SRP TS02225 presents SRP requirements for rock removal by blasting and is written to augment blasting specifications for the Work issued by OWNER. This Technical Specification presents only SRP requirements for protection of SRP facilities, notification of SRP of blasting events, monitoring of SRP facilities during blasting events, and requirements of Work near SRP facilities; and therefore, excludes general Work requirements such as, but not limited to, the following, as these requirements will be presented within OWNER issued Project Documents:

- a. Authoritative and governmental requirements,
- b. materials to be used
- c. handling of materials,
- d. storage of materials,
- e. transportation of materials,
- f. property surveys,
- g. use of explosives,
- h. loading of explosives,
- i. firing and inspection,
- j. handling of misfires,
- k. public notification and signage,
- I. control of blast site,
- m. schedule of work,
- n. excavation sequence and method,
- o. personnel qualification requirements,
- p. monitoring of blasting, and
- q. OSHA and NESC clear working distances.

#### 2.0 REQUIRED SUBMITTALS

#### 2.1 Pre-Blast Survey

A pre-blast survey of all SRP facilities and structures within 500-feet of all blast events to be performed by independent, qualified third party. Final, complete report to be submitted to SRP a minimum of 10-days prior to commencement of blasting. Purpose of survey is to document any distress including existing cracks within SRP structures. The third party may exclude condition of conductor, attachments, and insulators of SRP structures as SRP will conduct own pre-blast survey of these items.

#### 2.2 Blasting Plan

A Blasting Plan for <u>each</u> proposed event that is to occur within 500-feet of an SRP facility (includes, but not limited to, underground structures, above-ground structures, structures supporting overhead electric power, overhead conductor, overhead equipment and materials, substation equipment and walls, underground electric ducts, underground conduit, underground irrigation pipeline, manholes, and box culverts) must be submitted to SRP for approval. Submittal should be by e-mail as described in **Section 6.1 "SRP Representatives and Submittal Confirmation."** SRP will require a maximum of four (4) business days (excludes weekends and holidays) to approve or deny a submitted Blasting Plan.

Blasting Contractor shall fully comply with the requirements of the approved Blasting Plan. SRP approval is focused on the protection of nearby SRP facilities, and SRP approval of the Blasting Plan should not be interpreted as SRP dictating or approving safety and method used by the Blasting Contractor. The Blasting Contractor is solely responsible to ensure that his method is safe, that all statutory and imposed requirements and limitations are followed, and to obtain approval from all relevant authorities and follow their requirements.

Submitted Blasting Plan is to provide details of the proposed event including, as a minimum, the following information:

- a) Project name, shot/event identification, and submittal date.
- b) Location (include map and show SRP facilities including horizontal distance from blast area to facilities, and include location of drill holes in relation to SRP overhead conductor and provide elevations of top of drill rig and overhead conductor when inside SRP right-of-way).
- c) Provide sketch showing where blast monitoring equipment for SRP facilities will be placed, and show distance from blast.
- d) Scaled distance, anticipated PPV, and anticipated maximum air overpressure at nearest SRP facility.
- e) Production diameter, spacing, total depth, total number, inclination, and map of location of holes.

- f) Bench height, sub-drill height, stemming height, burden height, and loaded height.
- g) Type and size of explosives used including specific gravity.
- h) Quantities of explosives used/hole and total quantity of explosive.
- Sequence of blasting and planned time delays. Include holes/delay and maximum explosive pounds/delay. Sketch showing anticipated movement of shot relative to SRP facilities including anticipated direction of throw of blasted rock.
- j) Comment on throw of rock blasted rock and its impact on SRP facilities (including overhead conductor) and any measures used to control flyrock, if required.
- k) Detailed description of flyrock control method, where required (i.e., overburden thickness, overburden material type, overburden footprint, compactive effort used to place overburden, type of blasting mat/strip, size of blasting mat/strip, detail of blasting mat/strip placement including any anchoring, mat/strip weight, composition of mat, and any special blasting techniques used such as delays and development of free faces away from the structure provisions to control flyrock).

The Contractor's blasting event shall generally be considered satisfactory and in conformity with these specifications when the unstable rock mass is cleanly split from the stable rock mass in such a way that subsequent site activities do not shatter or loosen adjacent rock that is not to be removed. All drilling and blasting shall be done in such a manner as to bring the cliff face as close as possible to a stable profile and to disturb as little as possible the material to be left in place.

#### 2.3 Event Report

Blasting Contractor shall provide **SRP Designated Blasting Representative** an Event Report for each blasting event. Event Report must be submitted to e-mail address described in **Section 6.1 "SRP Representatives and Submittal Confirmation."** Event Report must be submitted prior to performing any future blasting event that requires SRP approval, or within 24-hours from the most recent blast event, whichever is the shorter period. The time required to provide the Event Report may be adjusted by SRP should accurate verbal regarding blasting event data be provided to SRP Blasting Representative soon after completion of the blasting event.

The Event Report shall contain all pertinent information of the blast event, and shall use English units. Event reports shall provide, as a minimum, the following information:

- a. Blast Date and Time.
- b. Blast Identification.
- c. Duration of Record Time.
- d. Operator Name.

- e. Set-Up Identification/Location.
- f. Serial Number of Seismograph.
- g. Seismograph Most Recent Calibration Date and by Source of Calibration.
- h. File Name.
- i. Maximum Pounds of Explosive per Delay.
- j. Peak Velocity for Each Component (Transverse, Vertical, Longitudinal).
- k. Zero Crossing (ZC) Frequency for Each Component
- I. Time Relative to Trigger for Each Component.
- m. Peak Acceleration for Each Component.
- n. Peak Displacement for Each Component.
- o. Peak Sound Pressure Level (PSPL).
- p. Zero Crossing (ZC) Frequency for Air Overpressure.
- q. Plot of Data with OSMRE and USBM RI8507 Limits.
- r. Vibration and Microphone Data Time Histories (Plot, Tape, or Other Data Presentation Method).
- s. Drawing, Map, and/or Scaled Image of Blast Location and Monitoring Locations, and Any Other Pertinent Information.

### 3.0 MONITORING OF SRP FACILITIES

3.1 Monitoring Equipment and Set-Up

Each blast event shall be monitored for blast induced ground vibration and air overpressure by a qualified independent testing consultant or agency well experienced in that type of work.

The manufacture, calibration, and operation of blasting seismographs shall follow the recommended guidelines set forth by the International Society of Explosives Engineering Seismograph Section (ISEE), titled "ISEE Field Practice Guidelines for Blasting Seismographs 2015," and "ISEE Performance Specifications for Blasting Seismographs 2016."

Seismographs shall be state of the art, digital units, proven to be in calibration. Seismograph units shall be capable of recording the three components of ground vibration (vertical, longitudinal or radial, and transverse). Seismograph units must be capable of recording a frequency range of 2 to 250 Hz and air overpressure resolution of 0.00029 psi (100 dB Linear Scale). Ground transducers have the same frequency range with a velocity resolution range between 0.005 and 10 in/s. A wind-screen shall be used to cover the air pressure transducer to eliminate wind pressure interference with the airblast, and geophones shall be well-coupled to the ground using burial methods. Air overpressure shall be monitored using the same seismograph equipment used to monitor ground vibrations.

Seismographs to be programmed to continuously monitor vibrations and air overpressure at a rate of at least 2,048 samples per second (S/s) and record blast time histories for a minimum duration of 6 seconds when vibration or air overpressures exceed maximum trigger levels of 0.03 in/s and 120 dB, respectively.

Blasting Contractor shall be responsible for coordinating and scheduling the monitoring of each blast event for blast induced ground vibration and air overpressure. Monitoring of SRP facilities to be performed using a minimum of two (2) on-site seismographs. Seismographs to be placed per current standard-of-practice, on the ground surface adjacent to SRP structure, on the side of the structure toward the blast event, and should never be placed on the structure or on the structure's foundation.

Seismographs are to be set-up at the two closest SRP facilities with at least one (1) seismograph set-up adjacent to an SRP structure supporting overhead electric power (pole, H-frame, lattice tower) even when a second underground or above-ground structure is located closer, provided the structure supporting overhead electric power is within 500-feet of the blast event. Should the SRP structure supporting overhead electric power be located outside the 500-foot zone of influence, the second seismograph would be placed at the next closest SRP underground or above-ground structure located within the 500-foot zone. Should a second SRP facility not be located within the 500-foot zone, the second seismograph should be placed in the proximity of the first seismograph, providing a second source for data of ground vibration and air overpressure.

For SRP multi-foundation structures (H-frames, lattice towers) supporting overhead electric power, a seismograph is to be placed on the ground surface adjacent to the two closest foundations when no other SRP facility is located closer. Should an SRP underground or above-ground structure be located closer to the blast event than the SRP structure supporting overhead electric power, one seismograph is to be placed at the structure and the second seismograph is to be placed adjacent to the closest foundation of the structure supporting overhead electric power.

Establishment of this monitoring system for SRP facilities does not relieve the Blasting Contractor of his obligation to monitor and record the blast induced ground vibration and air overpressure at non-SRP structures. Additionally, the Blasting Contractor remains responsible to control his operation so that the blasting event remains within the limits stated within the Blasting Plan including the control of flyrock.

#### 3.2 Limits for Blast Induced Ground Vibration and Air Overpressure

Blast induced ground vibration (including foundations for structures supporting overhead electric power) shall be below limiting levels presented by the U.S. Department of the Interior Bureau of Mines, RI 8507 (Siskind, et al., 1980), **Figure 1.0**. Peak particle velocity recorded by a three-component seismograph shall never exceed 0.75 inches per second (ips) for frequencies between 4 and 15 Hz, and 2.00 ips for frequencies above 40 Hz.

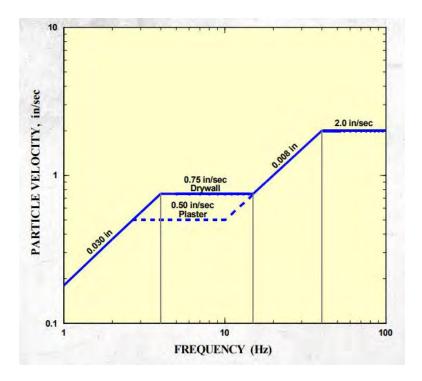


Figure 1.0: Limiting Levels for Blast Induced Ground Vibration (RI 8507 from U.S. Department of the Interior Bureau of Mines, Siskind, et al., 1980).

Air overpressure at nearest SRP facility (includes overhead conductor) should not exceed 133 dBL (0.013 psi). Air overpressure to be measured at seismograph locations and may require interpolation to nearest SRP asset.

Ground surface vibrations on the ground surface above buried pipelines and other utility (i.e., electric duct banks and electric conduit) is to be limited to a PPV of 2 in/s for vibration peak frequencies less than 20 Hz and a PPV of 4 in/s for frequencies above 20 Hz. When blasting near SRP underground structures, the blast must be performed so that the maximum distance of cracking and backbreak is 50% of the distance from the structure to the blast area.

# 4.0 SRP BLASTING REQUIREMENTS NEAR SRP FACILITIES INCLUDING OVERHEAD CONDUCTOR

Blast events must be planned and performed so as not to generate flyrock that may impact any SRP facility, this includes but is not limited to structures, structures supporting overhead electric power, insulators, conductor, hardware, attachments, and arms of structures.

SRP will not permit blasting events within 20-feet (horizontal distance) of any SRP structure supporting overhead electric power, and any other underground and above-grade structure. OWNER may request a special review process for blasting closer than 20-feet with the understanding that SRP review of this process may require several weeks, and it is likely that this review would not allow blasting at the closer distance.

Blasting may be conducted directly beneath SRP overhead conductor upon approval by SRP.

SRP requires that any blasting within 50-feet (horizontal distance) of an SRP structure, structure supporting overhead electric power, or overhead conductor be designed to control flyrock. This design, as a minimum, must include covering of loaded holes using non-conductive blasting mats, non-conductive rubber strips, and/or overburden. Additionally, specialized blasting techniques such as use of delays and controlling development of free faces away from the conductor should be incorporated into the design. Method proposed by Blasting Contractor to control flyrock must be proofed to the satisfaction of SRP by at least one test blast or one production blast located outside the 50-foot distance. Success of the proof would dictate requirement for adjustment of method and further proof testing.

Metal blasting mats and any other conductive blasting mats are not permitted within 200feet (horizontal distance) of overhead conductor. Blasting mats must be anchored to prevent the mat or other material from being thrown into the overhead conductor. Leading wires shall be placed at right angles to the overhead conductor alignment and shall be securely anchored to prevent the blasting circuit conductor from being thrown into the overhead conductor.

Placement of overburden (including but not limited to thickness, compactive effort, material type, and area) is to be determined by the Blasting Contractor.

#### 5.0 SRP RIGHT TO DELAY OR CANCEL BLASTING WORK

SRP has the right to postpone or cancel a blast event due to operation concerns of the electric power system. These concerns would include items such as high load through conductor, or the in-ability to shed load rapidly in case of damage. The **SRP Designated Blasting Representative** would communicate any required cancellation or postponement to the Blasting Contractor as soon as possible.

SRP has the right to postpone or cancel future blast events should a preceding blast event not have performed as designed, or the event had the appearance of possibly damaging existing at-grade or underground structures, overhead conductor, or structures supporting overhead electric power. Items such as PPV or air overpressure values being above limits stated herein, flyrock encroaching structures or conductor, and the **SRP Designated Blasting Representative** observing any possible damage to structures and conductor would be considered a reasonable cause for shutdown.

Blasting Work would be shutdown until SRP has had the opportunity to observe and assess competency of structures and overhead conductor, and SRP has completed all necessary repairs (if required). Also, Blasting Work would be shutdown until SRP approves submittal from OWNER presenting reason(s) that blast event was not as anticipated, and corrective action(s) that will be taken to prevent such occurrence from repeating.

SRP has the right to modify requirements of this Specification should damage occur to their facilities due to blasting events that meet all requirements stated within.

#### 6.0 SRP NOTIFICATION

#### 6.1 SRP Representatives and Submittal Confirmation

SRP will have two (2) to four (4) representatives to accept the submittal of a scheduled blasting event or Blasting Plan. These representatives are identified as "SRP Blasting Representatives." Initial contact of the SRP Blasting Representative of a scheduled blasting event or submittal of a Blasting Plan by the Blasting Contractor must be by SRP designated e-mail. SRP designated e-mail may be a project specific address or designated SRP individuals, which would be determined by SRP after assessing communication volume and needs.

Upon receipt of the initial contact e-mail from the Blasting Contractor, a single SRP person responsible for communication with the Blasting Contractor for the duration of the specific blasting event will be assigned at this time, and this person would be identified as the "**SRP Designated Blasting Representative.**" Blasting Contractor will be notified of receipt of the scheduled blasting event or Blasting Plan by return e-mail from the **SRP Designated Blasting Representative** on the same business day as the submittal is received; except for submittals received after 2:00 pm, with confirmation of the receipt of these emails occurring before 12:00 (noon) the following business day.

The Blasting Contractor should call the SRP phone number designated for support of OWNER blasting Work should the Blasting Contractor not receive a confirmation e-mail from SRP within the period described in the preceding paragraph,

#### 6.2 Notification Schedule

SRP shall be notified of schedule for a new blasting event (includes date, preliminary time, location) and/or a new Blasting Plan a minimum of four (4) business days prior to a scheduled blast event. Blasting Plans require a maximum of four (4) business days for SRP review and comment.

A minimum of two (2) business days prior to scheduled blast event, the Blasting Contractor shall notify the **SRP Designated Blasting Representative** to provide 30minute window when blast event(s) will occur, and anticipated time that blast event(s) will be completed.

At 120-minutes prior to blast event, the Blasting Contractor shall notify the **SRP Designated Blasting Representative** by phone to confirm that blast event(s) will occur, confirm time blast event(s) will occur, and confirm time that blast event(s) will be completed.

At 30-minutes prior to blast event, the Blasting Contractor shall notify the **SRP Designated Blasting Representative** by phone to confirm that charges have been installed and connected and confirm time blast event(s) will occur and confirm time that blast event(s) will be completed. At no more than 30-minutes after the blast event, the Blasting Contractor shall notify the **SRP Designated Blasting Representative** by phone to confirm that the blast was as planned, successful, completed, and all-clear. Any issues of the blast must be preliminarily discussed at this time.

**SRP Designated Blasting Representative** must be on-site to observe impact of specific blast event(s) upon SRP facilities. Blasting near SRP facilities may not be performed until the SRP representative is on-site and in a position to observe the impact of the blast on SRP facilities. The SRP representative must be provided a safe location to observe impact of the blast event upon SRP facilities, specifically, presence of flyrock into overhead conductor and structures.

# Resolution Copper Project Noxious Weed and Invasive Species Management Plan on National Forest System Lands

Prepared for: U.S. Forest Service—Tonto National Forest 2324 E. McDowell Road Phoenix, Arizona 85006

Prepared by: Resolution Copper 102 Magma Heights Superior, Arizona 85173-2523



May 2019

# **Table of Contents**

1.	INTRODUCTION	. 1
	1.1. Plan Objectives	. 1
	1.2. Plan Description	. 1
2.	BACKGROUND	. 2
3.	PREVENTION	. 2
4.	DETECTION	. 3
5.	CONTROL AND MANAGEMENT	. 4
6.	RESTORATION AND REHABILITATION	. 5
7.	REFERENCES	. 6

### **Tables**

Table 1.	Invasive Species Observed within Resolution Baseline Activities Area	
	on Tonto National Forest	4
Table 2.	Typical and Maximum Application Rates for Herbicides and Carriers	5

# **Appendices**

- Appendix A. Invasive Animals List
- Appendix B. Federal Noxious Weed List
- Appendix C. Tonto National Forest Weed Seed List and Invasive Species List with Descriptions



## 1. Introduction

This *Noxious Weed and Invasive Species Management Plan* (Plan) was created to minimize, reduce, or eliminate the potential for introduction, establishment, spread and impact of invasive species in habitats affected by activities associated with the construction, operation, and closure of the Resolution Copper Project (the Project) on National Forest System (NFS) lands. Hereafter, this document uses the term "invasive species" to refer to exotic invasive plant and animal species. Treatment options include mechanical, chemical, or biological controls and seeding desired species. Noxious weeds, invasive species, or other undesirable species will be monitored and treated according to management objectives.

### 1.1. Plan Objectives

Section 6 of Resolution's *General Plan of Operations* (GPO; Resolution 2016) summarizes the plans associated with all aspects of revegetation, reclamation, and closure of the Resolution Project, including noxious and invasive plant management (Resolution 2016, Section 6.13).

The purpose of this Noxious Weed and Invasive Species Management Plan, in alignment with the U.S. Forest Service (USFS) National Strategic Framework for Invasive Species Management (USFS 2013), is to achieve the following on NFS lands impacted by the Project:

- Prevent the introduction of invasive species;
- Detect invasive species on and around Project areas on NFS lands;
- Eradicate (if possible), control, or manage priority invasive species to minimize spread and adverse effects;
- Restore and rehabilitate areas impacted by invasive species or associated management activities; and
- Communicate with agencies and organizations.

### 1.2. Plan Description

The remainder of this Plan includes the following sections:

- Section 2: Background
- Section 3: Prevention
- Section 4: Detection
- Section 5: Control and Management
- Section 6: Restoration and Rehabilitation
- Section 7: References



### 2. Background

The term "invasive" is an aggressive characteristic of a plant or animal that invades and tends to spread prolifically and undesirably. A species is considered to be invasive if it meets two criteria: 1) it is non-native to the ecosystem, and 2) its introduction causes, or is likely to cause, economic or environmental harm or harm to human health (Executive Order 13112) .Invasive species which produce undesirable effects (e.g., decreases species diversity, outcompetes native species, is poisonous to livestock, changes fire frequency or intensity) will be controlled. Infestations of invasive species would be treated as soon as they are identified, or as soon as conditions are appropriate for treatment (USFS 2013).

Invasive animal species include invertebrates and aquatic species; a list of invasive animal species is provided in **Appendix A**. These animals may consume resources more quickly than natives, spread disease, or even directly consume native species. The greater impact from invasive species is on threatened and endangered species. For example, the threatened Chiricahua leopard frog (CLF) is susceptible to American bullfrogs, northern crayfish, tiger salamanders, and other aquatic invasive species. Invasive animals may be identified, monitored, and removed (USFS 2013).

Federal agencies are directed to prevent introduction of noxious and invasive species (Federal Noxious Weed Act 1974 and 1990), and to follow an Invasive Species Management Plan (Executive Order 13112, USFS 2013). Invasive species are detrimental and destructive to native biodiversity, and difficult to control or eradicate, and the USFS has issued management guidelines for these species (USFS 1998). Those species listed by the TNF are called "invasive species" (USFS 2014a). In this report, the term "noxious weeds" is used for TNF invasive species. The Federal noxious weeds list is provided as **Appendix B**, and the TNF weed seed list and invasive species list is provided as **Appendix B**. The presence of any noxious weeds or invasive species would trigger treatment (USFS 2013).

## 3. Prevention

The most effective and environmentally sound way to manage invasive species is to prevent their introduction and establishment. Invasive species may be introduced through a variety of methods. Invasive species may be introduced to a site inadvertently through reclamation materials or by soil and/or other materials attached to vehicles/equipment, etc. Invasive insects, like tiger mosquitoes, may be brought to the site via winds or may disperse on their own. Drainages also provide a path for invasive species. Seeds may be washed downstream during storm events and be deposited on disturbed ground.

As appropriate, Resolution will implement the following standard practices for the prevention of invasive species introduction on Project areas located on National Forest System lands :

• Certified weed-free seed and hay will be used for reclamation and compliance activities, including wattles and organic materials used for erosion control.



- Invasive ornamental plants will not be used for landscaping or reclamation.
- All heavy equipment will be cleaned prior to entering National Forest System lands and being used on the Project.

Applicant committed environmental protection measures which specifically include components of invasive species control on NFS lands:

- Reseeding activity will use exclusively certified seed and other materials of seed certified to be free of weeds listed on the TNF Weed Seed List (**Appendix C**);
- TNF approval will be obtained prior to initiating any noxious weed control program on federal land;
- Noxious weed control will be limited to chemicals and procedures approved by TNF on National Forest System lands; and
- Monitoring reports summarizing reseeding success will be periodically submitted to the USFS (Resolution 2016, Section 4.9).

# 4. Detection

An assessment will be conducted to locate invasive species occurring on NFS lands prior to grounddisturbing activities. The assessment will provide baseline information on existing invasive species. The goal of monitoring is to detect and eliminate invasive species within project areas on NFS lands prior to ground-disturbing activities.

To the extent practicable, concurrent reclamation of construction footprints will occur as soon as possible to prevent the introduction of non-native species.

Newly reclaimed areas will be monitored for weeds and invasive plants for the first five years after reclamation. Infestations of invasive species would be treated as soon as they are identified, or as soon as weather conditions are appropriate for treatment.

There have been many invasive species identified across the United States. However, it is difficult to survey for a myriad of species, and it is unlikely that all species will have the potential to occur within Resolution disturbance footprint on NFS lands. A list of potential invasive species that have the potential to occur on Resolution disturbance footprint on NFS lands was compiled from the *Environmental Assessment for Integrated Treatment of Noxious or Invasive Plants* (USFS 2012), and *Forest Service Manual (FSM) Tonto National Forest 2000 National Forest Resource Management Chapter 2080 Noxious Weed Management* (USFS 2009) . If other invasive species are determined by the USFS to be problematic in the future, they will be added to the list of species of concern. **Table 1** provides a list of invasive species detected on Tonto National Forest within the Resolution Baseline Activities area.



Noxious Weed Species	Access Route Sites (n = 157)	Baseline Activities Sites (n= 141)	Percent of Total Sample Sites (n=298) (where species were observed)
Brome ( <i>Bromus</i> sp.)	155	138	96.3
Asian mustard (Brassica tournefortii)	34	25	19.8
Non-native annual grass (Schismus sp.)	34	16	16.8
Thistle ( <i>Cirsium</i> sp.)	15	11	8.7
Lehmann's lovegrass (Eragrostis lehmanniana)	5	0	1.7
Buffelgrass (Pennisetum ciliare)	3	2	1.7
Fountain grass (Pennisetum setaceum)	0	1	0.3
Saltcedar ( <i>Tamarix</i> sp.)	1	0	0.3
Saltcedar ( <i>Tamarix</i> sp.)		U	0.3

Table 1. Invasive Species Observed within Resolution Baseline Activities Area on Tonto National Forest

(WestLand 2014)

### 5. Control and Management

Once an invasive species is identified, a plan of action will be created and best management practices will be implemented for its control. Risk factors for invasions depend on the species' biology, introduction pathways, and effects on the ecosystem. These factors will be used to develop effective control tools.

If multiple, non-native species occur within the planned footprint of activities on NFS lands, each nonnative species will be prioritized based on the risk it poses to the native species and the vulnerability of the affected ecosystem. Treatment priorities would be coordinated with the TNF. Follow-up monitoring will determine the effectiveness of the treatment and whether additional follow-up treatment would be required (USFS 2013).

There are many methods available to manage invasive species, including mechanical/physical and chemical methods. For example, it may be necessary to mechanically cut down an invasive tree, and then apply an herbicide to the remaining stump to completely eradicate it. **Table 2** provides a list of herbicides and adjuvants acceptable for use on the Tonto National Forest. Approval from the USFS would be obtained prior to initiating any weed control program on federal land.



Herbicide/ Carrier	Rangeland	Forestland	Facilities	Right-of- Way	Recreation/ Administration	Riparian
Aminopyralid	0.078 to 0.11	0.078 to 0.11	0.078 to 0.11	0.078 to 0.11	0.078 to 0.11	0
Chlorsulfuron <sup>1</sup>	0.75 to 3	0.75 to 3	0.75 to 3	0.75 to 3	0.75 to 3	0.75 to 3
Clopyralid	0.25 to 0.5	0.25 to 0.5	0.25 to 0.5	0.25 to 0.5	0.25 to 0.5	0.25 to 0.5
Dicamba	2 to 4	2 to 4	2 to 8	2 to 4	2 to 4	2 to 4
Glyphosate	1 to 4	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4
Imazapyr	1 to 1.5	1 to 1.5	1 to 1.5	1 to 1.5	1 to 1.5	1 to 1.5
Metsulfuron methyl	0.5 to .75	0.5 to 1.8	0.5 to 1.8	0.5 to 1.8	0.5 to 1.8	0.5 to 1.8
Picloram	1 to 2	1 to 2	2 to 3	2 to 3	1 to 2	1 to 2
Sethoxydim	4.3 to 7.2	4.3 to 7.2	4.3 to 7.2	4.3 to 7.2	4.3 to 7.2	4.3 to 7.2
Sulfometuron methyl	2 to 9	2 to 6	2 to 9	2 to 9	2 to 9	2 to 9
Triclopyr	1.5 to 2	3 to 6	4 to 9	4 to 9	1.5 to 2	4 to 8
Imazapic	.03 to .06	.03 to .06	.03 to .06	.03 to .06	.03 to .06	0
	C A R R I E R S					
Mineral Oil	2 to 4	4 to 8	2 to 8	2 to 14	2 to 4	2 to 4
Vegetable Oil	2 quarts	2 quarts	2 quarts	2 quarts	2 quarts	2 quarts
Methylated Seed Oil	1 to 2 pints	1 to 2 pints	1 to 2 pints	1 to 2 pints	1 to 2 pints	1 to 2 pints

Table 2. Typical and Maximum Application Rates for Herbicides	and Commission (in a	
Lane 7 Typical and Maximum Application Rates for Herpicides	and Carriers (in r	notings active indredient per acret
Table 2. Typical and Maximum Application Nates for Herbicides		

(USFS 2012)

<sup>1</sup> This application rate is provided in ounces of active ingredient per acre.

Biological characteristics and mechanisms used by the invasive species may also be identified to help determine effective treatment options. For example, when and how an invasive species reproduces will be considered for treatments. Plants may be manually removed or treated with herbicide prior to the development of flowers/seed to prevent the need for bagging seed.

Monitoring will be conducted on treated areas as needed to determine if follow-up treatments are required. Personnel handling herbicides follow the proper use of pesticides per USFS Region 3 guidelines (USFS 2014b).

Individual plants/weeds will be pulled by hand, clipped, or treated with herbicides. Seeding native, resistant species will direct recovery. Mechanical treatments can treat significant infestations over large areas but are limited by slope inclination and soil characteristics. If aquatic invasive species are found, they will be removed (USFS 2013).

During or immediately following treatment, data will be collected regarding the general area of the treatment application and the invasive species targeted.

### 6. Restoration and Rehabilitation

Following treatment, the area will be re-evaluated to determine if treatment was successful. The timing of the follow-up visit will be on an as-needed basis. For example, if only a few individual invasive plants/weeds were identified and pulled, monitoring may not be necessary until the next growing season or scheduled monitoring event. Follow-up inspections will record the date, location, and findings, i.e., the present or absence of invasive species.



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# **APPENDIX A**

Invasive Animals List

### APPPENDIX A - INVASIVE ANIMALS LIST (USDA 2019)

Terrestrial Invertebrates		Terrestrial Vertebrates	Aquatic Fish and Vertebrates	Aquatic Invertebrates
Africanized honeybee	Hemlock woolly adelgid	Brown tree snake	Alewife	Asian clam
Asian citrus psyllid	Khapra beetle	Burmese python	Asian swamp eel	Asian shore crab
Asian gypsy moth	Kudzu bug	European starling	Bighead carp	Channeled apple snail
Asian long-horned beetle	Light brown apple moth	Wild boar	Black carp	Chinese mitten crab
Asian longhorned tick	Mediterranean fruit fly		Bullfrog	Clubbed tunicate
Asian tiger mosquito	Mexican fruit fly		Cane toad	Colonial sea squirt
Brown marmorated stink bug	Nun moth		Eurasian ruffe	European green crab
Cactus moth	Old world bollworm		Flathead catfish	Golden mussel
Chilli thrips	Oriental fruit fly		Grass carp	Killer shrimp
Citrus longhorned beetle	Pink bollworm		Lionfish	New Zealand mud snail
Coconut rhinoceros beetle	Pink hibiscus mealybug		Nile perch	Quagga mussel
Common pine shoot beetle	Red imported fire ant		Northern snakehead	Rusty crayfish Northern crayfish (from AGFD top 10)
Emerald ash borer	Russian wheat aphid		Nutria	Spiny water flea
European cherry fruit fly	Screwworm		Round goby	Veined rapa whelk
European grapevine moth	Siberian moth		Sea lamprey	White spotted jellyfish
European gypsy moth	Silverleaf whitefly		Silver carp	Zebra mussel
European spruce bark beetle	Sirex woodwasp			
False codling moth	Soybean cyst nematode			
Formosan subterranean termite	Spotted lanternfly			
Giant African snail	Tropical bont tick			
Glassy-winged				
sharpshooter				

https://www.invasivespecies info.gov/terrestrial-invasives

# **APPENDIX B**

Federal Noxious Weed List

### APPENDIX B - FEDERAL NOXIOUS WEED LIST (USDA 2006) (as of December 10, 2010)

Last updated March 21, 2017 (synonymy added and one spelling correction) http://www.aphis.usda.gov/plant\_health/plant\_pest\_info/weeds/downloads/weedlist.pdf

<b></b>	Aquatic	
Latin Name	Author(s)	Common Name(s)
Azolla pinnata	R. Brown	Mosquito fern, water velvet
<i>Caulerpa taxifolia</i> (Mediterranean strain)	(Vahl) C. Agardh	Killer algae
Eichhornia azurea	(Swartz) Kunth	Anchored water hyacinth, rooted water hyacinth
Hydrilla verticillata	(L.) Royle	Hydrilla
Hygrophila polysperma	T. Anderson	Miramar weed
Ipomoea aquatica	Forsskal	Water-spinach, swamp morning glory
Lagarosiphon major	(Ridley) Moss	African elodea
Limnophila sessiliflora	(Vahl) Blume	Ambulia
Melaleuca quinquenervia	(Cavanilles) S.T. Blake	Broadleaf paper bark tree
Monochoria hastata	(Linnaeus) Solms-Laubach	Arrowleaf false pickerelweed
Monochoria vaginalis	(N.L. Burm.) K. Presl	Heartshape false pickerelweed
Ottelia alismoides	(L.) Pers.	Duck lettuce
Sagittaria sagittifolia	Linnaeus	Arrowhead
Salvinia auriculata	Aublet	Giant salvinia
Salvinia biloba	Raddi	Giant salvinia
Salvinia herzogii	de la Sota	Giant salvinia
Salvinia molesta	D.S. Mitchell	Giant salvinia
Solanum tampicense	Dunal	Wetland nightshade
Sparganium erectum	Linnaeus	Exotic bur-reed

### Aquatic

### Parasitic

Latin Name	Author(s)	Common Name(s)
Aeginetia spp.	Linnaeus	Varies by species
Alectra spp.	Thunb.	Varies by species
<i>Cuscuta</i> spp.(except for natives)	Linnaeus	Dodders
<i>Orobanche</i> spp. (except for natives)	Linnaeus	Broomrapes
Striga spp.	Lour.	Witchweeds

	Terrestrial	
Latin Name	Author(s)	Common Name(s)
Acacia nilotica	(L.) Willd. ex Delile	Prickly acacia
= Vachellia nilotica	(L.) P.J.H. Hurter & Mabb.	(updated 3/21/2017)
Ageratina adenophora	(Sprengel) King & Robinson	Crofton weed
Ageratina riparia	(Regel) King & H. Rob.	Mistflower, spreading snakeroot
Alternanthera sessilis	(L.) R. Brown ex de Candolle	Sessile joyweed
Arctotheca calendula	(L.) Levyns	Capeweed
Asphodelus fistulosus	Linnaeus	Onionweed (corrected 3/21/2107)
Avena sterilis	Durieu	Animated oat, wild oat
Carthamus oxyacantha	M. Bieberstein	Wild safflower
Chrysopogon aciculatus	(Retzius) Trinius	Pilipiliula
Commelina benghalensis	Linnaeus	Benghal dayflower
Crupina vulgaris	Cassini	Common crupina
Digitaria scalarum	(Schweinfurth) Chiovenda	African couchgrass, fingergrass
Digitaria velutina	(Forsskal) Palisot de Beauvois	Velvet fingergrass, annual couchgrass
Drymaria arenariodes	Humboldt & Bonpland ex J.A.	Lightning weed
,	Schultes	
Emex australis	Steinheil	Three-corned jack
= Rumex hypogaeus	T. M. Schust. & Reveal	(updated
		3/21/2017)
Emex spinosa	Campdera	Devil's thorn
= Rumex spinosus	L.	(updated 3/21/2017)
Euphorbia terracina	Linnaeus	False caper, Geraldton carnation weed
Galega officinalis	Linnaeus	Goatsrue
Heracleum mantegazzianum	Sommier & Levier	Giant hogweed
Imperata brasiliensis	Trinius	Brazilian satintail
Imperata cylindrica	(L.) Raeuschel	Cogongrass
Inula britannica	Linnaeus	British yellowhead
Ischaemum rugosum	Salisbury	Murainograss
Leptochloa chinensis	(Linnaeus) Nees	Asian sprangletop
Lycium ferocissimum	Miers	African boxthorn
Lygodium flexuosum	(L.) Sw.	Maidenhair creeper
Lygodium microphyllum	(Cav.) R. Br.	Old world climbing fern
Melastoma malabathricum	Linnaeus	Malabar melastome
Mikania cordata	(Burman f.) B. L. Robinson	Mile-a-minute
Mikania micrantha	Kunth	Bittervine
Mimosa invisa	Martius	Giant sensitive
Now: M. diplotricha	C. Wright	plant (Updated July 2016)
Mimosa pigra	Linnaeus	Catclaw mimosa
Moraea collina	Thunberg	Cape tulip
Moraea flaccida	(Sweet) Steudel	One leaf cape tulip
Moraea miniata	Andrews	Two leaf cape tulip
Moraea miniaia	Andrews	
Moraea miniaia Moraea ochroleuca	(Salisbury) Drapiez	Apricot tulip

Nassella trichotoma	Nees) Hackel ex Arechavaleta	Serrated tussock
Onopordum acaulon	Linnaeus	Stemless thistle
Onopordum illyricum	Linnaeus	Illyricum thistle
<i>Opuntia aurantiaca</i>	Lindley	Jointed prickly pear
Oryza longistaminata	A. Chevalier & Roehrich	Red rice
Oryza punctata	Kotschy ex Steudel	Red rice
Oryza rufipogon	Griffith	Red rice
Paspalum scrobiculatum	Linnaeus	Kodo-millet
Pennisetum clandestinum	Hochstetter ex Chiovenda	
		Kikuyugrass
= Cenchrus clandestinus	Hochst. ex Chiov.	(updated 3/21/2017)
Pennisetum macrourum	Trinius	African feathergrass
= Cenchrus caudatus	(Schrad.) Kuntze	(updated 3/21/2017)
Pennisetum pedicellatum	Trinius	Kyasumagrass
= Cenchrus pedicellatus	(Trin.) Morrone	(updated 3/21/2017)
Pennisetum polystachion	(Linnaeus) Schultes	Missiongrass, thin napiergrass
= Cenchrus polystachios subsp		
polystachios	(L.) Morrone	(updated 3/21/2017)
Prosopis alpataco	R. A. Philippi	Mesquite
Prosopis argentina	Burkart	Mesquite
Prosopis articulata	S. Watson	Velvet mesquite
Prosopis burkartii	Munoz	Mesquite
Prosopis caldenia	Burkart	Calden
Prosopis calingastana	Burkart	Cusqui
Prosopis campestris	Griseback	Mesquite
Prosopis castellanosii	Burkart	Mesquite
Prosopis denudans	Bentham	Mesquite
Prosopis elata	Burkart	Mesquite
Prosopis farcta	(Banks & Solander) J.F. Macbride	Syrian mesquite
Prosopis ferox	Grisebach	Mesquite
Prosopis fiebrigii	Harms	Mesquite
Prosopis hassleri	Harms	Mesquite
Prosopis humilis	Gillies ex Hooker & Arnott	Algaroba
Prosopis kuntzei	Harms	Mesquite
Prosopis pallida	(Humboldt & Bonpland ex Willdenow) Kunth	Kiawe, algarroba
Prosopis palmeri	S. Watson	Mesquite
Prosopis reptans	Bentham	Tornillo
Prosopis rojasiana	Burkart	Mesquite
Prosopis ruizlealii	Burkart	Mesquite
Prosopis ruscifolia	Grisebach	Mesquite
Prosopis sericantha	Gillies ex Hooker & Arnott	Mesquite
Prosopis strombulifera	(Lamarck) Bentham	Argentine screwbean
Prosopis stromoutjera Prosopis torquata	(Cavanilles ex Lagasca y Segura) de Candolle	Mesquite
Rottboellia cochinchinensis	(Lour.) W. Clayton	Itchgrass

Rubus fruticosis	Linnaeus	Wild blackberry
Rubus moluccanus	Linnaeus	Wild raspberry
Saccharum spontaneum	Linnaeus	Wild sugarcane
Sagittaria sagittifolia	Linnaeus	Arrowhead
Salsola vermiculata	Linnaeus	Wormleaf salsola
Senecio inaequidens	DC	South African ragwort
Senecio madagascariensis	Poir.	Fireweed
Setaria pumila ssp. pallidefusca (Now: subsp. subtesselata)	(Schumach.) B. K. Simon (Büse) B.K. Simon	Cattail grass (Updated 9/30/2014)
Solanum torvum	Swartz	Turkeyberry
Solanum viarum	Dunal	Tropical soda apple
Spermacoce alata	Aublet	Winged false buttonweed
Tridax procumbens	Linnaeus	Coat buttons
Urochloa panicoides	Beauvois	Liverseed grass

# **APPENDIX C**

Tonto National Forest Weed Seed List and Invasive Species List with Descriptions

# **Tonto National Forest Weed Seed List**

Updated June 2013

This list is to be provided to seed testing laboratories, for noxious weed testing in addition to species listed in the Fifty-State Weed Seed List\*:

Bromus catharticus	Rescuegrass
Bromus diandrus	Ripgut brome
Bromus japonicus	Japanese brome
Bromus rubens	Red brome
Ceratocephala testiculata	Curveseed butterwort
Eragrostis curvula	Weeping lovegrass
Eragrostis lehmanniana	Lehmann's lovegrass
Melilotus officinalis	Yellow sweetclover
Oncosiphon piluliferum	Globe chamomile
Pennisetum ciliare	Buffelgrass

This list may be modified if these species are added to the Arizona State Noxious Weed Seed List, or if new invasive species are suspected as contaminants.

\*The <u>Fifty-State Weed Seed List</u> may be found at the website: http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRD3317318

Latin name	Common name	AZ Dept. of Agriculture Weed List*	APHIS Weed List	On neighboring states' weed lists?	Tonto category**	AZ- WIPWG class ***
Acroptilon repens	Russian knapweed	P, Res.		CA, CO, NM, NV,UT	A	Н
Aegilops cylindrica	Jointed goatgrass	P, Res.		CA, CO, NM	В	L. ~
Ailanthus altissima	Tree of heaven				С	
Alhagi maurorum	Camelthorn	P, Res.		CA, CO, NM, NV,	Α	М
Arundo donax	Giant reed				В	Н
Asphodelus fistulosus	Onionweed		х	NM	А	L
Avena fatua	Wild oats			СО	С	М
Brassica nigra	Black mustard				В	
Brassica tournefortii	Asian mustard				С	M~
Bromus catharticus	Rescuegrass				С	
Bromus diandrus	Ripgut brome				С	М
Bromus japonicus	Japanese brome				С	
Bromus rubens	Red brome				С	Н
Bromus tectorum	Downy brome			СО	С	Н
Cardaria draba	Globe-podded hoary cress	P, Res.		CA, CO, NM, NV UT	А	М
Cardaria pubescens	Hairy white-top	Р		CA	А	М
Carduus acanthoides	Plumeless thistle	Р		CA, CO	А	
Carduus nutans	Musk thistle			CA, CO, NM, NV, UT	А	М
Cenchrus echinatus	Southern sandbur	P, Reg.		CA	А	
Cenchrus spinifex	Field sandbur	P, Reg.		CA	A	
Centaurea biebersteinii	Spotted knapweed	P, Res.		CA, CO, NM, NV, UT	А	м~
Centaurea diffusa	Diffuse knapweed	P, Res.		CA, CO, NM, NV, UT	В	М
Centaurea melitensis	Malta starthistle			NM, NV	С	М
Centaurea solstitialis	Yellow starthistle	P, Res.		CA, CO, NM, NV, UT	С	Н
Chondrilla juncea	Rush skeletonweed	Р		CA, CO, NV	А	М
Chorispora tenella	Blue mustard			CA, CO	А	

# List of Invasive Species for the Tonto National Forest

Latin name	Common name	AZ Dept. of Agriculture Weed List*	APHIS Weed List	On neighboring states' weed lists?	Tonto category**	AZ- WIPWG class ***
Cirsium arvense	Canada thistle	Р		CA, CO, NM, NV, UT	А	М
Cirsium vulgare	Bull thistle			CO, NM	С	
Convolvulus arvensis	Field bindweed	P, Reg.		CA, CO, NM, UT	С	М
Dimorphotheca cuneata	White bietou				A	
Dipsacus fullonum	Common teasel			CO, NM	В	
Eleagnus angustifolia	Russian olive			CO, NM	A	Н
Elymus repens	Quackgrass	P, Res.		CA, CO, UT	В	L
Eragrostis curvula	Weeping lovegrass				С	L. ~
Eragrostis Lehmanniana	Lehmann's lovegrass				С	Н
Euphorbia esula	Leafy spurge	Р		CA, CO, NM, NV, UT	A	Н
Euryops subcarnosus	Sweet resinbush				А	н~
Isatis tinctoria	Dyer's woad	Р		CA, CO, NM, NV, UT	А	
Kochia scoparia	Kochia			СО	А	
Leucanthemum vulgare	Oxeye daisy			СО	A	L
Linaria dalmatica	Dalmatian toadflax	P, Res.		CA, CO, NM, NV	А	M~
Linaria vulgaris	Yellow toadflax			CO, NM, NV	А	М
Lythrum salicaria	Purple loosestrife	Р		CA, CO, NM, NV, UT	А	
Melilotus officinalis	Yellow sweetclover				С	М
Nerium oleander	Oleander				В	
Oncosiphon piluliferum	Globe chamomile				В	
Onopordum acanthium	Scotch thistle	P, Res.		CA, CO, NM, NV, UT	В	L
Peganum harmala	African rue	Р		CA, CO, NM, NV	A	
Pennisetum ciliare	Buffelgrass	P, Reg.			С	Н~
Pennisetum setaceum	Fountain grass				С	Н~
Pentzia incana	Karoo bush				А	
Polygonum cuspidatum	Japanese knotweed			CA	А	
Potentilla recta	Sulfur cinquefoil			CO, NV	А	

Latin name	Common name	AZ Dept. of Agriculture Weed List*	APHIS Weed List	On neighboring states' weed lists?	Tonto category**	AZ- WIPWG class ***
Pyracantha sp.	Pyracantha				В	
Rhus lancea	African sumac				В	М
Salsola kali & S. tragus	Russian thistle			CA, CO	С	
Salvia aethiopis	Mediterranean sage			CA, CO, NV	А	
Schismus arabicus	Arabian schismus				С	М
Schismus barbatus	Mediterranean grass				С	М
Sinapis arvensis	Wild mustard			СО	В	
Tamarix chinensis	Five-stamen tamarisk			NM	С	H~
Tamarix parviflora	Smallflower tamarisk			CO, NM, NV	С	H~
Tamarix ramosissima	Saltcedar			CO, NM, NV	С	H~
Ulmus pumila	Siberian elm			NM	А	М
Vinca major	Periwinkle				В	М

Definitions: \*Arizona State Dept. of Agriculture Weed List: P= Prohibited. These weeds are prohibited from entry into the state.

Reg. = Regulated. These weeds MAY be controlled or quarantined if found within the state, to prevent further infestation.

Res. = Restricted. These weeds SHALL be controlled or quarantined if found within the state.

\*\*Tonto Weed List: Class A weeds are of limited distribution in Arizona, or unrecorded in the state. They pose a serious threat. Management goal is eradication. Class B weeds are of limited distribution in Arizona, common in some places in the state. Management goal is to contain their spread, decrease population size, then eliminate. Class C weeds have spread beyond our capability to eradicate them. Management goal is to contain spread to present size, then decrease the population if possible. \*\*\*AZ-WIPWG = Arizona Wildland Invasive Plant Working Group rating. (SWEPIC 2005) H = High. These species have severe ecological impacts

\*\*\*AZ-WIPWG = Arizona Wildland Invasive Plant Working Group rating. (SWEPIC 2005) H = High. These species have severe ecological impacts on ecosystems; invasiveness attributes are conducive to moderate to high rates of dispersal and establishment; species are usually widely distributed. M = Medium. These species have substantial and apparent ecological impacts on ecosystems; invasiveness attributes are conducive to moderate to high rates of dispersal, often enhanced by disturbance; ecological amplitude and distribution range from limited to widespread. L = Low. These species have minor yet detectable ecological impacts; invasiveness attributes result in low to moderate rates of invasion; ecological amplitude and distribution are generally limited, but the species can be problematic locally.

Additional designation for some species whose current ecological amplitude and distribution are limited. Species are capable of invading unexploited natural communities, based on initial, localized observations or behavior in similar ecosystems/communities elsewhere.

### **Russian knapweed**

Acroptilon repens (L.) DC.

Russian knapweed is a perennial shrub, forming dense colonies by adventitious shoots from widely spreading black roots. Above-ground parts die back each winter; perennial roots send up new shoots in the spring. These roots can penetrate the ground to a depth of over 8 feet and can cover up to 12 square yards in two growing seasons. Stems are erect, openly branched, 18-26" tall. Pink to lavender flowers bloom from June to September (Whitson 2002). It produces seeds sparingly, approximately 50 to 500 per shoot. Seeds are viable for two to three years in soil. Its primary method of reproduction is from vegetative propagation, with seed of secondary importance.

Russian knapweed reduces competition from other plants by allelopathy (production of biochemicals that inhibit the growth of other plants) (Beck 2004). It also produces a neurotoxin that induces symptoms in horses identical to those of yellow starthistle when ingested (Knight 2003). There is no effective treatment for either yellow star thistle or Russian knapweed poisoning because the affected areas in the brain undergo necrosis and do not regenerate.

Russian knapweed is a native to southern Ukraine, southeast Russia, Iran, Kazakhstan and Mongolia; probably introduced into North America about 1898. It is now widely established throughout the west. It is a fairly common weed in the northern half of Arizona, and is also being documented in the southeastern part of the state (USDI 2005). There are infestations along the Upper Verde River upstream from the Tonto. On the Tonto, very small populations have been documented in the vicinity of Gordon Canyon on Highway 260 (Horsley 2005), and at Shumway Millsite on the Payson Ranger District south of Payson (Fenner 2005).

### Jointed goatgrass

### Aegilops cylindrica Host

Jointed goatgrass is a winter annual grass, 15-30" tall with one to many erect stems or tillers. The flower spike contains 2-12 spikelets, each with 1-3 viable seeds. Flowering and seed production occur May to July. Viability of seeds in the soil is 3-5 years; seeds retain 75% of their viability after passing through a ruminant's digestive tract (CDFA 2005).

Jointed goatgrass is native to southern Europe, but is now established in most winter wheat growing areas of North America. It was introduced from Turkey in the late 1800s (Colorado WMA 2002). It is normally spread as a seed contaminant (Whitson 2002).

Jointed goatgrass normally grows as a crop weed in parts of the U.S. where winter wheat is produced. CRISIS Weed Map and Data Server (2005), which compiles invasive plant records from California, Arizona, Nevada, New Mexico, Utah, Colorado, and parts of Idaho, Oregon, Wyoming and Texas, shows no occurrences of jointed goatgrass in the west. Populations along Highway 87 from Payson to Strawberry, and in the Young area may be fairly recent, or at least have not been documented in any database to date.

### Tree of heaven

Ailanthus altissima (P. Mill.) Swingle

*Ailanthus* is a fast growing deciduous tree, a prolific seed producer, a persistent stump and root sprouter and an aggressive competitor with respect to the surrounding vegetation. It grows up to 90 feet tall. (USDA FS Feb. 2004) It occurs primarily in disturbed areas, though it may invade undisturbed habitats such as riparian areas. Seeds ripen in large crowded clusters from September to October and may persist on the tree through the following winter (Little 1974, Hu 1979). An individual tree can produce 325,000 seeds per year which are easily wind-dispersed (Bory and Clair-Maczulajtys 1980). Seeds are also dispersed by birds and water. Seeds are relatively short-lived (less than 3 years), and vegetative proliferation through root sprouting is by far the most common method of reproduction (Roye 2003).

In the Americas, *Ailanthus* occurs from Canada to Argentina (Hoshovsky 1988). The species was apparently introduced into America by two different routes. It was first introduced to America from China by way of England, by a Philadelphia gardener in 1784 (Hu 1979). Because of its rapid growth and ability to grow in unfavorable conditions with little care, it became a common stock in eastern nurseries by 1840. The second route was through Chinese miners. During the days of the California gold rush, many Chinese miners brought *Ailanthus* seeds with them as they settled in California, probably because of its medicinal and cultural importance to them.

The production of toxic chemicals by *Ailanthus* may also explain the success of this plant. An aqueous extract of ailanthus leaves has been shown to be toxic to 35 species of gymnosperms and 10 species of angiosperms (Mergen 1959). This may be important in limiting natural succession in *Ailanthus* stands.

A recent clinical observation recorded in the Annals of Internal Medicine documents a case of myocarditis that was traced to the patient having worked as a tree surgeon on a team responsible for clearing heavy infestations of tree of heaven. Symptoms included abdominal pain, chest pressure that radiated to both arms, and shortness of breath. The patient reported that all of his coworkers also exhibited these same symptoms. Among its many uses in folk medicine, sap of the tree of heaven is thought to be a cardiac depressant and has been used to slow heart rate (Bisognano et al 2005).

In Arizona, this tree is mostly associated with mining towns. It has been documented around Cottonwood, Camp Verde, and Jerome. There are recent records (1999 and 2002) from Santa Cruz and Pima counties on the Coronado National Forest (CRISIS 2005). On the Tonto, it has been documented on the Verde River near Childs, in the towns of Superior and Globe and on National Forest lands nearby. In the spring of 2005, a few pole-sized plants were documented near the confluence of Pinal Creek and the Salt River (Fenner 2005). Seed were probably carried down the creek from the town of Globe, where the tree grows in abundance. It has also been documented growing in the town of Payson near the Forest boundary.

### Camelthorn

Alhagi maurorum Medik.

Camelthorn, a spiny, intricately branched perennial shrub, grows to a height of 1-1/2 to 4 feet. The greenish stems have slender spines 1/4 to 1-3/4 inches long. Single leaves are wedge-shaped and alternate. Flowers are small, pea-like, pinkish purple to maroon, occurring on short spine-tipped branches on the upper portion of the plant. The entire plant dies back to the ground every winter and resprouts from its extensive root system the following spring. It can grow through pavement, and the thorns can flatten car tires. Where it grows near highways, it causes extensive cracking in the asphalt, and constant road repairs are necessary (Horsley 2004).

Camelthorn, a member of the Pea family, was introduced from Asia and grows well on dry or moist sites. It spreads rapidly along streams and canals. (Colo. WMA 2005)

It is considered one of the most difficult noxious weeds to eradicate, due to its extensive root system. It is an aggressive perennial that sends thick rhizomes out 12 meters or more from the parent plant. Seeds may be viable for years, although reproduction is mostly vegetative; seedlings are rarely found (DiTomaso 2003). Although the plant is very thorny, it is apparently also very palatable. Passage through ruminants' digestive tracts serves to scarify the extremely hard seed coats, thus increasing germinability (CDFA 2005).

In Arizona, camelthorn has been documented growing between 100 and 5000 feet in elevation (ADOT 2005). It has established heavy infestations in the northeastern part of the state. It grows along ditches and canals in the vicinity of Painted Rock Dam, southwest of Phoenix, and has recently been found in fields on the west side of Phoenix near Loop 101 near an alfalfa field (Northam 2005). Arizona Department of Transportation has been applying herbicides to an infestation in Chandler for some years. They have also worked for several years on a small infestation along Highway 60 a few miles north of Globe (Horsley 2005). Other camelthorn infestations farther north along Highway 60, north of the Salt River, are also very close to the Tonto; there could easily be camelthorn growing along the Upper Salt River that have spread from these infestations. Surveys of the Upper Salt during the spring of 2005 did not find camelthorn from Cibecue Canyon to the take-out point above the Diversion Dam. The first seven miles below the Highway 60 bridge were not surveyed (Fenner 2005).

### **Giant reed**

Arundo donax L.

Giant reed, also known as wild cane, is a tall, perennial grass that can grow to over 20 feet in height. Its fleshy, creeping rootstocks form compact masses from which tough, fibrous roots emerge that penetrate deeply into the soil. Leaves are elongate, 1-2 inches wide and a foot long. The flowers are borne in 2-foot long, dense, plume-like panicles during August and September.

Reproduction of giant reed is primarily vegetative, through rhizomes which root and sprout readily. Little is known about the importance of sexual reproduction in giant reed, or about its seed viability, dormancy, germination, and seedling establishment (Benton et al 2005). It does not produce viable seeds even in most areas where it appears to be well-adapted (Perdue 1958).

Giant reed becomes established in moist places such as ditches, streams, and riverbanks, growing best in well drained soils where abundant moisture is available. It tolerates a wide variety of conditions, including high salinity, and can flourish in many soil types from heavy clays to loose sands.

Giant reed is widely dispersed into all of the subtropical and warm temperate areas of the world, mostly through intentional human introductions. It was probably first introduced into the United States at Los Angeles, California in the early 1800's. Today, giant reed is widely planted throughout the warmer areas of the United States as an ornamental and in the Southwest, where it is used along ditches for erosion control (Benton et al 2005).

*Arundo* chokes stream channels, crowds out native plants, interferes with flood control, and increases fire potential. The long, fibrous, interconnecting root mats of giant reed form a framework for debris dams behind bridges, culverts, and other structures that leads to damage. It ignites easily and can create intense fires. It can float miles downstream where root and stem fragments may take root and initiate new infestations. Due to its rapid growth rate and vegetative reproduction, it is able to quickly invade new areas and form pure stands at the expense of other species. Once established, giant reed has the ability to out-compete and completely suppress native vegetation (Hoshovsky 1986).

This species has been planted in many rural communities throughout the state. It grows near the headwaters of the Verde River at Dead Horse State Park, near the Irving Power Plant on Fossil Creek, and is common in the towns of Camp Verde, Globe and Superior. It can be difficult to distinguish from common reed (*Phragmites australis*), which grows on every continent except Antarctica, and is probably the most widespread flowering plant in the world (Tucker 1990). Because *Phragmites* has invaded and formed near-monotypic stands in some North American wetlands only in recent decades there has been some debate as to whether it is indigenous to this continent or not. Convincing evidence that it grew in the western U.S. long before European contact is now available. Identifiable Phragmites remains dating from 600 to 900 A.D. and constituting parts of a twined mat and other woven objects were found during archaeological investigations of Anasazi sites in southwestern Colorado (Breternitz et al. 1986). Other reports document preserved *Phragmites* remains in the southwestern U.S. dating back 40,000 years. (Saltonstall 2005).

*Phragmites* grows along the Verde River, and has increased in density during the recent drought (Fenner 2003). There is a low probability of Arundo invading habitat along the Verde River, since *Phragmites* is gainfully occupying the same niche. However, with the presence of *Arundo* on the Upper Verde upstream of the Tonto, if a large riverflow were to scour the river channel and floodplains, they could be opened up to invasion by *Arundo*.

### Onionweed

Asphodelus fistulosus L.

Onionweed is an herbaceous perennial in the lily family (Liliaceae). It grows to about a foot tall and almost as wide. Clusters of long, tapering, round, hollow leaves very much resemble chives

or scallions. Leaves sprout after winter rains, with flowers appearing in spring. Plants die to the ground during dry seasons. Fruits are 1/8-inch round capsules.

Onionweed might be confused with some native onions (*Allium* spp.). *Allium macropetalum* (desert onion) is a much shorter plant with leaves rarely more than four inches tall. Taller native onions grow in different habitats than onionweed. Onionweed is known to grow in very dry sites where native onions would not grow.

Onionweed is an aggressive invasive species. Introduced as an ornamental, it easily escapes cultivation into surrounding unirrigated land. It seeds prolifically (2-13,000 seeds per plant annually) and can establish large populations quickly (Fox 2004). Seeds remain viable in the soil for many years. Onionweed is unpalatable to cattle and apparently to most wildlife, so it is very persistent once established. To date it tends to invade disturbed ground, so it is unclear whether it will be a threat to natural communities.

This plant is native to southern Europe, Mediterranean Africa, and Western Asia. In the United States onionweed occurs in California (in several coastal southern counties), Arizona, New Mexico, and Texas. Onionweed is also known to be in Mexico. Plants introduced into the United States in the 1980s may be the progenitors of the Arizona population. They were offered for sale in Alpine, Texas and Phoenix, Arizona as early as 1984. Some of the original US plants were collected from a naturalized population near Saltillo, Coahuila, Mexico, where the species was documented in 1930 (Arizona-Sonora Desert Museum 2005).

Some nurseries offer onionweed as an ornamental even though it is a prohibited noxious weed in many states as well as a federally listed noxious weed. Plants have been found in Arizona from about 2000 feet elevation to at least 4500 feet (Arizona-Sonora Desert Museum 2005). Arizona infestations are primarily in the southeastern corner of the state, in areas above the desert that receive moderate winter rainfall. A few small infestations have been found in Tucson. An infestation was discovered in Ajo in 1989 by an Arizona Department of Agriculture employee, who eradicated it by hand pulling all of the plants. In 1994, it was discovered in a demonstration plot at a botanical garden in Tucson. That infestation was also eradicated by hand removal. It has been discovered in several sites in Tucson and southeastern Arizona, including the Audubon Research Ranch, plant nurseries, and residential yards. The most recently identified infestations are near Tombstone, Arizona along Highway 80 (Northam 2005), and in Sedona (Moser 2005).

A well-established population in suburban Tucson was reduced to only two plants after the severe drought of 2002. Germination and plant establishment seem to be enhanced by fire, as observed after fires burned over an infestation near Elgin in 2002 and 2003. (Northam 2005) Onionweed has not been documented on the Tonto.

### Wild oats

Avena fatua L.

Wild oats is a cool season annual grass that originated in the Mediterranean area, and has naturalized throughout the world everywhere cereal grains are grown. Besides being an

agricultural weed, it has become a common weed of roadsides and undisturbed wildlands in the western U.S. It was well established in California by the late 1700's.

It is a tall grass, growing up to 4 feet tall, but usually 2 -3 feet tall. Fields of wild oats can produce up to 10,000 seeds per square meter (Brusati 2004). Seeds can survive 4-7 years, but 99% of seeds germinate before 4 years. Seedbank half-life is estimated to be 6 months (Kirby & Moerkerk 2000).

It has been used in Arizona to revegetate disturbed areas near highways, and has spread into lowelevation vegetation types from juniper grassland to the Sonoran desert. It is found along most highways on the Tonto. It dries out by late spring, providing a source of dry standing fuel to carry desert fires from the highway into adjacent uplands.

### **Black mustard**

Brassica nigra (L.) Koch

Black mustard is an annual cool-season forb that grows 2-8 feet tall. Stems are erect, with some dense hairs on lower portions, and upper stems usually smooth. Leaves vary from 2-10 inches long, and 1-6 inches wide. Leaves are stalked and deeply lobed. Flowers are larger and brighter yellow than those of Asian mustard. This species can be easily differentiated from wild and Asian mustard in that its seed pods are closely appressed to the stem at maturity (Whitson 2003). Mustard seed can remain viable in the soil for over 5 years.

This plant has been reported to have an allelopathic substance in its leaves (Munir et al 2002). While it tends to grow in clumps that crowd out native plants, it has been considered to have a low invasive potential by other states in the west.

Black mustard was introduced to the U.S. from the Mediterranean area, possibly as a seed grain contaminant. It now grows in nearly every state (Ewing 1999). It is increasing in abundance in Arizona. On the Tonto it has been identified growing along Highway 188 through Tonto Basin, and in revegetation sites along Highway 87. It was apparently also a contaminant in seed used for revegetation of safety zones created during suppression of the Willow Fire in 2004; inspections in 2005 found black mustard plants in nearly every safety zone that was seeded.

### Asian mustard

### Brassica tournefortii Gouan

This cool-season annual forb germinates in the late fall to winter, and grows very rapidly, seeding out as early as February of the following year. One mature plant can produce as many as 9,000 seeds. Seed longevity is unknown, but based upon observations of other Brassica species, is probably several years (Sanders & Minnich undated).

Asian mustard replaces other native and invasive species by growing in high densities, using soil nutrients and moisture before other plants. It often causes native annuals to die early in the spring, due to lack of available soil moisture (Brooks 2003). It may have an adverse effect to desert tortoise by reducing biomass of native annual forbs and grasses that have palatable leaves

and stems close to the ground at the time of year when tortoises are coming out of their dormant period and foraging for food (Jennings 1993).

Asian mustard is native to the deserts of North Africa, the Middle East, and Mediterranean lands of southern Europe. It was probably introduced to this country with date palms brought from the Middle East in the early 20<sup>th</sup> century to Coachella Valley. It experienced a population explosion during above-normal winter/spring precipitation years of 1977 to 1983 (Sanders & Minnich 2005).

Asian mustard may have been classified as a "B" species prior to the winter/spring of 2004-2005. Higher than normal precipitation following years of drought that had removed ground cover at lower elevations, resulted in the recent population explosion of Asian mustard. After the last wet winter/spring, Asian mustard has quickly proliferated to occupy roadside and field disturbed areas from southern Arizona to Kingman and the Arizona Strip, into western New Mexico and the deserts of eastern California. It had been present in low numbers before 2004, but seemed to take advantage of abundant cool season precipitation to extend its range dramatically. Mature plants break off and tumble, scattering seed from pods. Asian mustard plants have now moved from the right-of-way along Highway 87 to distances of a quarter mile or more into undisturbed desert, where tumbling plants have hung up under mesquite, palo verde and catclaw, or along minor drainages (Fenner 2005b). A Plant Assessment Form for this species, completed by the California Exotic Pest Plant Council reports that it has spread rapidly from the Sonoran Desert to the Mojave Desert during the 1980's and 1990's (Brooks 2003).

It is now widespread through the Tonto, from Cave Creek Road, to the lower Salt River, Highway 60, Highway 87 to Sunflower, Highway 188 (mostly near new construction at the south end) and roads and drainages through the Mesa, Globe, and Tonto Basin Ranger Districts. New infestations are beginning to appear on the southern boundary of the Cave Creek Ranger District.

This species appears to progress in waves, after extremely wet years. It may not be a dominant weed next year, but its seed is now in the soil on many acres of National Forest, waiting for another wet winter.

In addition to replacing native annual species, Asian mustard matures very early in the spring, leaving a thoroughly dried, often large quantity of biomass along roadsides that can easily carry fire into the desert. Its spreading panicle and growth habit of leafless stems with a rosette of large leaves at the base may prevent it from carrying fire on its own, unless it is growing on a steep slope. But presence of dried annual grasses can serve to carry the fire, which is fueled by Asian mustard, for long distances.

### Red brome, rescuegrass, downy brome, Japanese brome, ripgut brome

Bromus rubens L., B. catharticus Vahl., B. tectorum L., B. japonicus Thunb., B. diandrus Roth

Red brome is native to Europe. It was introduced to the U.S. in the 1800's. By 1870 it had overtaken California's overgrazed rangelands. Its range in the west is similar to that of downy brome (cheatgrass), except downy brome grows at higher elevations as it is better able to withstand frost (Newman 1992). Temperatures below freezing kill red brome. Downy brome is

native to Eurasia and the Mediterranean area. It was brought to this country and had extensively invaded the Great Basin and other parts of the west by the late 1800's (Carpenter and Murray 1999). Japanese brome was brought into the U.S. from Europe. It was intentionally planted in some areas in the Midwest, for rangeland improvement. Unlike other bromes, it is not adapted to survive frequent fires, but prefers a layer of litter for maximum germination (Grace et al 2001). Rescuegrass was introduced to the U.S. from South America. It is cultivated as winter forage in southern states. It is an annual or short-lived perennial cool-season grower. Originating in the Mediterranean area, ripgut brome was first reported in the San Francisco area by Watson (1880). It became widely established throughout California before the end of the 19<sup>th</sup> century (Parish 1920).

These cool-season annual grasses are all classified as C species on the Tonto National Forest. This means they are so abundant and widespread that eradication is not a realistic goal. They are included in this analysis for treatment so that they can be removed from strategic sites. Brome grasses created a continuous fuel source that carried desert fires to engulf unprecedented acreages in the summer of 2005. Seven years of drought, followed by an exceptionally wet winter and spring created a landscape where native perennials had died and been replaced by lush annual growth for a few months during the spring months. When early lightning struck in the desert, it ignited the continuous groundcover of red brome that carried fast-moving fires that could not be contained for weeks (Fenner 2005b). The Cave Creek Complex Fire, second largest fire in the state, and the largest ever to burn in the desert, was fueled by red brome. Nearly 250,000 acres burned – 20% of which were classified Sonoran desert scrub. A significant part of the cactus/succulent component of the vegetation was killed. Deserts did not evolve to withstand fire – their normal community structure is widely spaced plants with cryptogamic soils between the plants.

Downy and Japanese bromes grow at higher elevations. The fire hazard they create is not as significant an effect to the vegetation types in which they grow, which are typically adapted to fire frequencies of 5-7 years. However, they move into forests and rangelands where grazing or other disturbance has reduced the competitiveness of native grasses, and replace them, changing perennial grasslands to annual grasslands. In a dense stand, the extensive, fibrous root system can extract all the available moisture from the upper soil profile, so there is none available for slower growing native species.

Downy brome, or cheatgrass seedlings germinate with fall precipitation. Roots can grow throughout most of the winter at soil temperatures as low as 37°F, and can reach a maximum depth of 3 to 4 feet as plants mature. Under ideal conditions, a dense infestation of downy brome can produce over 500 pounds of seed per acre (1 pound of seed contains approximately 250,000 seeds). Dry matter production of downy brome on rangeland sites can vary from less than 100 lb/acre on the poorest sites to more than 2000 lb/acre on the better sites. The brome is of little forage value because it dries quickly, leaving dried awns that can create serious sores in mouths of livestock.

Rescuegrass grows from 140 to 7000 feet elevation. It is reported to compete with and displace native plants, especially on riparian sites (Marshall et al. 2000).

Ripgut brome grows early, creating a continuous fine fuel as do other bromes, but does not tend to grow in monotypic stands as other bromes do. It is a prolific seed producer (over 1000 seeds/square foot), but seeds have a short soil viability (under 3 years). Infestations typically start in disturbed areas, but can move into openings in wildlands. Florets have sharp awns and can wedge into clothing, fur, and machinery. It can also spread as a contaminant in grain seed (Kyser 2004). Ripgut brome plants germinate, grow and produce seeds during the winter, spring and early summer. By the end of the summer most seeds germinate with the opening rains. Seed production can range from 600 to over 3000 per plant.

*Bromus* species are contaminants of grain and wool, damage animal hides and host a range of serious cereal diseases. In pastures the seeds penetrate eyes, mouths and feet of grazing animals (Cooper & Moerkerk 2000).

Rescuegrass has been identified growing in Yavapai County at Montezuma Castle National Monument, not far from the Tonto's western boundary (Guertin 2001). It probably grows on the Tonto as well. Both ripgut brome and rescuegrass grow in the Tucson Mountains in southern Arizona (Rondeau et al 2000). Ripgut brome has been identified growing on these National Monuments that neighbor the Tonto: Tuzigoot, Montezuma Castle, and Tonto National Monuments (Guertin 2001), and at the Hassayampa River Preserve (Drezner et al. 2001). It has also been identified on the Verde where Highway 260 crosses, near the town of Strawberry, in the area of the Willow Fire of 2004 west of Rye, and at Sycamore Creek along the Beeline Highway (Northam 2005). It grows in riparian areas from below 2000' up to about 5000' on the Tonto (Northam 2005).

### Globe-podded hoary cress, hairy white-top

Cardaria draba (L.) Desv., C. pubescens (C.A.Meg) Jarmolenko

Whitetop is a deep-rooted perennial in the mustard family, native to Russia. It was first brought to the U.S. in the late 1800's. It often grows up to 2 feet tall, with roots going 12 to 30 feet deep. It can produce 50 shoots in a square yard. With no competition, one plant can spread to cover an area 12 feet in diameter in its first year. It reproduces by seed and by root segments. An extensive root system is established early in the life of a seedling – a 25-day old plant can have a taproot 10 inches deep, with 5-6 lateral roots with vegetative buds. One plant can produce up to 4800 seeds at maturity. The seeds are relatively short-lived, retaining viability for only up to 3 years in the soil (CNAP 2000)

This plant is found on alkaline, disturbed soils and is highly competitive once it becomes established (Whitson 2002).

Hoary cress may be at least mildly toxic to livestock. The plant contains glucosinolates, which are sulfur-containing compounds that can form toxic compounds in the digestive tracts of animals. These compounds are generally present at low levels, which are normally tolerated by livestock and wildlife. While hoary cress has some forage value, managers should use caution when allowing animals to graze hoary cress-infested rangelands (McInnis et al 1993).

Populations have been recorded in Prescott, Camp Verde, Flagstaff, and Cottonwood, and on the upper Verde River near Perkinsville (USDA FS Feb 2004, Northam 2005). It has been

documented on the Tonto, growing on the Pleasant Valley Ranger District (USDI 2005, Northam 2005).

#### **Plumeless thistle**

Carduus acanthoides L.

Members of the genus Carduus are native to Europe and Asia. Plumeless thistle is an erect 4-5 foot tall purple-flowered biennial. Leaves are pinnately-lobed and slightly hairy, extending down the stem to form spiny wings. Flowering is induced by a cold period, thus it may not be adapted to invading lower elevations on the Tonto. First flower heads produce up to 1500 seeds, with later flower heads producing only about 25. 99 percent of seeds fall within 150 feet of the adult plant, and are viable for a short time. A study of plumeless thistle suggested that viable seeds of this species rarely persist in the soil seedbank due to decomposition and seed predation by insects, mammals, and birds (CDFA 2005). Competition by perennial grasses suppresses growth of this thistle.

This species has not been documented on the Tonto. The closest population to the Tonto is at the Petrified Forest National Park

#### Musk thistle

Carduus nutans L.

Musk thistle is an aggressive, biennial herb with showy red-purple flowers and spiny stems and leaves. Mature plants range in height from  $1\frac{1}{2}$  to 6 feet tall, and have multi-branched stems. Leaves are dark green, coarsely lobed, with a smooth waxy surface and a yellowish to white spine at the tip. The large disk-shaped flower heads, containing hundreds of tiny individual flowers, are  $1\frac{1}{2}$  to  $3\frac{1}{2}$  inches in length and occur at the tips of stems. Flower heads will droop to a 90-degree angle from the stem when mature, hence its alternate name, nodding thistle. The number of seedheads per plant is site-dependent and ranges from about 24 to 56 on favorable sites and 1 to 18 on less favorable sites. Flowers emerge in early May to August and seed dissemination occurs approximately one month after the flowers form. A single flower head may produce 1,200 seeds and a single plant up to 120,000 seeds, which may be wind blown for miles. Seed may remain viable in the soil for over ten years, making it a difficult plant to control.

It is unpalatable to wildlife or livestock, and establishes easily in areas opened up by disturbance, such as fire or overgrazed rangelands (Remaley 2005). In pinyon-juniper communities, cheatgrass and musk thistle (among other invasive plants) tend to establish and dominate, replacing native grasses and forbs, following fires (Zouhar 2002). When musk thistle plants bolt, older rosette leaves begin to decompose, releasing allelopathic chemicals into the surrounding soil (Duncan 2005).

Musk thistle is a native of eastern Europe, and was introduced to the eastern U.S. in the mid-1800's (Duncan 2005). It is now found in nearly every state, from sea level to 8000 feet elevation. Musk thistle is very common in the four-corners area (USDI 2005), and has been documented at several locations on the Coconino and Kaibab National Forests in northern Arizona (USDA FS Feb 2004). The species has not been documented on the Tonto.

#### Southern & Field sandbur

Cenchrus echinatus L., C. spinifex Cav.

Southern sandbur, although a native grass, is on the Arizona prohibited and regulated weed lists. Both species are summer annuals that aggressively colonize open disturbed sites such as roadsides and ditch banks. They compete poorly with dense vegetation and rarely become established where there is a good ground cover of native species (CDFA 2005).

Spikelets are enclosed by fused spiny bracts that form a bur. Burs disperse by clinging to skin and fur of animals, shoes and clothing of humans, vehicles, and by floating on water. Seed from upper spikelets normally germinate within one year; those from lower spikelets may remain dormant for up to 5 years. One plant can produce up to 1000 seeds (USDI 2005).

Bur spines are stiff and can injure the mouths of grazing animals.

Sandbur grows along the right-of-way of Highway 60 east of the Tonto National Forest, on the Fort Apache Reservation. It has also been identified on the Tonto, on the right-of-way of Highway 188 a few miles north of Globe.

#### Spotted knapweed

Centaurea biebersteinii DC.

Spotted knapweed is a biennial or short-lived perennial. Its name is derived from the spots formed by black margins on the flower bract tips. Spotted knapweed typically forms a basal rosette of leaves in its first year and flowers in subsequent years. Rosette leaves are approximately 8 inches long by 2 inches wide, borne on short stalks, and deeply lobed once or twice on both sides of the center vein, with lobes oblong and wider toward the tip. The taproot is stout and deep. Flowers are purple to pink, rarely white, with 25 to 35 flowers per head. Plants bloom from June to October, and flower heads usually remain on the plant (Carpinelli 2005).

It is native to Central Europe, east to central Russia, Caucasia, and western Siberia. Spotted knapweed was introduced to North America from Eurasia as a contaminant in alfalfa and possibly clover seed, and through discarded soil used as ship ballast. It was first recorded in Victoria, British Columbia in 1883 and spread further in domestic alfalfa seeds and hay before it was recognized as a serious problem. Today it is widely distributed in Canada and nearly every state in the U.S.

Spotted knapweed plants in North America generally live 3 to 7 years but can live up to nine years or longer. Plants can sprout from buds on the root crown. Reproduction is by seed only, and plants are capable of producing 500 - 4,000 seeds per square foot per year. About 90% of the seeds are viable at the time of dispersal, and they can remain viable in the soil for 5-8 years. Most seeds are dispersed near the parent plant but can be transported by people, wildlife, livestock, vehicles, and in soil, crop seed, and contaminated hay. Gravel pits, soil stockpiles, powerlines, grain elevators, railroad and equipment yards are important seed distribution points.

This species infests meadows, forests, and lower elevation rangelands, where it out-competes native plant species. It is capable of invading well-managed rangeland. Forage production for livestock and wildlife is decreased, erosion is increased, and stream sedimentation is increased (Carpinelli 2005). Spotted knapweed impacts native vegetation through a combination of resource competition and allelopathy (Ridenour and Callaway 2001).

Repin, a compound that is neurotoxic, damages the brains of horses that graze this species (TNC 2005). It is not toxic to sheep, goats, or cattle.

A report by an employee of the Idaho Panhandle National Forest in 1997 raised the question of carcinogenicity of spotted knapweed sap. One day was spent pulling this plant bare-handed; after several months aggressive tumors developed that required amputation of two fingers. This case was followed up with the doctor at the University of Washington, who believed there is a compound in knapweed that causes cancer. This compound may also exist in diffuse knapweed (TNC 2005).

In Arizona, there are infestations along Highways 89A and 179 in Sedona, on Northern Arizona University campus, along Lake Mary Road, and in the vicinity of Prescott (USDA FS Feb. 2004). It also occurs north of the Grand Canyon in the Arizona Strip, and not far north of the Tonto above the Mogollon Rim (CRISIS 2005). There is an unconfirmed report of spotted knapweed growing on the Pleasant Valley Ranger District.

#### **Diffuse knapweed**

Centaurea diffusa Lam.

The origin of diffuse knapweed is the Mediterranean region of Europe. It was probably introduced to North America as a contaminant in alfalfa seed from Asia Minor or in hybrid alfalfa seed from Germany (Maddox 1979). It is one of the dominant rangeland weeds in North America, infesting over 3 million acres of rangeland in the western United States, with the area infested increasing at a rate of 18 percent a year (Zimmerman 1997). It often invades disturbed areas, but is able to compete easily in well-managed rangelands (Duncan 2005).

Diffuse knapweed is a many-branched annual or short-lived simple perennial ranging in height from 1 to 2 feet at maturity. Basal leaves are finely divided; stem leaves are entire and smaller than basal leaves. It flowers from June through September with a white to purple flower. Characteristic floral bracts are yellowish green with a light brown, comblike margin. These bracts are tipped with a definite slender spine (EC Bar Ranch, undated).

Spotted and diffuse knapweed seeds exhibit three germination patterns: non-dormant seeds that germinate with or without light exposure, dormant seeds that germinate in response to red light, and dormant seeds that are not light sensitive. All germination types occur on each plant. Seeds often disperse when stems break off near the ground and tumble along with wind.

Diffuse knapweed contains an allelopathic chemical that can suppress growth of other species and allow diffuse knapweed to grow in monotypic stands (Watson and Renney 1974). It is

unpalatable to livestock, and its spines can cause injury to grazing animals. It also causes increased soil erosion and reductions in wildlife populations (Roche and Roche 1988).

On the Tonto, this species has been documented growing at the Pleasant Valley airport, the Pleasant Valley Ranger Station, along Cherry Creek, and along Highway 288 at Board Tree Saddle south of Young. There are many small infestations on the Pleasant Valley Ranger District. Diffuse knapweed is common on private lands in Young.

#### Malta starthistle

#### Centaurea melitensis L.

Malta starthistle was introduced to the southwestern U.S. from Europe as a seed contaminant. It is very similar to yellow starthistle in appearance, and is often mistaken for it. Like yellow starthistle, leaves extend down the stems, giving the stem a winged appearance. A major difference between the two starthistles is length of spines on the flower bracts: those of yellow starthistle are usually approximately an inch in length, while Malta starthistle spines are normally less than 1/2 inch long. Unlike yellow starthistle also, Malta starthistle seeds appear to have longer longevity in the soil: Malta starthistle seed lives for over 3 years in the soil, making it potentially more difficult to eradicate.

Malta starthistle has been implicated in case reports of chewing disease of horses. Ingestion of significant quantities can cause "chewing disease" which is characterized by fatigue, lowered head, an uncontrolled rapid twitching of the lower lip, tongue-flicking, involuntary chewing movements, and an unnatural open position of the mouth. Poisoning occurs after a horse has ingested 60 to 160% of its body weight over a two month period (Panter 1990, 1991). Toxicity effects are cumulative and irreversible. In most cases, poisoning occurs where horses had little or no other palatable feed available to them (Schalau 2005, UNCE undated).

Malta starthistle is rapidly expanding its range in Arizona. In 1972, it was already reported in Apache, Yavapai, Maricopa, Pinal, Graham, Pima and Cochise counties, but was not so serious as to be declared a noxious weed (Parker 1972). It is becoming very common in urban settings in central Arizona, is now found in the far eastern portion of the state, south of Duncan, and in the Tucson area. This plant is also very widespread and spreading rapidly at low elevations on the Tonto. To date, it has been documented below 3000 feet elevation, with a few exceptions. It grows densely along Highway 188 from Highway 87 through Punkin Center to Roosevelt Lake. It has spread to the east side of Roosevelt Lake to the A-Cross Road, west to Camp Reno, and many other sites in Tonto Basin. Patches can be found along Highway 60 from Apache Junction to Florence, to Oak Flat east of Superior. In the spring of 2005 it was pulled from a small site at the Cave Creek Ranger Station horse pasture and at Bartlett Lake. It has spread from the Horseshoe Recreation Area to endangered Arizona cliffrose habitat near Lime Creek. Other mapped locations on the Cave Creek Ranger District include Cartwright Basin and along Forest Road 41. Forest Road 41 is a major access point to the Forest's west side from the northwest Phoenix metro area. Malta starthistle was recently identified growing in abundance on state land west of the Forest's boundary on FR41, on the west end of FR 41 on the Tonto, and in the private landowner's pastures and corrals in that same area. It is common throughout the entire Phoenix metropolitan area, up to Cave Creek and Carefree. The farthest north and highest elevation site

on the Tonto is at Shumway Millsite (4780 feet), where it grows next to yellow starthistle (Fenner 2005b). It has also been documented near Young, Arizona (USDI 2005).

#### **Yellow starthistle**

Centaurea solstitialis L.

Yellow starthistle originated from southern Europe, and first entered the United States shortly after the 1849 gold rush. It was imported as a contaminant in alfalfa hay. At that time, the only place California imported alfalfa from was Chile. It had been spread to Chile in the 1600's from Spain. By 1958, it infested over a million acres in California. Today, there are an estimated 16 million acres of yellow starthistle in California, and a couple of additional million acres in other western states. It has spread to 23 of the 48 contiguous states, as far east as New York (DiTomaso 2001).

Yellow starthistle is a winter annual that is a member of the knapweed complex in the sunflower family. It grows about 2-3 feet tall and has yellow flowers. Leaves extend down the edges of the stems, giving the stems a winged appearance. Inflorescences have bracts with stiff, sharp spines that are about an inch long. A single starthistle plant has the potential to produce up to 150,000 seeds. Germination occurs either in the fall or spring; the young plant has a rosette growth form. As plants mature, a flower stalk elongates from the center of the rosette.

Although some studies show that some seeds can remain viable for up to 10 years (Callihan et al 1993), studies done in California under natural conditions demonstrated that 95% of the seeds had either germinated or were damaged after only 2-3 years in the soil (Joley et al 1992)

This plant has the ability to invade rangelands, pastures, croplands, and roadsides throughout the west, especially those with deep, loamy soils. The competitive success of yellow starthistle is directly related to its ability for rapid growth and capture of water, nutrients, light, and space. This species displaces native plant communities, reduces plant diversity, and accelerates soil erosion and surface runoff. It can form solid stands that drastically reduce forage production for livestock and wildlife. Its ability to deplete soil moisture has been compared to a loss of 15 to 25% of annual precipitation (Jetter et al. 2003).

Yellow starthistle is poisonous to horses, causing the same nervous disorder that Malta starthistle causes. Livestock can be injured eating even small amounts of yellow starthistle if forced to feed on the spiny portions of the plant. Animals and humans normally avoid heavily infested sites due to the spiny nature of the mature plants.

Human activities are the primary mechanisms for the long distance movement of yellow starthistle seed. Seed is transported in large amounts by road maintenance equipment and on the undercarriage of vehicles. The movement of contaminated hay and uncertified seed are also important long distance transportation mechanisms. Once at a new location, seed is transported in lesser amounts and over short to medium distances by animals and humans.

A 1972 publication entitled "An Illustrated Guide to Arizona Weeds" states that yellow starthistle was unknown in Arizona (Parker 1972). Since that time, it has become well

established in central Arizona, with thousands of acres of dense infestations in the communities of Flagstaff, Camp Verde, Payson, Star Valley, and Young.

On the Tonto National Forest, this plant currently grows mainly on the higher elevation Districts – Payson and Pleasant Valley. Infestations have also been documented in Tonto Basin at elevations below 3000 feet.

#### **Rush skeletonweed**

Chondrilla juncea L.

Rush skeletonweed is native to Europe, northern Africa and central Asia. It was first introduced to eastern North America through contaminated seed, animal bedding or fodder, in 1872. It was first detected on the west coast in 1938. Today it infests an estimated 8.4 million acres in the United States. It invades Ponderosa pine, chaparral, pinyon-juniper, and mountain grassland habitats.

Rush skeletonweed is a perennial or biennial herbaceous plant, growing to 16-60 inches tall. Plants exist as basal rosettes until flowering. The leaves, stem and roots exude a milky sap when cut. The plant grows a long slender taproot that can extend over 6 feet into the soil, reaching into fissures in bedrock. Lateral roots may produce buds and rosettes. Rush skeletonweed exhibits obligate apomyxis (reproducing without pollination), so that populations are normally not genetically diverse. Infestations can be dense, with 2-6 rosettes per square foot measured on dry sites in the western U.S. While a single plant can produce 10,000 to 20,000 seeds in a season, drought severely limits seed production and viability of seeds. Some experiments have demonstrated seed to be viable under certain optimum conditions for up to 5 years; however, most seeds exhibit no dormancy and generally survive for less than 6 to 18 months in the field. Seeds are adapted to both wind dispersal and dispersal through attachment to moving objects.

This species has not been documented on the Tonto. The only documented population in Arizona is at Grand Canyon National Park (CRISIS 2005). This identification of this population may still need to be verified.

#### **Blue mustard**

Chorispora tenella (Pall.) DC.

Blue mustard is a native of Russia and southwest Asia (Whitson 2002). It was introduced to the U.S. in 1929, in contaminated grain seed. It infests winter annual crop fields, roadsides, and disturbed rangeland.

It is a leafy annual, 6 - 18 inches tall, with purple flowers. Stems and leaves are covered with gland-tipped hairs. Flowers, which occur in early spring are showy pale purple to bluish purple. Viable seed can be produced as soon as 10 days after flowering begins.

While this plant has not been documented growing on the Tonto, it is not far. In the spring of 2005 a dense patch of it several acres in size was observed along Highway 69 between Cordes

Junction and Prescott. CRISIS regional maps show it as growing in Prescott and also north of Holbrook (CRISIS 2005).

#### Canada thistle

Cirsium arvense (L.) Scop.

Canada thistle was first introduced to the U.S. in the early 1600's. By 1954, it was declared a noxious weed in 43 states. It has long been recognized as an agricultural weed. Only recently has it become a problem in wildlands.

It is an herbaceous perennial with an erect stem and creeping rootstock. It produces an abundance of bristly-plumed seed that are wind-dispersed. Most of these germinated within a year, but some many remain dormant in the soil for over 20 years (CDFA 2001, Thunhorst & Swearingen 2005a). The taproot sends out lateral roots as deep as three feet underground, which produce above-ground shoots. It can regenerate from root fragments less than an inch in length (Thunhorst & Swearingen 2005a).

Several varieties of Canada thistle have been identified, which differ in their leaf form, growth, photoperiodism and susceptibility to herbicides (Hodgson 1970).

Canada thistle is found in the northeast part of Arizona. It is very common in northern New Mexico. One site has been documented on the Tonto, near the OW Ranch, west of Canyon Creek, on the Pleasant Valley Ranger District. It has been treated by digging plants and roots out in 2004 and 2005, and the infestation is expanding.

# **Bull thistle**

Cirsium vulgare (Savi) Tenore

Bull thistle was brought to this country from Europe and Asia, as a seed contaminant. Bull thistle is a biennial growing 2 to 5 feet tall. It has a short, fleshy taproot. Stems are very pubescent and have dark purple veins. The first year's leaves form a rosette. Second-year leaves are double-toothed ending in a spine; are wavy; have prickles on the surface; and are pubescent on the underside. Stem leaves are similar to rosette leaves, but they are smaller and have longer spines. The tapering pointed ends of the leaves give this thistle its other common name, spear thistle. Flower heads, made up of dark purple flowers, are 1.5 to 2.0 inches wide. Bracts surrounding the receptacle are narrow and spine-tipped (EC Bar Ranch, undated).

Bull thistle has been mapped in northeastern Arizona, northwestern New Mexico, and is common from Flagstaff south to the Mogollon Rim (CRISIS 2005). Bull thistle is probably the least aggressive non-native thistle in the state. It typically appears as a few scattered individuals plants or populations, primarily at higher, moister sites. These individuals proliferate by shedding seed that mostly lands near the parent plant, but can also be wind- or air-borne. It does not compete well with native vegetation where the existing vegetation forms a good ground cover. Small infestations spread opportunistically, taking advantage of scouring floods, periodic heavy grazing, fires, and other soil disturbances that leave openings for seeds to land and germinate. Seed that is located on or near the soil surface has a very short life; however, seed that is buried at least 6 inches may have over 50% viability after 3 years (Zouhar 2002). This induced dormancy at this depth could account for bull thistle infestations emerging after disturbance in previously uninfested sites. Bull thistle has evolved a system to encourage seed burial. Seeds have a nutrient-rich "peg" called an elaiosome. This external part of the seed induces ants to transport the seed to their underground nests, in order to feed on the elaiosome. After this part is eaten, the seed is discarded in another part of the underground ant nest. When the site becomes disturbed so that the seed is exposed to light, the induced dormant period is broken and a new infestation is started. Bull thistle plants in dry Canadian grasslands are often associated with ant nests (Zouhar 2002).

A major infestation began in Canyon Creek in the wake of the Rodeo-Chediski Fire of 2002. The infestation extends from the headwaters of Canyon Creek below the Mogollon Rim to the Fort Apache Reservation. It grows along Canyon Creek and also on forested slopes. Small infestations have been reported in various sites on the Payson Ranger District, many associated with burn piles.

#### Field bindweed

#### Convolvulus arvensis L.

Field bindweed originated in Eurasia but has spread across the world to become a cosmopolitan species growing between 60°N and 45°S latitudes. It was introduced to the eastern U.S. in the 1700's and spread westward rapidly with construction of the railroads. It was established in the western U.S. by the early 1900's (Weaver & Riley 1982).

It is a persistent, perennial vine of the morning-glory family, which spreads rhizomatously and by seed. An extensive root system makes total eradication nearly impossible. Lateral root growth in one year has been measured to average 15 feet. Lateral roots are generally within the top foot of soil, but 1/3 of the total root system grows below 2 feet. Field bindweed also produces extremely persistent seed. In one experiment with 55-year-old seed, 65% were found to be still viable (Brown & Porter 1942). Seed can remain viable in the stomachs of migrating birds for up to 6 days, dispersing it over a distance of many miles (Lyons 1998).

Relatively little is known of the impact of this plant on natural areas. Its extensive root system can deplete the top foot of soil of water to below wilting point for most species. It can choke out native grasses and forbs, especially in riparian areas.

Foliage contains alkaloids that can cause intestinal problems in horses grazing on heavily infested pastures (CDFA 2005).

This plant has mainly been found on roads, near fields and other disturbed areas within the Tonto National Forest, on the Payson and Pleasant Valley Ranger Districts.

#### White bietou

Dimorphotheca cuneata (Thunb.) Less.

This plant is a perennial half-shrub, native to South Africa, but can be easily purchased in seed form from anywhere in the world. There are no records regarding this plant as an invasive species in the U.S. A related species, *D. sinuata*, is documented as occurring in California as an invasive plant (San Diego Natural History Museum, undated). This species is an annual, commonly called an African daisy.

The Tonto has one population of this plant that has spread from an ornamental planting approximately 20 years ago on private lands south of the Globe Ranger Station. This plant currently occupies 40 acres of the National Forest. This half-shrub, with extremely attractive large white flowers is widespread in yards and canyons between Six Shooter Canyon and National Forest lands to the west.

#### **Common teasel**

Dipsacus fullonum L.

Teasel is a European plant introduced to the U.S. in the 1700's (WDNR 2004). It is commonly used, and spread, in dried flower arrangements. It is also sold by nurseries as a flowering plant.

It grows as a short-lived perennial or biennial. It spends one or more years as a rosette before sending up a flower stalk. Teasel's unique inflorescence makes the plant readily identifiable when flowers or seedheads are present. Tiny purple flowers in an ovoid inflorescence are each subtended by a long spiny bract. Infestations occur in sunny riparian areas.

Teasel produces an abundance of seeds. A single teasel plant can produce over 2,000 seeds; up to 30-80% of the seeds may germinate. Seeds may remain viable for at least 2 years. Seeds typically don't disperse far; most seedlings will be located near the parent plant. Streamflow in riparian areas can carry them some distance from the original infestation, however.

There are only a few known isolated populations of teasel in northern Arizona. One patch is at Watson Woods on Granite Creek in the Prescott area (USDA FS Feb 2004). CRISIS maps show another infestation elsewhere in Yavapai County. Teasel has been documented on the Tonto at Shumway Millsite, south of Payson, on the Payson Ranger District. Employees at Payson Ranger District have reported seeing it in the vicinity of Sharp Creek Campground. These infestations are all associated with riparian areas.

#### **Russian olive**

*Eleagnus angustifolia* L.

Russian olive is a fast-growing tree, reaching a height of 10 - 25 feet at maturity (Whitson 2002). Trunks and branches are covered with 1 to 2 inch thorns. Leaves are narrow, 2-3 inches long. Clusters of yellow flowers bloom in early summer; fruit resembles small reddish-brown olives. Birds and small animals eat the fruits, which aids in dispersal of the seeds. Its large seeds remain viable for up to 3 years and are capable of germinating over a broad range of

conditions (Shafroth et al. 1995). Also, seeds germinate anytime from fall to spring, giving Russian olive a competitive advantage over native riparian trees. Russian olive also spreads vegetatively (Tu 2003).

It was introduced from Europe in the early 1800's as a desirable ornamental shade tree. It is now invasive in 17 western states. It is especially invasive in riparian woodlands, taking advantage of scouring events to replace cottonwood and willow trees (Tu 2003). It has nitrogen-fixing roots, which enable it to grow on bare mineral substrates and dominate riparian vegetation where overstory cottonwoods have died. Bird species richness is higher in native riparian vegetation than where Russian olive dominates (Muzika & Swearingen 2005a).

It can survive drought conditions, so is adapted to ephemeral riparian drainages that are common on the Tonto. Dense thickets of Russian olive increase the occurrence of catastrophic wildfires in riparian areas, due to their heavy fuel-loading (Caplan 2002).

Russian olive has been found in the northeast quadrant of Arizona (CRISIS 2005), and also in Prescott Valley, Chino, Camp Verde, and east of Flagstaff (USDA FS Feb 2004). It has not been documented on the Tonto.

#### Quackgrass

Elymus repens (L.) Gould

Quackgrass is a cool-season, exotic, perennial, rhizomatous graminoid. Its stems are erect growing to 1 to 3 feet in height. Rhizomes can grow 23 inches or more from the main shoot before sending out stems (Fernald 1950). Quackgrass propagates mainly by rhizomes but also reproduces by seed. Seed production, however, is reported to be as low as 25 viable seeds per plant per season. The seeds can remain viable for 1 to 6 years. Viability can be maintained even after passing through the digestive tract of most farm animals (Reidy & Swanton 2001).

Quackgrass is native to Europe and Western Asia. It has been reported growing in every state of the United States (Batcher 2002).

Quackgrass produces chemicals that inhibit nearby plant growth. As a cool-season grower, it can usurp water and soil nutrients through the soil profile, thus suppressing growth of later, warm-season grasses.

To date, this is an uncommon weed in Arizona. It has only been documented near Flagstaff, and in the Grand Canyon National Park. It has been found on one site on the Tonto National Forest, on the Pleasant Valley Ranger District.

#### Weeping and Lehmann's lovegrass

Eragrostis curvula & E. Lehmanniana

Although there is a native lovegrass species (*E. intermedia*), these 2 species of *Eragrostis* are introduced from South Africa.

These plants were introduced as part of range restoration/soil conservation programs in the southwest, and thousands of acres were planted with them in the 1930's (Moser & Crisp 2003). In the mid to late 1900's, these species were commonly included in seed mixes used after fires, highway construction/reconstruction, and other ground-disturbing activities, such as powerline road construction. Lehmann's lovegrass has thrived the best at elevations from 3000 to 4500 feet; weeping lovegrass grows in Arizona from 4900 to 6500 feet. They were planted with forage value in mind, however, they are not as palatable as native perennial grasses, and tend to out-compete them. Although they are classified as warm-season growers, they produce more green herbage in the winter and early spring than native grasses. This active growth during a time when native warm-season grasses are still dormant is key to their dominance in a grassland community years after planting (Moser & Crisp 2003, Uchytil 1992, Walsh 1994).

When native grassland and pastures seeded to Lehmann's and weeping lovegrass were compared, the two site types differed consistently in that the planted exotics grew in monospecific stands and native grasses did not. Total native herbaceous canopy, species richness, shrub density and shrub canopy were significantly reduced on plots seeded to the lovegrasses. Small birds that nest in grasslands will use Lehmann's lovegrass, but nest more frequently in native grassland if it is available. (Uchytil 1992)

Lehmann's lovegrass reseeds itself quickly after disturbance, and tends to replace native grasses where it has been planted. It has replaced Arizona cottontop, threeawn grasses, and grama grasses over much of the Santa Rita Experimental Range in Arizona (Cable 1971). Weeping lovegrass produces up to 1000 seeds per seedhead, but rate of spread by seeds is very slow, and this plant does not actively colonize adjacent nonplanted sites. Weeping lovegrass should not be planted after wildfires for restoration if management objectives are to maintain native plant communities. Although weeping lovegrass is not particularly invasive, once it is planted, it remains in place for a very long time (Walsh 1994).

Desert shrublands that have been invaded by Lehmann's lovegrass experience much more intense burning during wildfires. Most native desert plants and cryptogams are not adapted to intense and frequent fires; species composition changes over time in sites that have been invaded by this and other exotic perennial grasses such as buffelgrass.

Lehmann's lovegrass seeds are initially dormant, requiring 6 to 9 months of afterripening. They need some type of dry heat to scarify their seedcoat and increase water uptake by the seed to be able to germinate. Shading inhibits germination, as the seeds also require exposure to red light to germinate (Uchytil 1992). Weeping lovegrass exhibits facultative apomyxis; that is, seeds do not have to be fertilized to grow into new plants. Weeping lovegrass seedlings must have dependable moisture after they germinate. Less than 20% of newly germinated seedlings survived one day of dessication, and none survived 3 days of dessication (Uchytil 1992).

On the Tonto, these grasses have been extensively seeded along highways, powerline corridors, and even aerially seeded after fires. In 1951, weeping lovegrass was aerially seeded in the Pinal Mountains after a wildfire (Walsh 1994).

#### **Leafy spurge** *Euphorbia esula* L.

Leafy spurge was transported to the U.S. possibly as a seed impurity in the early 1800s. First recorded from Massachusetts in 1827, leafy spurge spread quickly and now occurs across much of the northern U.S., with the most extensive infestations reported in Montana, North Dakota, Nebraska, South Dakota, and Wyoming (Thunhorst & Swearingen 2005b). In 1996 there were 2.5 million acres infested with leafy spurge in the U.S. and Canada (Biesboer 1996).

Leafy spurge is an erect, branching, perennial herb 2 to 3½ feet tall, with smooth stems and showy yellow flower bracts. Stems frequently occur in clusters from a vertical root that can extend many feet underground. Stems and leaves have a white milky sap that is a skin irritant. The leaves are small, oval to lance-shaped, somewhat frosted and slightly wavy along the margin. The flowers of leafy spurge are very small and are borne in greenish-yellow structures surrounded by yellow bracts.

Leafy spurge reproduces by seeds that have a high germination rate and may remain viable in the soil for at least seven years. Its seed capsules open explosively, dispersing seed up to 15 feet from the parent plant and may be carried further by water and wildlife. 99% of seeds germinate within two years (Biesboer 1996). Most seeds germinate in the spring, but germination and establishment does occur throughout the growing season. Leafy spurge also spreads vegetatively at a rate of several feet per year. The root system can reach 15 or more feet into the ground, and may have numerous buds.

The milky sap produced by leafy spurge will cause a severe skin rash in humans. This weed is also poisonous to most livestock, with the exception of sheep, which can be used to control it. If horses are permitted to walk in areas with leafy spurge, the sap will cause severe blistering and hair loss on their feet (Nova Scotia Department of Agriculture and Fisheries 2003). It is reported to cause severe irritation of the mouth and digestive tract in cattle, which may result in death (Whitson 2002).

When leafy spurge infests pastures, herbage production can be reduced by as much as 75% (Lym & Messersmith 1985). Cattle will avoid grazing an area with as little as 10% cover of leafy spurge (Hein & Miller 1992).

Extracts from the roots of leafy spurge are leached into the soil wherever the weed grows. These extracts inhibit the germination and growth of other plants in the surrounding area (Nova Scotia Department of Agriculture and Fisheries 2003)

Leafy spurge is an aggressive invader and, once present, can completely overtake large areas of open land. Because of its persistent nature and ability to regenerate from small pieces of root, leafy spurge is extremely difficult to eradicate (Thurhorst & Swearingen 2005b).

The Environmental Impact Statement for treatment of invasive plants on the three northern Forests in Arizona cites one infestation on the Coconino National Forest and two on the Kaibab National Forest (USDA FS Feb 2004). This plant has not been documented on the Tonto.

#### Sweet resinbush

Euryops subcarnosus DC. ssp. vulgaris B. Nord

Sweet resinbush is a perennial shrub, growing up to 3 feet in height, native to South Africa. It was collected by SCS Regional Director F.J. Crider in 1934 for introduction to the southwest to control high erosion that was occurring during the 1930's (Pierson & McAuliffe 1995). A 1928 publication, The Flowering Plants of South Africa claimed sweet resinbush to have good forage value, especially for sheep, to be drought-resistant, and to propagate easily. Two out of three claims were correct. Recent research has shown that most species of Euryops contain noxious chemicals so that they are not only unpalatable, but toxic to wildlife and livestock (Schalau 2001).

Resinbush was planted in many locations throughout the southwest by Civilian Conservation Corps crews doing erosion control projects. Also seeds and young plants were made available by SCS to anyone who would plant them (Pierson & McAuliffe 1995).

The largest population today in Arizona (3000 acres) is on Fry Mesa south of Safford (Schalau 2001). In 1998 it was discovered growing on the Santa Rita Experimental Range in southern Arizona (Howery et al 2003).

Small (less than 1 acre in size) patches of sweet resinbush, remnants of CCC erosion-control plantings, have been mapped south of the Globe Ranger Station, in the same area as the *Dimorphotheca* population. One infestation of about 3 acres remains in Tonto Basin west of Highway 188; the largest population on the Tonto is approximately 30 acres on the north side of Highway 60, north of the Miami cemetery. It also grows east of the cemetery on slopes and two miles down Bloody Tanks Wash toward Miami. All of these populations are associated with CCC civil works projects of the 1930's. Many of the checkdams constructed by the CCC are still functioning, including some very impressive ones in Bloody Tanks Wash west of Globe/Miami.

Invasion by sweet resinbush has produced dramatic changes in much of the semi-arid grasslands and shrublands where it was planted. It creates monocultures, excluding normally prevalent half-shrubs like *Calliandra*, shrubby buckwheat, and even snakeweed. Elimination of grasses leads to a dramatic increase in exposure of bare soil, and increased soil erosion (Pierson & McAuliffe 1995). In a sweet resinbush site in Marijilda Canyon, the bare soil created by the dominance of this species resulted in soil that moved more easily. Exposed roots and soil pedestals around bases of the few remaining native grasses were evident in the zone just ahead of resinbush dominance. A sharp demarcation zone at the front of the resinbush infestation was not due to allelopathy, but to extremely efficient uptake of water by the resinbush, leaving none for the native plants (Pierson & McAuliffe 1995).

Little is known of seed dormancy patterns, production, or longevity in the soil. Most seed falls underneath the parent plant and germinates there. Seed is also transported by adhering to fur or clothing, or by floating in streams or ephemeral washes.

## Dyer's woad

Isatis tinctoria L.

Dyer's Woad was introduced into North America from Europe late in the 17<sup>th</sup> century. It was cultivated as a source of blue dye (Callihan and Miller 1999). It is a perennial or biennial herb in the mustard family.

It reproduces by seed, with most seeds falling near the parent plant. An average of 383 oneseeded pods are produced per plant (CDFA 2005). These pods do not open, and contain watersoluble inhibitors that prevent seeds from germinating until thorough leaching occurs. Seed longevity has not been studied.

Dyers woad invades both disturbed and undisturbed areas, and seems to prefer open dry rocky soils. It also invades stands of other invasive plants, such as cheatgrass. It reduces forage availability by suppressing growth of grasses, and it is low in palatability to grazing animals. It is frequently spread through contaminated hay, as it grows as a weed in alfalfa fields. It is also moved about on contaminated equipment.

This species has not been documented on the Tonto, and there are no documented records for this species in either the CRISIS or SWEMP databases. It is known mainly in the intermountain west and northwest U.S.

#### Kochia

Kochia scoparia (L.) Schrad.

Kochia is an annual forb brought to North America from Europe. It is now common across the northern U.S, and is working its way southward. In Arizona there are many documented observations in the northeast quadrant of the state. It was observed on the Fort Apache Reservation north of the Salt River during a weed survey of the river in the spring of 2005 (Fenner 2005).

It has a thick taproot, from which it breaks off when the plant is mature. It disperses seeds by tumbling like Russian thistle. One plant typically produces nearly 15,000 seeds (WSNWCB 2005). Seeds on the soil surface typically survive 1-2 years, but buried seeds may remain viable for over 3 years (Zorner et al 1984).

It withstands drought well, becoming a dominant plant in the Midwest during the dust bowl years. It is documented to possess allelopathic properties that affect even its own seedlings (Wali 1999).

*Kochia scoparia* causes hepatotoxicity with photosensitization, renal disease and polioencephalomalacia to livestock. Another species of kochia, *K. prostrata*, is sold as a forage crop for livestock. *K. prostrata* is a drought-tolerant perennial sub-shrub. Both species have been used for livestock forage (kochiaseed.com 2003).

#### Oxeye daisy

Leucanthemum vulgare Lam.

Oxeye daisy is a perennial forb in the sunflower family that has naturalized from Europe into all 50 states (USDA NRCS 2004). Spread is assisted by seed companies who sell seed packets even in states where the plant is listed as a noxious weed (WSNWCB 2000). It also spreads vegetatively by rhizomes (Alvarez undated)

Ox-eye daisy is able to produce seed its first summer of growth. It is a prolific seed producer when it is growing in moist soil. Most ox-eye daisy seed remain viable for 20 years in the soil, and remain viable after passing through the digestive tracts of animals (Alvarez undated).

Oxeye daisy has a white flower with a yellow center, and grows to a height of 30 inches. It often invades overgrazed or otherwise disturbed ground. It can tolerate drought and frost, but prefers moist, unshaded sites.

In areas of heavy infestations, there is more bare soil than adjacent native meadows, which increases the potential for soil erosion (Olson & Wallander 1999). Plants are resistant to grazing, and since cattle normally avoid eating oxeye daisy, pastures with this species tend to deteriorate in range capacity through time (WSNWCB 2000).

It has not been documented on the northern three National Forests in Arizona, but does grow in Flagstaff and Kachina Village south of Flagstaff (USDA FS Feb 2004). It was recently identified growing inside an elk exclosure along Canyon Creek, on the Pleasant Valley Ranger District (Fenner 2005). The exclosure fence was recently constructed by the Arizona Game & Fish Department to control overgrazing by elk in this popular fishing area.

#### Dalmatian toadflax, Yellow toadflax

Linaria dalmatica (L.) P. Mill., Linaria vulgaris P. Mill.

Both toadflaxes are native to the Mediterranean region. Dalmatian toadflax was introduced to the west coast of the U.S. in 1874 for use as an ornamental. Yellow toadflax was brought to New England from its native south-central Eurasia in the late 1600's as an ornamental and medicinal plant. Today it is still sold as "butter and eggs," "Jacob's Ladder," or "wild snapdragon." Seed of Dalmatian toadflax is also sold by garden catalogs and nurseries.

Dalmatian toadflax is a creeping perennial herb that grows up to three feet tall. It has grayishgreen alternate leaves that clasp the stem. Flowers are yellow and very similar to snapdragon flowers. This plant reproduces by root sprouts and an enormous number of seeds. While it is attractive and not thorny, it does tend to take over wildlands, replacing other species of more value to wildlife, livestock, and erosion control. A single Dalmatian toadflax plant can produce up to 500,000 seeds in one growing season (Robocker 1970). Seed of both toadflaxes can remain viable in the soil for over 10 years. Dalmatian toadflax patches can totally disappear, only to reestablish after several years, from either buried seeds or vegetative buds on the roots (Robocker 1974). Yellow toadflax is also a perennial forb with a woody base. Leave are narrower than those of Dalmatian toadflax. Flowers are borne in axils of upper leaves, as in Dalmatian toadflax; however, flowers of yellow toadflax have a longer spur.

Both toadflaxes have adapted through centuries of grazing in Europe, to survive highly disturbed habitats. They will move from small sites of natural disturbance into pristine rangeland. Once it invades native rangeland, it is very difficult to stop its spread. Toadflaxes commonly displace existing plant communities and associated animal life. Consequent loss of forage adversely impacts livestock and wildlife. Where it replaces sod-forming or bunch grasses, erosion increases.

Yellow toadflax has been reported to be toxic to cattle, but this is rare, since cattle normally avoid it (Lajeunesse 1999).

Dalmatian toadflax is very common around Flagstaff. It is widespread in Ponderosa pine forests on the Kaibab, Coconino, and Prescott National Forests (USDA FS Feb 2004). On the Tonto, it grows at the Payson Ranger District Hot Shot Base, and along Highway 87 between Payson and Rye (Fenner 2005b). Arizona Department of Transportation treated the infestation on Highway 87 with herbicides for several years, until recently. It was nearly eradicated, but is now returning. In 2003, a small infestation was discovered growing on a low rocky terrace above the Verde River, one mile downstream from Childs, on the Cave Creek Ranger District. It appeared to be associated with a trespass road into the Mazatzal Wilderness. This is the lowest elevation where Dalmatian toadflax has been documented in Arizona (Northam 2004). Yellow toadflax has not been documented on the Tonto.

# **Purple loosestrife**

Lythrum salicaria L.

Purple loosestrife is native to Eurasia and was first reported from the northeastern coast of North America in 1814 (Stuckey 1980).

*Lythrum salicaria* is a stout, erect perennial herb with a strongly developed taproot. The plant ranges in height from 1  $\frac{1}{2}$  to 8 feet (Bender 2001, Whitson 2002). The inflorescence is spike-like, 4 – 16 inches long. Petals are usually magenta, but white or light pink flowers are also common (Bender 2001). It is usually associated with riparian areas. The semi-woody aerial shoots die in the fall but persist for one to two years making stands of purple loosestrife very dense. New shoots arise the following spring from buds at the top of the rootstocks (Bender 2001).

The seeds are small, weighing 0.06 mg each. Dispersal is mainly by wind, but seeds can also be transported on the feet of waterfowl or other wetland animals. Red-winged blackbirds have been observed eating the seeds. Humans carry seeds inadvertently on clothing and shoes. The seeds and cotyledon stage seedlings are buoyant and can be dispersed by water currents. The seed bank potential is enhanced by the high viability of the seeds. After two years in a lake, 80% of seed viability was retained (Bender 2001). Purple loosestrife seed germinates in such high densities

that it out-competes native seedlings. It tends to build up biomass from year to year, enabling it to move into open water.

Purple loosestrife is considered an important weed of wetlands in most of North America. Reservoirs with widely fluctuating water levels provide excellent habitat for it (Rawinski & Malecki 1984).

The only known populations of purple loosestrife in Arizona are on the Apache-Sitgreaves National Forest (Crisp 2000).

#### Yellow sweetclover

Melilotus officinalis (L.) Lam.

*Melilotus* species are native to the Mediterranean area through central Europe to Tibet. They were reported in North America as early as 1664 and have been extensively used by agriculturalists as forage crops, soil builders (they are in the legume family, that fix nitrogen in the soil), and as a nectar source for honey bees. The sweetclovers have spread from cultivation and thrive in waste places and roadsides throughout the U.S. and Canada (Eckardt 1987). Yellow sweetclover can act as a winter annual or a biennial (Whitson 2002).

Rainwater runoff and stream flow are probably the most important means of seed dispersal, although wind can blow seeds several feet. Newly mature seeds will be soft, but as they dehydrate they become temporarily "hard" or impermeable, and can remain viable in this state for many years. Hard sweetclover seeds can remain viable in the soil for over 20 years (Eckardt 1987). Other sources state seeds could remain viable in the soil up to 50 years (USGS undated). Each plant can produce 14,000 to 350,000 seeds. Yellow sweetclover does not reproduce vegetatively.

Yellow sweetclover has a bitter taste, making it less palatable to cattle than other legumes. It is more palatable in early spring and summer, becoming woody in late summer and fall (Sullivan 1992).

This plant is fairly widespread through Arizona – it has been documented at the Grand Canyon, and in Cochise, Pinal, Maricopa, Apache, and Yavapai counties (AZWIP-WG undated). On the Tonto, it has been used in seed mixes, and has lingered on in wetter sites. It is very common in the riparian zone along the Verde River, on the Cave Creek Ranger District.

# Oleander

#### Nerium oleander L.

This is a very commonly used landscaping plant in the Phoenix urban area. There are two sites where it has naturalized on the Tonto National Forest. Several clumps of it have attained great height, growing in Arnett and Telegraph Canyons, near Boyce Thompson Arboretum (Grove 2004). Another large individual plant was found growing in Camp Creek, on the Cave Creek Ranger District, apparently naturalized from a nearby recreational residence (Loomis 2006, Nelson 2006).

Oleander has not been considered to have invasive potential until fairly recently. A Red Alert was issued by the California Invasive Species Council for this plant in 2000. It had been found along the Sacramento floodplain near Redding, and riparian zones in southern California (Tu and Randall 2000).

This year, in Arizona, the Arizona Daily Star included oleander in a list of ornamental plants that were becoming invasive in Saguaro National Park (McKernan 2005).

Oleander is native to the Mediterranean region, where it grows in ephemeral washes. Its pods contain seeds that have plumes of hairs for wind dispersal.

All parts of the plant are extremely poisonous, containing 10 different cardiac glycosides. These compounds induce cardiac arrhythmia and eventual death. The lethal dose of green oleander leaves for cattle and horses is 0.005% of the animal's body weight. Inhalation of smoke from a burning oleander also can cause poisoning (Skurka 2005).

#### **Globe chamomile**

Oncosiphon piluliferum (L. f.) Källersjö

This plant is a close relative of *Pentzia incana*, another introduction from South Africa. It is an annual plant, which has escaped cultivation in the U.S. and also in western Australia. In 2005 it began to be observed at several different places in Arizona, possibly naturalized from plantings. To date, it has been documented growing in abundance along 5 miles of I-17 north of Phoenix, spreading up to <sup>3</sup>/<sub>4</sub> mile into the desert on both sides of the interstate (Fenner 2005b, Northam 2005). Isolated patches of globe chamomile have also recently been identified near Skunk Tank Ridge south of Cave Creek on the Cave Creek Ranger District, at the Cave Creek Ranger Station, at the Sonora Desert National Monument, at Pinal City near Superior, along Highway 84 west of Casa Grande, at the Extension Service demonstration garden on east Broadway in Phoenix, on a disturbed site four miles east of I-17 on Carefree Highway, and growing in cultivation at the Desert Botanical Garden and Boyce Thompson Arboretum (Trask 2004, Northam 2005).

#### Scotch thistle

Onopordum acanthium L.

Scotch thistle is native to Europe and Asia. It was introduced to the eastern U.S. in the late 1800's; today it can be found in most western states. It prefers moist sites, and has the potential to invade riparian areas. It also has been documented to replace native bunchgrasses and sod-forming grasses (Beck 1999).

It is normally a biennial, but can also grow as an annual or a short-lived perennial plant (Young and Evans 1969). This is a large thistle, growing to a height of up to 8 feet, with basal leaves 2 feet long. Leaves are spiny and covered with fine dense hairs on both sides. Flowers are 1-2 inches in diameter, pale purple to red, and flat-topped. Below the flower are spiny bracts (Beck 1999). Up to 90% of seeds are dormant when mature. A water-soluble germination inhibitor in the seeds ensures the plant will grow in moist sites, and prolongs the seeds' life in the soil. Most

seeds germinate near the parent plant, although transport by human activities and animals does occur.

This plant can create a tall, dense, spiny obstruction to human and animal movements.

Scotch thistle is common in the Four Corners area, the Arizona strip, and along the interstate system around Flagstaff. There is one known population on the Prescott National Forest (USDI USGS 2005, USDA FS Feb. 2004). In 2004, the first infestation of this plant was documented on the Tonto, growing in Strawberry at the Highway 87 bridge.

#### African rue

Peganum harmala L.

African rue is a many-branched perennial that has an aggressive, woody root system. Height rarely exceeds 1 to 1.5 feet. Stems are fleshy. When crunched, the stems have a bitter, acrid taste and a disagreeable odor. Leaves are alternate, smooth, and divided into linear segments. Flowers consisting of five white petals are borne singly in leaf axils along the stems.

African rue's origin is North Africa. The first reported infestation in the United States was near Deming, New Mexico, in the 1920s (EC Bar Ranch, undated). It was brought in by a farmer who wanted a new plant that would yield a red dye for wool yarn (Davison & Wargo 2001).

African rue is poisonous to cattle, sheep, horses, and humans. Other species may be vulnerable as well. The seeds, fruit and young leaves are the most poisonous plant parts. Rue is an extremely unpalatable plant and livestock consume it only when starving or under a severe mineral deficiency. The early symptoms of poisoning include weakness in the hind legs, listlessness, salivation, and anorexia. In humans, the alkaloids present in the plant cause hallucinations and severe vomiting (Davison & Wargo 2001).

The Arizona Department of Transportation recently confirmed a small infestation of African rue growing in Pima County along I-10 near the town of Vail. It also occurs in northwestern and southwestern New Mexico (EC Bar Ranch, undated). This species has not been documented on the Tonto.

# Buffelgrass

Pennisetum ciliare (L.) Link

Buffelgrass is native to arid regions of Africa, Asia and the Middle East. It was introduced to Texas as early as 1917, but the most common variety in this country was brought to San Antonio, Texas, California, Arizona and New Mexico from Kenya by the Soil Conservation Service in the 1940's. In Tucson, it was studied at the place now known as the Natural Resource Conservation Service – Tucson Plant Materials Center. It was planted from the 1970's through the 1980's at sites around Tucson, including the Santa Rita Experimental Range, where it still grows (Yetman & Burquez 1994).

It has a sprawling growth habit, with stems that can grow to four feet long, and a mass of tough roots that can penetrate the ground to 4 feet deep (Douglas King Co. 1999).

Buffelgrass is adapted to survive frequent fire. It will burn while still green, and forms new sprouts immediately after the fire has died. This perennial grass crowds out other desert vegetation, or grows in areas that are normally occupied only by ephemeral spring or fall vegetation. It provides a continuous fuel that carries fire into the Sonoran desert, which is not adapted to frequent fire.

Extensive buffelgrass invasions with their consequent frequent fire, have converted desert scrub communities into non-native grassland in Mexico (Burquez et al. 2002).

This perennial cool-season grass is common in Phoenix. It is spreading onto the Tonto along Highways 60 and 87, Pima Road in Scottsdale, Cave Creek Road, and other roads.

#### **Fountain grass**

Pennisetum setaceum (Forsk.) Chiov.

Originally native to Africa and the Middle East, fountain grass has been introduced to many parts of the world as an ornamental grass (Benton 2005). It is popular in many countries as an ornamental plant – it has dispersed into wildlands across Arizona, California, Florida, Hawaii, Fiji, South Africa and Australia thanks to sales in nurseries (Lovich undated).

Fountain grass is an attractive perennial grass with a densely clumped growth form and erect stems that grow 2 to 3 feet high. The small flowers of fountain grass are grouped in pink or purple, bristly, upright inflorescences 6-15 inches long. Fruits are small, dry achenes with long bristles. Seed are wind-dispersed, and remain viable in the soil for 7 years or longer. Its seeds may be dispersed greater distances by water, vehicles, livestock and humans (Cal IPC 2005). The long-lived seeds of fountain grass make its control extremely difficult. Fountain grass is apomictic, which means it can reproduce by either fertilized or unfertilized seeds (Simpson & Bashaw 1969).

Fountain grass is a highly aggressive, fire-adapted colonizer that readily out-competes native plants and rapidly reestablishes after burning. Fountain grass raises fuel loads, which increases the intensity and spread of a fire, and results in severe damage to native desert species including all species of cactus.

Fountain grass has been documented on the Tonto on all desert Districts. It grows profusely along Highway 60 between Superior and the mountain tunnel east of town. It also grows along Highway 87, along the road to Bartlett and Horseshoe Reservoirs, and in the Salt River Recreation Area. It is commonly used for landscaping, and is an escaped ornamental throughout the greater Phoenix area.

#### Karoo bush

Pentzia incana (Thunb.) Kuntze

*Pentzia incana* was first introduced from South Africa to Arizona by the Soil Conservation Service working with the Civilian Conservation Corps, in the 1930's. It was selected for its drought tolerance, and intended to prevent soil erosion, which was rampant during the drought of the 1930's. Karoo bush was planted as late as 1946 in plant trials at the Santa Rita Experimental Range in southeastern Arizona (Munda & Pater 2003).

It is a small shrub in the sunflower family. Its yellow ball-like flowers appear during the winter. It has not exhibited a great deal of invasiveness in the one site it has been documented on the Tonto, north of Oak Flat Campground on the Globe Ranger District. Soils in the site it inhabits have been severely disturbed. This site is associated with checkdams constructed by CCC crews in the 1930's.

*Pentzia* is advertised on some landscaping websites as a desirable plant; The State Department of Water Resources recommends it as a low water-use plant (Arizona Dept. of Water Resources 2004), as does the University of Arizona's Office of Arid Land Studies.

#### Japanese knotweed

Polygonum cuspidatum Sieb. & Zucc.

Japanese knotweed is an herbaceous perennial that can grow to over 10 feet in height. Stems of Japanese knotweed are smooth, stout and swollen at joints where the leaf meets the stem. Leaves are about 6 inches long by 3 to 4 inches wide, broadly oval to somewhat triangular and pointed at the tip. Small greenish-white flowers bloom in the summer. Small winged fruits contain triangular, shiny, 1/10 inch-long seeds.

Japanese knotweed spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it is able to rapidly colonize after scouring floods. Once established, populations are extremely persistent. Japanese knotweed spreads primarily by vegetative means. It may also be transported by water, and the tiny seeds may be wind-dispersed. It naturalizes easily from gardens; discarded cuttings are common routes of dispersal from urban areas.

This invasive species can tolerate a variety of adverse conditions including full shade, high temperatures, high salinity, and drought. It is found near water sources, such as along streams and rivers, in low-lying areas, waste places, utility rights-of-way, and around old homesites. It can quickly become an invasive pest in natural areas after escaping from cultivated gardens.

Japanese knotweed was probably introduced to the U.S. in the late 1800's. Also known as crimson beauty, Mexican bamboo, Japanese fleece flower, or Reynoutria, it was first introduced as an ornamental and has also been used for erosion control and for landscape screening. It is now found throughout the eastern U.S., in several western states, and Alaska.

This plant was recently discovered for sale at a nursery in Star Valley, east of Payson (Brock 2004).

## Sulfur cinquefoil

Potentilla recta L.

Sulfur cinquefoil is a perennial shrub of the Rose family, native to Eurasia and North Africa. It grows to a height of  $1 - 1\frac{1}{2}$  feet, with 1 to 8 unbranching stems. The entire plant is covered with shiny erect hairs. A single plant can live up to 30 years. The plant has a single taproot, and may have several spreading branch roots. Flowers are pale yellow with petals up to 1 inch in length.

It can grow in biomes that range from coniferous forests to pinyon-juniper to grassland. It is a very competitive plant – it has been reported to replace spotted knapweed in Montana (Rice 1991). It is a prolific seed producer, averaging up to 5600 seeds per plant. Seeds are wind-dispersed, but typically falling within a foot of the parent plant. Long-distance dispersal can use several vectors, as seeds become easily attached to anything passing by. Research indicates seed may remain viable in the soil for more than 4 years (Endress & Parks 2004).

Sulfur cinquefoil is an aggressive invader, causing a decrease in biodiversity of native plant communities, and altering natural successional processes. *Potentilla* recta has been known to hybridize with other species of the same genus under natural conditions, thus causing reduced reproductive success of native *Potentilla* species (Endress & Parks 2004).

In northern Arizona, it has been documented along the Rio de Flag and on the Lake Mary Road on the Coconino National Forest. It has not been found on the Tonto National Forest.

# Pyracantha

Pyracantha M. Roemer

Pyracantha is a commonly used landscaping shrub in the rose family that has small, shiny green leaves, spiny stems, and small clusters of white flowers in the spring that mature to red berries. It was introduced from China as an ornamental plant. Seeds spread by either water or bird distribution.

It is uncommon for this plant to be invasive in the southwest. There is one site that has been identified on the Tonto, where plants probably originated from nearby ornamental plantings, along Camp Creek at the recreational residences. It was removed by the Cave Creek Complex Fire in July 2005; further observations will be made to assess whether it can return after being burned.

#### African sumac

Rhus lancea L.

This species is recommended as a low water use plant for landscaping by the Arizona Department of Water Resources website (ADWR 2004). It has been used extensively in

landscaping throughout the Phoenix metropolitan area, and is beginning to naturalize in areas with slightly higher runoff or greater moisture conditions than the surrounding desert. It may pose a threat to native trees in riparian ecosystems in the Sonoran Desert.

It has not been documented on the Tonto at the time of this writing.

#### **Russian thistle**

Salsola kali L., Salsola tragus L.

Russian thistle was brought to the U.S. from Russia in flax seed about 100 years ago. It has spread rapidly. It is an annual bushy plant, growing to from ½ foot to 6 feet in height. At maturity, the stem breaks off at ground level, giving the plant its most common name, tumbleweed. Seeds are dispersed as the plant tumbles across miles of desert. One plant may produce thousands of seeds, which remain viable for years.

Russian thistle is a restricted noxious weed in Arizona. It is a common invader of disturbed areas, especially along roadsides. In Arizona it has not been observed moving into undisturbed areas. Nitrates produced during periods of rapid growth may be toxic to wildlife and livestock.

It is found on the Tonto on recently disturbed soils along roads and highways, and at mining and millsites. Experienced natural resource managers at the Arizona Department of Transportation state they have not seen this plant spread beyond the immediate area of disturbance, where it phases out under competition when native perennial grasses and other native plants recover (Horsley 2004).

#### Mediterranean sage

Salvia aethiopis L.

Mediterranean sage is an erect, coarse biennial or short-lived perennial, with a stout taproot. The squarish stem, opposite leaves and bilabiate flowers are typical of the mint family. When crushed, a sage-like odor is emitted.

This species is native to Mediterranean North Africa. In Nevada it invades rangelands and pastures, but spread to undisturbed areas has been limited.

Mediterranean sage reproduces by seed. Each plant can produce 50 to 100,000 seeds. Each flower produces four smooth, egg-shaped seeds. Seeds mature by late August, but they are not usually dispersed until September or October, when consistent moisture is available for germination. Mediterranean sage acts like a tumbleweed to disperse the seeds. The flowering stem has an abscission line 4-6 inches above the ground. The stem becomes brittle and light, and breaks off at this line. These stalks roll with the wind, often ending up in fence lines, or creek bottoms. When seeds get wet and imbibe water, they produce a mucilaginous cover within 5 minutes to protect them from desiccation (WSNWCB 1999).

#### **Mediterranean grass**

Schismus arabicus Nees, S. barbatus (L.) Thell.

Mediterranean grass is an annual short grass, native to southern Europe, northern Africa and the Near East (Jackson 1985). It was in Arizona before the 1900's, and is now particularly abundant where grazing, off-road vehicle use, or construction of linear corridors has reduced vegetative cover. Mediterranean grass out-competes the native annual grass, six-weeks fescue, and tends to replace it through time (Brooks undated).

*Schismus* germinates in early winter, normally 2 weeks after receiving 0.4 inches of precipitation. It typically matures in March, but can produce seed in as little as two weeks. *Schismus* can also germinate after summer rains and can survive for up to four months with no additional rains (Gutterman & Evenari 1994).

It generally occupies the space between shrubs in desert communities, and its extensive shallow root system monopolizes precipitation to the exclusion of native annual grasses. Dead stems of *Schismus* remain standing for long after the plant dies, serving to carry fire across inter-shrub spaces in normally sparse deserts of Arizona and California.

#### Wild mustard

#### Sinapis arvensis L.

Wild mustard is a winter annual forb, with bright yellow, four-petalled flowers in small clusters sitting on thick stalks. The stems are branched near the top and have upper leaves that are toothed and lower leaves with deep lobes, both hairy underneath. Mature plants are 0.3 - 1 m tall. Wild mustard is spread by seed. Each plant produces 2,000 - 3,500 seeds that may remain viable in the soil for several years. It is commonly a crop weed. It reduces crop yields, lowers crop value, and can reduce livestock forage production on pastures. Wild mustard is native to Eurasia.

There are a few small infestations of this mustard growing along Highway 188, from Punkin Center to Roosevelt, on private lands. It is very common on the Agua Fria National Monument, west of Cave Creek Ranger District's Perry Mesa tobosa grassland. The combination of drought, fires, and grazing may have allowed the infestation on the Monument to increase in recent years (Fenner 2005b).

#### Salt cedar

Tamarix parviflora DC., Tamarix chinensis Lour., T. ramosissima Ledeb.

"There is probably not another genus of plants as well known as the tamarisks in which the species are so poorly understood or separated on more obscure characters" (McClintock 1951). Each species has a distinct distribution in Eurasia, but they may have hybridized in the southwestern United States (Smith et al 1997). Most salt cedars, or tamarisks, are deciduous shrubs or small trees growing to 12 -15 feet in height and forming dense thickets. Salt cedars are characterized by slender branches and gray-green foliage. The bark of young branches is smooth and reddish-brown. As the plants age, the bark becomes brownish-purple, ridged and furrowed. Leaves are scale-like, about 1/16 inch long and overlap each other along the stem. They are often

encrusted with salt secretions. From March to September, large numbers of pink to white flowers appear in dense masses on 2-inch long spikes at branch tips. Salt cedar spreads vegetatively, by adventitious roots or submerged stems, and sexually. Each flower can produce thousands of tiny (1/25-inch diameter) seeds that are contained in a small capsule usually capped with a tuft of hair that aids in wind dispersal. Seeds can also be dispersed by water. Seedlings require extended periods of soil saturation for establishment. The fragile seeds remain viable for at most 45 days under ideal conditions. (Stevens 1990).

Salt cedar is found in many riparian areas throughout the West. It was introduced in the early 1800's as an ornamental and for erosion control.

Salt cedars are fire-adapted species and have long tap roots that allow them to intercept deep water tables and interfere with natural aquatic systems. They can also increase the risk of fire in riparian ecosystems through deposition of flammable fuels (Brooks & Minnich in press).

Salt cedar disrupts the structure and stability of native plant communities and degrades native wildlife habitat by out-competing and replacing native plant species, monopolizing limited moisture, and increasing the frequency, intensity and effect of fires. The foliage of tamarisk can add salt deposits to the soil, inhibiting growth of other species (Egan et al. 1993, Brotherson & Field 1987). Although it provides some shelter, the foliage and flowers of salt cedar provide little food value for native wildlife species that depend on nutrient-rich native plant resources (Muzika & Swearingen 2005b, Brooks & Minnich, In press).

Salt cedar is able to use salty water. It does this by absorbing the salts through cell membranes. It avoids the toxic effects by using special glands to excrete the salts and by dropping salt-filled leaves. The leaves dropped each fall accumulate to a considerable depth under the canopy. Through this process, salt cedar acts as a salt pump concentrating salts from deep in the ground onto the soil surface. Over time, salts in the mulch layer kill existing plants and prevent others, especially desirable riparian species, from becoming established. As a result, the ground under a salt cedar or within a salt cedar thicket is void of plants except, on occasion, another salt tolerant species (Johnson et al 2002).

The federally endangered southwestern willow flycatcher (*Empidonax traillii extimus*) is known to nest in salt cedar thickets. There has been concern that control of salt cedar would present a threat to recovery of this subspecies of flycatcher. In fact, this endangered flycatcher prefers to feed and breed in riparian woodlands dominated by native plants such as willow, baccharis, and arrowweed. Where salt cedar is removed by control treatments, recovery by these native plants would be expected to fill this void (Lovich and de Gouvenain 1998). In addition, flycatcher nests would be subject to much greater risk of fire in salt cedar dominated riparian areas than in riparian areas dominated by native vegetation.

On the Tonto, salt cedar grows sparsely in many small drainages and along the Verde River and its tributaries. It grows densely along much of the Salt River both above and below the chain of lakes. Salt and Verde River reservoirs have created habitat for salt cedar at inflows into the reservoirs, where there are deep silt deposits and water levels fluctuate too much for native riparian trees such as cottonwood and willow to survive (Fenner 2005b).

#### Siberian elm

Ulmus pumila L.

Siberian elm is a fast-growing tree in the elm family (Ulmaceae) distinguished by small toothed leaves about 1-2½ in long and half as wide, and pointed at the tip. Mature trees reach a height of 50-70 feet, with a round crown of slender, spreading branches. The bark is rough, gray or brown, and shallowly furrowed at maturity. Flowering occurs in the springtime, either before or with bud break for leaves. After flowering, a single seed forms in the center of each smooth, flattened, circular, ½ inch wide fruit. The seeds are easily windborne to distant areas and germination rate is high (Wieseler 2005)

Preferred habitat is dry to mesic open areas and streambanks at high elevations. Once a tree has become established, thickets of seedlings form underneath it and in disturbed sites in the vicinity. Fast growing seedlings easily overtake native vegetation, especially shade-intolerant species. This often leads to invasion by additional weedy species. (Wieseler 2005).

This tree was introduced to the U.S. in the 1860's for its cold and drought-hardiness (Wieseler 2005). It is fairly common in northern Arizona, often planted as a shade tree. There are currently isolated infestations on the Coconino National Forest east of Flagstaff, and in the Verde River/Lynx Lake/Thumb Butte areas of the Prescott National Forest (USDA FS Feb. 2004). There are no documented populations of this plant on the Tonto National Forest.

#### Periwinkle

Vinca major L.

*Vinca* is a spreading perennial vine, introduced from southern Europe and northern Africa as an ornamental groundcover and medicinal herb. It spreads vegetatively and is not known to reproduce sexually (Bean & Russo 1986). Plants spread by sprawling stems that root at the nodes. It grows best in moist shady environments.

In the U.S., Vinca's range extends from California throughout the southern states.

Water can spread broken stem fragments along riparian areas, where it can easily sprout and spread rapidly. Once established, it forms a dense groundcover that prevents growth and establishment of other plant species (Drewitz 2005). In Ramsey Canyon in southern Arizona, *Vinca* has suppressed natural erosional processes in the creek, promoting deepening and scouring of the creek bed and altering local hydrology and vegetation (McKnight 1993).

*Vinca* naturalizes from gardens on private lands within or adjacent to the National Forest. Grantham homestead on Highway 288 is one example.

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# **APPENDIX E**

Arizona Hedgehog Cactus Salvage Protocol Waldron and Durham (2016) as revised (USFS 2020)

# ARIZONA HEDGEHOG CACTUS (*ECHINOCEREUS ARIZONICUS* VAR. *ARIZONICUS*) SALVAGE AND MONITORING PROCEDURES

## 1. Source area:

Each plant will be photographed before any excavation occurs. There will be two photos: (1) directly overhead; and (2) one from a specified cardinal direction (directly north of the plant seems to offer the fewest shadows across the area) and with as high a resolution as possible (20 megapixels or higher). Place an identification card (size  $8 \times 13$  cm) and a color scale bar in the frame of each Arizona hedgehog cactus (AHC) photo. The width of the picture needs to be large enough to capture the entire plant and its immediate surroundings. The goal of the picture is to establish (before transplanting) the viability (overall health) of the plant and general conditions surrounding the hedgehog cactus, such as the size and properties of any rock formations, sun exposure (amount of shade), and sun orientation.

The distance of the nearest plant neighbor(s) will be recorded and the amount of area covering or shading the plant will be visually estimated and recorded to allow for biologists to select the transplant area to as closely mimic the micro-habitat of the source area as is practical. The GPS location of each plant in Universal Transverse Mercators (UTMs) (NAD 83), date, time, and AHC identification number will also be recorded (GPS model will be recorded as well). In addition, the general aspect and any site-specific observations (e.g., damage, general plant condition, herbivory, etc.) and number of stems will be recorded.

#### 2. Transplant area:

Establish the designated planting location prior to plant removal from the source area. The area where the transplanted AHC will be located should mimic the original site characteristics to the extent practicable (e.g., aspect, sun exposure, geology, nearest neighbors). The transplant area shall be photographed in the same manner as the source area, again before any excavation. The GPS location in UTMs, date, time, and AHC plant identification (ID) will be recorded as above. The aspect and site-specific observations (e.g., evidence of disturbance, etc.) will be recorded and will mimic the original site characteristics as closely as possible.

#### 3. Transplant Procedures:

- Clearly mark, using "white out," the solar orientation for each stem of each plant in case the individual stems separate or need to be divided during transport.
- The excavated AHC will be photographed in front of a ruled photo board (centimeters or inches) to document the intactness of the root system (any apparent damage), the size of the plant and root system, and the amount of soil (or lack thereof) remaining after removal and before transplantation.
- Multiple stem plants may need to be secured using a mesh material such as nylon "drywall" tape, shade cloth, or other comparable material to minimize the potential for separation of the stems during transport.
- Remove each plant using care to minimize damage to the plant stems and roots using hand tools; it may be necessary to pry apart rock to excavate the plant starting from well away from the plant and working back toward the plant stem(s).
- If plant stems are inadvertently damaged, it may be necessary to remove them from the larger cluster by cutting and planting (using a rooting hormone) the individual stems adjacent to the "parent" plant; these stems will be identified in the pictures and data recorded to monitor their survivability as a subset to the main plant study.

- Replant each cactus (or stem) at the designated replanting area as soon as possible after it is removed from the original site. Each cactus (or stem) will be re-planted with a solar orientation that matches original solar orientation. Each plant will be planted as closely as possible to its original depth, which can be determined by the change of color of the epidermis (green to brown). Do not harden off the roots or add any fungicides, sulfur, or other soil additives to the plant or planting site. If cut stems are to be replanted, a root growth stimulator may be used.
- If needed, a small mound of rock and soil can be built up to provide a support structure for the cactus plant and root system to assist in recreating source conditions.
- Remove any materials applied to plant to keep its cohesiveness.
- Install a marker using rebar or similar metal stake and/or metal tag with plant ID, and record the location using GPS.
- Photograph the plant upon completion of the transplant process the same as at the source area and during monitoring.
- A short report will be prepared after the transplanting process to document the locations and condition of the transplanted cacti and the control cacti; the report will include introduction, methods, and results sections and include pictures of the cacti at the source area, the excavated cactus, and the transplanted cactus. In addition, pictures of the control cacti and a listing of the plants (including their GPS locations) will be provided.

# 5. Monitoring:

Initial monitoring would be conducted in in years 1, 2, 5, and 10 after construction is completed. Each of the re-transplants would be visited by a qualified biologist, photographed (as described in the source area section above), and evaluated for general health. Plants in the study area that were not moved would serve as a control group and could be used for comparison with transplanted individuals should any future health issues arise.

An annual report would be prepared that would document the results of each year of monitoring efforts. The report would be submitted to the Tonto National Forest and the U.S. Fish and Wildlife Service. The contents of the report would include side-by-side photographs of each plant monitoring event and a listing and discussion of the qualitative health evaluation of each of the plants, both the transplanted cacti and the control (non-transplanted) cacti.

# APPENDIX F

Arizona's Online Environmental Review Tool Results

# **Arizona Environmental Online Review Tool Report**



Arizona Game and Fish Department Mission To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.

#### **Project Name:**

Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona

#### **User Project Number:**

030951.05

#### **Project Description:**

SWCA is assisting the Tonto National Forest to prepare a Biological Assessment for the Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona. The BA will address the proposed copper mining and associated activities, including Clean Water Act permitting and compensatory mitigation.

#### **Project Type:**

Mining, Extraction Other minerals (copper, limestone, cinders, shale, salt), Other minerals (copper, limestone, cinders, shale, salt)

#### **Contact Person:**

**Eleanor Gladding** 

#### Organization:

SWCA Environmental Consultants

# On Behalf Of:

FS

Project ID: HGIS-10652 Please review the entire report for project type and/or species recommendations for the location information entered. Please retain a copy for future reference.

#### Disclaimer:

- 1. This Environmental Review is based on the project study area that was entered. The report must be updated if the project study area, location, or the type of project changes.
- 2. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area. This review is also not intended to replace environmental consultation (including federal consultation under the Endangered Species Act), land use permitting, or the Departments review of site-specific projects.
- 3. The Departments Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. HDMS data contains information about species occurrences that have actually been reported to the Department. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
- 4. HabiMap Arizona data, specifically Species of Greatest Conservation Need (SGCN) under our State Wildlife Action Plan (SWAP) and Species of Economic and Recreational Importance (SERI), represent potential species distribution models for the State of Arizona which are subject to ongoing change, modification and refinement. The status of a wildlife resource can change quickly, and the availability of new data will necessitate a refined assessment.

#### Locations Accuracy Disclaimer:

Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Report is solely responsible for the project location and thus the correctness of the Project Review Report content.

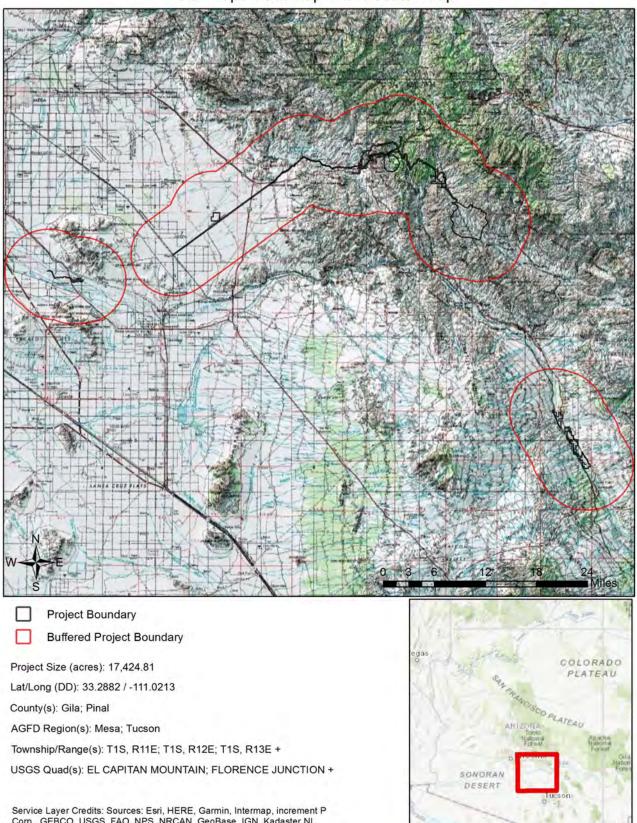
#### Recommendations Disclaimer:

- 1. The Department is interested in the conservation of all fish and wildlife resources, including those species listed in this report and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
- 2. Recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation).
- 3. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project. These recommendations are preliminary in scope, designed to provide early considerations on all species of wildlife.
- 4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
- 5. Further coordination with the Department requires the submittal of this Environmental Review Report with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map). Once AGFD had received the information, please allow 30 days for completion of project reviews. Send requests to:

Project Evaluation Program, Habitat Branch Arizona Game and Fish Department 5000 West Carefree Highway Phoenix, Arizona 85086-5000 Phone Number: (623) 236-7600 Fax Number: (623) 236-7366 Or

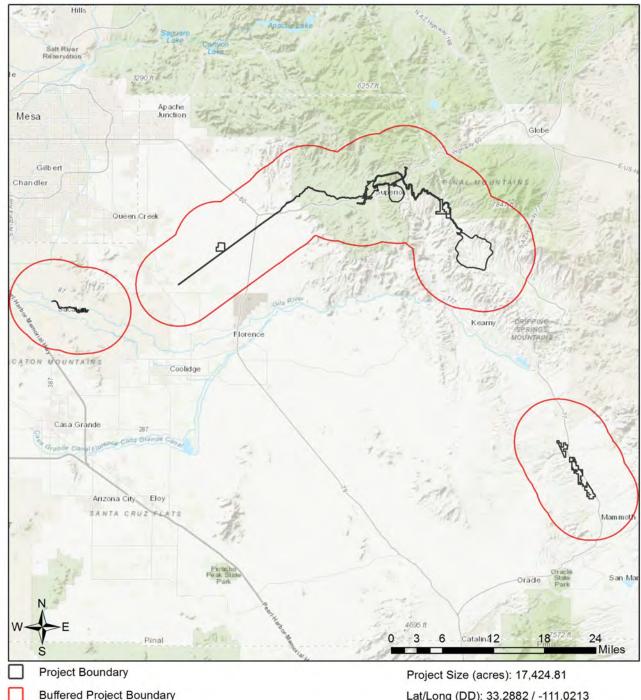
#### PEP@azgfd.gov

 Coordination may also be necessary under the National Environmental Policy Act (NEPA) and/or Endangered Species Act (ESA). Site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona USA Topo Basemap With Locator Map



Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap

## Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona Web Map As Submitted By User



Lat/Long (DD): 33.2882 / -111.0213

County(s): Gila; Pinal

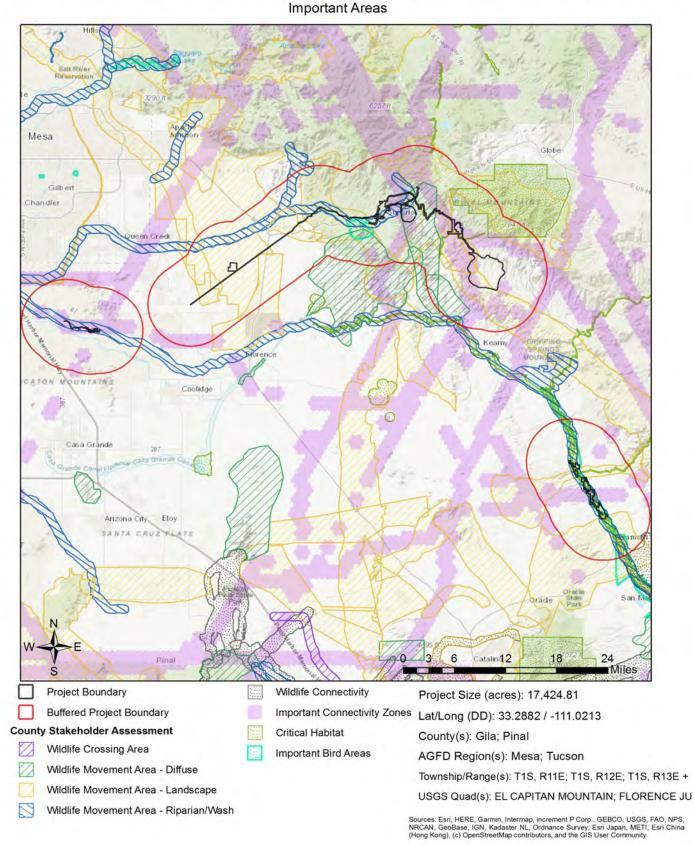
AGFD Region(s): Mesa; Tucson

Township/Range(s): T1S, R11E; T1S, R12E; T1S, R13E +

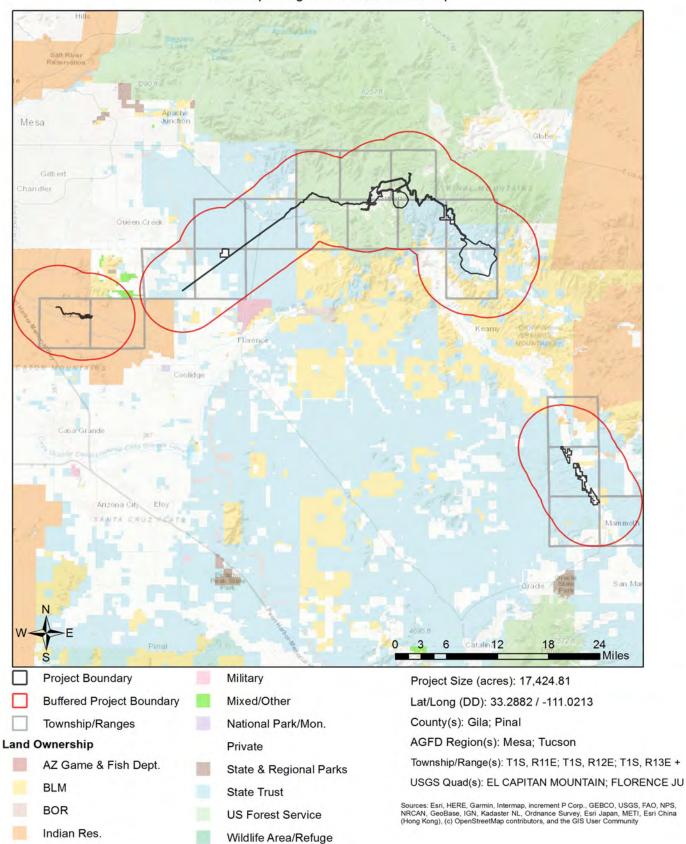
USGS Quad(s): EL CAPITAN MOUNTAIN; FLORENCE JU

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona



Proposed Resolution Copper Project near Superior in Pinal and Gila Counties, Arizona Township/Ranges and Land Ownership



Special Statu	s Species Documented within 5 Mile	s of Pro	ject Vici	inity		
Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Abutilon parishii	Pima Indian Mallow	SC	S	S	SR	
Agosia chrysogaster chrysogaster	Gila Longfin Dace	SC		S		1B
Antrostomus ridgwayi	Buff-collared Nightjar		S			1B
Aquila chrysaetos	Golden Eagle	BGA		S		1B
Bat Colony						
Buteo plagiatus	Gray Hawk	SC				
Camptostoma imberbe	Northern Beardless-Tyrannulet		S			
Catostomus clarkii	Desert Sucker	SC	S	S		1B
Catostomus insignis	Sonora Sucker	SC	S	S		1B
Chionactis occipitalis klauberi	Tucson Shovel-nosed Snake	SC				1A
Coccyzus americanus	Yellow-billed Cuckoo (Western DPS)	LT	S			1A
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	S		1B
Danaus plexippus	Monarch			S		
Echinocereus santaritensis	Santa Rita Hedgehog Cactus				SR	
Echinocereus triglochidiatus var. arizonicus	Arizona Hedgehog Cactus	LE			HS	
Empidonax traillii extimus	Southwestern Willow Flycatcher	LE				1A
Eriogonum capillare	San Carlos Wild-buckwheat	SC			SR	
Eumops perotis californicus	Greater Western Bonneted Bat	SC		S		1B
Falco peregrinus anatum	American Peregrine Falcon	SC	S	S		1A
Gila intermedia	Gila Chub	LE				1A
Gila robusta	Roundtail Chub	SC	S	S		1A
Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl	SC	S	S		1B
Gopherus morafkai	Sonoran Desert Tortoise	CCA	S	S		1A
Haliaeetus leucocephalus pop. 3	Bald Eagle - Sonoran Desert Population	SC, BGA	S	S		1A
Heloderma suspectum cinctum	Banded Gila Monster	SC				1A
Heloderma suspectum suspectum	Reticulate Gila Monster					1A
Heloderma suspectum	Gila Monster					1A
Ictinia mississippiensis	Mississippi Kite					1B
Kinosternon sonoriense sonoriense	Desert Mud Turtle			S		1B
Lasiurus blossevillii	Western Red Bat		S			1B
Lasiurus xanthinus	Western Yellow Bat		S			1B
Leopardus pardalis	Ocelot	LE				1A
Lepus alleni	Antelope Jackrabbit					1B
Lithobates yavapaiensis	Lowland Leopard Frog	SC	S	S		1A
Mabrya acerifolia	Mapleleaf False Snapdragon		S			
Macrotus californicus	California Leaf-nosed Bat	SC		S		1B
Meda fulgida	Spikedace	LE				1A
Myotis ciliolabrum	Western Small-footed Myotis	SC				

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Special Status Species Documented within 5 Miles of Project Vicinity							
Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN	
Myotis thysanodes	Fringed Myotis	SC					
Myotis velifer	Cave Myotis	SC		S		1B	
Myotis yumanensis	Yuma Myotis	SC				1B	
Nyctinomops femorosaccus	Pocketed Free-tailed Bat					1B	
Phyllorhynchus browni	Saddled Leaf-nosed Snake					1B	
Poeciliopsis occidentalis occidentalis	Gila Topminnow	LE				1A	
Strix occidentalis lucida	Mexican Spotted Owl	LT				1A	
Tadarida brasiliensis	Brazilian Free-tailed Bat					1B	
Terrapene ornata luteola	Desert Box Turtle			S		1A	
Tiaroga cobitis	Loach Minnow	LE				1A	
Tyrannus crassirostris	Thick-billed Kingbird		S			1B	
Xantusia bezyi	Bezy's Night Lizard		S			1B	

Note: Status code definitions can be found at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/

Special Areas Documented within the Project Vicinity							
Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN	
Boyce Thompson Arboretum and Arnett-Queen Creeks IBA	Important Bird Area						
CAP Canal	Maricopa County Wildlife Movement Area - Landscape						
CH for Empidonax traillii extimus	Southwestern Willow Flycatcher Designated Critical Habitat						
CH for Gila intermedia	Gila Chub Designated Critical Habitat						
CH for Meda fulgida	Spikedace Designated Critical Habitat						
CH for Tiaroga cobitis	Loach Minnow Designated Critical Habitat						
Canyon Passes between Superior and Globe	Pinal County Wildlife Movement Area - Landscape						
Devil's Canyon	Pinal County Wildlife Movement Area - Diffuse						
El Capitan - Aravaipa Canyon	Pinal County Wildlife Movement Area - Landscape						
Florence Military Reservation	Pinal County Wildlife Movement Area - Landscape						
Galiuro Mountains - Santa Catalina Mountains	Pinal County Wildlife Movement Area - Landscape						
Galiuro Mountains - Tortilla Mountains	Pinal County Wildlife Movement Area - Landscape						
Gila River - San Pedro River	Pinal County Wildlife Movement Area - Riparian/Wash						

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Special Areas Documented within the Project Vicinity							
Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN	
Gila River Indian Reservation	Gila River Indian Reservation						
Gila River	Pinal County Wildlife Movement Area - Riparian/Wash						
Important Connectivity Zone	Wildlife Connectivity						
Lower San Pedro River IBA	Important Bird Area						
PCH for Coccyzus americanus	Yellow-billed Cuckoo Proposed Critical Habitat						
PCH for Thamnophis eques megalops	Northern Mexican Gartersnake Proposed Critical Habitat						
Queen Creek - Gila River Indian Community	Maricopa County Wildlife Movement Area - Riparian/Wash						
Queen Creek - Gila River Indian Community	Pinal County Wildlife Movement Area - Riparian/Wash						
Queen Valley - Middle Gila/Mineral Mountains	Pinal County Wildlife Movement Area - Landscape						
Riparian Area	Riparian Area						
Tonto Forest West of Superior through Gonzales Pass	Pinal County Wildlife Movement Area - Landscape						
Valley north and east of the San Tan Mountains	Pinal County Wildlife Movement Area - Landscape						

Note: Status code definitions can be found at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/

#### Species of Greatest Conservation Need Predicted within the Project Vicinity based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Agosia chrysogaster	Longfin Dace	SC		S		1B
Aix sponsa	Wood Duck					1B
Ammodramus savannarum perpallidus	Western Grasshopper Sparrow					1B
Ammospermophilus harrisii	Harris' Antelope Squirrel					1B
Anthus spragueii	Sprague's Pipit	SC				1A
Aquila chrysaetos	Golden Eagle	BGA		S		1B
Aspidoscelis flagellicauda	Gila Spotted Whiptail					1B
Aspidoscelis stictogramma	Giant Spotted Whiptail	SC	S			1B
Aspidoscelis xanthonota	Red-backed Whiptail	SC	S			1B
Athene cunicularia hypugaea	Western Burrowing Owl	SC	S	S		1B
Baeolophus ridgwayi	Juniper Titmouse					1C
Botaurus lentiginosus	American Bittern					1B
Buteo regalis	Ferruginous Hawk	SC		S		1B
Buteo swainsoni	Swainson's Hawk					1C
Buteogallus anthracinus	Common Black Hawk					1C

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Callipepla squamata	Scaled Quail					1C
Calypte costae	Costa's Hummingbird					1C
Castor canadensis	American Beaver					1B
Catostomus clarkii	Desert Sucker	SC	S	S		1B
Catostomus insignis	Sonora Sucker	SC	S	S		1B
Chilomeniscus stramineus	Variable Sandsnake					1B
Chionactis occipitalis klauberi	Tucson Shovel-nosed Snake	SC				1A
Chordeiles minor	Common Nighthawk					1B
Cistothorus palustris	Marsh Wren					1C
Coccothraustes vespertinus	Evening Grosbeak					1B
Coccyzus americanus	Yellow-billed Cuckoo (Western DPS)	LT	S			1A
Colaptes chrysoides	Gilded Flicker			S		1B
Coluber bilineatus	Sonoran Whipsnake					1B
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	S		1B
Crotalus cerberus	Arizona Black Rattlesnake					1B
Crotalus tigris	Tiger Rattlesnake					1B
Cynanthus latirostris	Broad-billed Hummingbird		s			1B
Cynomys Iudovicianus	Black-tailed Prairie Dog	CCA		S		1A
Cyprinodon macularius	Desert Pupfish	LE				1A
Dipodomys spectabilis	Banner-tailed Kangaroo Rat			S		1B
Empidonax traillii extimus	Southwestern Willow Flycatcher	LE				1A
Empidonax wrightii	Gray Flycatcher					1C
Euderma maculatum	Spotted Bat	SC	s	S		1B
Eugenes fulgens	Rivoli's Hummingbird					1B
Eumops perotis californicus	Greater Western Bonneted Bat	SC		S		1B
Falco peregrinus anatum	American Peregrine Falcon	SC	S	S		1A
Gila intermedia	Gila Chub	LE				1A
Gila robusta	Roundtail Chub	SC	S	S		1A
Gopherus morafkai	Sonoran Desert Tortoise	CCA	S	S		1A
Haliaeetus leucocephalus	Bald Eagle	SC, BGA	S	S		1A
Heloderma suspectum	Gila Monster					1A
Ictinia mississippiensis	Mississippi Kite					1B
Incilius alvarius	Sonoran Desert Toad					1B
Kinosternon sonoriense sonoriense	Desert Mud Turtle			S		1B
Lasiurus blossevillii	Western Red Bat		S			1B
Lasiurus xanthinus	Western Yellow Bat		S			1B
Leopardus pardalis	Ocelot	LE				1A
Leptonycteris yerbabuenae	Lesser Long-nosed Bat	SC				1A
Lepus alleni	Antelope Jackrabbit					1B

Lithobates yavapaiensis         Lowland Leopard Frog         SC         S         S         1A           Macrotus californicus         California Leaf-nosed Bat         SC         S         1B           Meda tulgida         Spikedace         LE         1A           Melospiza lincolnii         Lincoln's Sparrow         1B           Melospiza lincolnii         Abert's Towhee         S         1B           Micrathene whitneyi         Elf Owl         1C         1C           Micrathene whitneyi         Elf Owl         1C         1C           Micrathene whitneyi         Elf Owl         1C         1C           Myarchus tuberculifer         Dusky-capped Flycatcher         1C           Myarchus tuberculifer         Sonoran Coralsnake         1B           Myotis socultus         Arizona Myotis         SC         S         1B           Myotis cocultus         Arizona Myotis         SC         S         1B           Myotis ourifier         Case Myotis         SC         S         1B           Myotis ourignianus         White-tailed Deer         1B         1C         1B           Odocolieus virginianus         Saga Thrasher         1C         1C         1A           Oreoscopte	-	ion Need Predicted within the Project	-				-
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Meda fulgidaSpikedaceLE1AMelanerpes uropygialisGila Woodpecker18Melosza lincolniiLincoln's Sparrow18Melozone abertiAbert's TowheeSMicrathene whitneyiElf Owl10Micrathene whitneyiElf Owl10Micrathene whitneyiElf Owl10Micrathene whitneyiBrown-crested Flycatcher18Myiarchus tubercuifferDusky-capped FlycatcherS18Myoids coultusArizona MyotisSCS18Myotis veliferCave MyotisSCS18Myotis veliferCave MyotisSCS18Myotis veliferCave MyotisSCS18Myotis veliferCave MyotisSCS18Oreoscoptes montanusSage Thrasher1010Oreoscoptes montanusSage Thrasher1010Oreothlypis luciaeLucy's Warbler1818Penynosoma godeiGode's Horned Lizard1818Phylorhynchus browniSaddled Leaf-nosed Snake1818Phylorhynchus browniSaddled Leaf-nosed Snake1818Porgen subis hesperiaDesert Purple MartinS18Rallus obsoletus yumanensisYuma Ridgway's RailLE14Rallus obsoletus yumanensisYuma Ridgway's RailLE14Rallus obsoletus yumanensisYuma Ridgway's RailLE14Sphyrapicus nuchalisReci-naped Sapsucker10 <td< td=""><td>Lithobates yavapaiensis</td><td></td><td></td><td>S</td><td></td><td></td><td></td></td<>	Lithobates yavapaiensis			S			
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Micruroides euryxanthusSonoran Coralsnake18Myiarchus tuberculiferDusky-capped Flycatcher18Myiarchus tyrannulusBrown-crested Flycatcher10Myiodynastes luteiventrisSulphur-bellied FlycatcherS18Myotis occultusArizona MyotisSCS18Myotis occultusArizona MyotisSCS18Myotis vuranensisYuma MyotisSCS18Nyctinomops femorosaccusPocketed Free-tailed Bat18Odecoileus virginianusWhite-tailed Deer18Oreothypis luciaeLucy's Warbler10Oreothypis luciaeLucy's Warbler16Ovis canadensis mexicanaMexican Desert Bighorn Sheep18Panthera oncaJaguarLE14Passerculus sandwichensisSavannah Sparrow18Phynosoma goodeiGoode's Horned Lizard18Phylorhynchus browniSadled Leaf-nosed Snake18Phylorhynchus browniSadled Leaf-nosed Snake18Phylorhynchus browniSadled Leaf-nosed Snake18Phylorhynchus proveniaSpekled DaceS3Stophaga petechiaYellow Warbler16Spitzella atrogularisBlack-chinned Sparrow16Spitzella atrogularisBlack-chinned Sparrow16Spitzella atrogularisBlack-chinned Sparrow16Spitzella atrogularisBlack-chinned Sparrow16Spitzella atrogularisBlack-chinned Sparrow16Spitzella atrogula	Melozone aberti	Abert's Towhee		S			1B
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And a	Oreoscoptes montanus	Sage Thrasher					1C
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Terrapene ornataOrnate Box Turtle1A	Sturnella magna	Eastern Meadowlark					1C
·	Tadarida brasiliensis	Brazilian Free-tailed Bat					1B
	Terrapene ornata	Ornate Box Turtle					1A
	Tiaroga cobitis	Loach Minnow	LE				1A

Species of Greatest Conservation Need Predicted within	the Project Vicinity based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Toxostoma lecontei	LeConte's Thrasher			S		1B
Troglodytes pacificus	Pacific Wren					1B
Tyrannus crassirostris	Thick-billed Kingbird		S			1B
Vireo bellii arizonae	Arizona Bell's Vireo					1B
Vireo vicinior	Gray Vireo		S			1C
Vulpes macrotis	Kit Fox	No Status				1B
Xantusia bezyi	Bezy's Night Lizard		S			1B

#### Species of Economic and Recreation Importance Predicted within the Project Vicinity

Common Name	FWS	USFS	BLM	NPL	SGCN
Gambel's Quail					
Mule Deer					
White-tailed Deer					1B
Band-tailed Pigeon					1C
Javelina					
Mountain Lion					
American Black Bear					
White-winged Dove					
Mourning Dove					
	Gambel's Quail Mule Deer White-tailed Deer Band-tailed Pigeon Javelina Mountain Lion American Black Bear White-winged Dove	Gambel's Quail Mule Deer White-tailed Deer Band-tailed Pigeon Javelina Mountain Lion American Black Bear White-winged Dove	Gambel's Quail Mule Deer White-tailed Deer Band-tailed Pigeon Javelina Mountain Lion American Black Bear White-winged Dove	Gambel's QuailMule DeerWhite-tailed DeerBand-tailed PigeonJavelinaMountain LionAmerican Black BearWhite-winged Dove	Gambel's QuailMule DeerWhite-tailed DeerBand-tailed PigeonJavelinaMountain LionAmerican Black BearWhite-winged Dove

# Project Type: Mining, Extraction Other minerals (copper, limestone, cinders, shale, salt), Other minerals (copper, limestone, cinders, shale, salt)

#### **Project Type Recommendations:**

Fence recommendations will be dependent upon the goals of the fence project and the wildlife species expected to be impacted by the project. General guidelines for ensuring wildlife-friendly fences include: barbless wire on the top and bottom with the maximum fence height 42", minimum height for bottom 16". Modifications to this design may be considered for fencing anticipated to be routinely encountered by elk, bighorn sheep or pronghorn (e.g., Pronghorn fencing would require 18" minimum height on the bottom). Please refer to the Department's Fencing Guidelines located on Wildlife Friendly Guidelines page, which is part of the WIldlife Planning button at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/.

During the planning stages of your project, please consider the local or regional needs of wildlife in regards to movement, connectivity, and access to habitat needs. Loss of this permeability prevents wildlife from accessing resources, finding mates, reduces gene flow, prevents wildlife from re-colonizing areas where local extirpations may have occurred, and ultimately prevents wildlife from contributing to ecosystem functions, such as pollination, seed dispersal, control of prey numbers, and resistance to invasive species. In many cases, streams and washes provide natural movement corridors for wildlife and should be maintained in their natural state. Uplands also support a large diversity of species, and should be contained within important wildlife movement corridors. In addition, maintaining biodiversity and ecosystem functions can be facilitated through improving designs of structures, fences, roadways, and culverts to promote passage for a variety of wildlife. Guidelines for many of these can be found

at: https://www.azgfd.com/wildlife/planning/wildlifeguidelines/.

Consider impacts of outdoor lighting on wildlife and develop measures or alternatives that can be taken to increase human safety while minimizing potential impacts to wildlife. Conduct wildlife surveys to determine species within project area, and evaluate proposed activities based on species biology and natural history to determine if artificial lighting may disrupt behavior patterns or habitat use. Use only the minimum amount of light needed for safety. Narrow spectrum bulbs should be used as often as possible to lower the range of species affected by lighting. All lighting should be shielded, canted, or cut to ensure that light reaches only areas needing illumination.

Minimize potential introduction or spread of exotic invasive species. Invasive species can be plants, animals (exotic snails), and other organisms (e.g., microbes), which may cause alteration to ecological functions or compete with or prey upon native species and can cause social impacts (e.g., livestock forage reduction, increase wildfire risk). The terms noxious weed or invasive plants are often used interchangeably. Precautions should be taken to wash all equipment utilized in the project activities before leaving the site. Arizona has noxious weed regulations (Arizona Revised Statutes, Rules R3-4-244 and R3-4-245). See Arizona Department of Agriculture website for restricted plants, <a href="https://agriculture.az.gov/">https://agriculture.az.gov/</a>. Additionally, the U.S. Department of Agriculture has information regarding pest and invasive plant control methods including: pesticide, herbicide, biological control agents, and mechanical control, <a href="https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/quality/?cid=stelprdb1044769">https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/quality/?cid=stelprdb1044769</a> The Department regulates the importation, purchasing, and transportation of wildlife and fish (Restricted Live Wildlife), please refer to the hunting regulations for further information <a href="https://www.azgfd.com/hunting/regulations">https://www.azgfd.com/hunting/regulations</a>.

Minimization and mitigation of impacts to wildlife and fish species due to changes in water quality, quantity, chemistry, temperature, and alteration to flow regimes (timing, magnitude, duration, and frequency of floods) should be evaluated. Minimize impacts to springs, in-stream flow, and consider irrigation improvements to decrease water use. If dredging is a project component, consider timing of the project in order to minimize impacts to spawning fish and other aquatic species (include spawning seasons), and to reduce spread of exotic invasive species. We recommend early direct coordination with Project Evaluation Program for projects that could impact water resources, wetlands, streams, springs, and/or riparian habitats.

The Department recommends that wildlife surveys are conducted to determine if noise-sensitive species occur within the project area. Avoidance or minimization measures could include conducting project activities outside of breeding seasons.

Based on the project type entered, coordination with the Office of Surface Mining may be required (<u>http://www.osmre.gov/index.shtm</u>).

Based on the project type entered, coordination with the Environmental Protection Agency may be required (<u>http://www.epa.gov/</u>).

Based on the project type entered, coordination with State Historic Preservation Office may be required (<u>http://azstateparks.com/SHPO/index.html</u>).

Pre- and post-survey/monitoring should be conducted to determine alternative access/exits to mines and to identify and/or minimize potential impacts to bat species. For further information when developing alternatives to mine closures, contact the Arizona Game and Fish Department Nongame Bat Coordinator at the Main Office in Terrestrial Branch, <a href="https://www.azgfd.com/agency/offices">https://www.azgfd.com/agency/offices</a> or (602) 942-3000.

Based on the project type entered, coordination with Arizona Department of Environmental Quality may be required (<u>http://www.azdeq.gov/</u>).

Based on the project type entered, coordination with Arizona Department of Water Resources may be required (<u>https://new.azwater.gov/</u>).

Vegetation restoration projects (including treatments of invasive or exotic species) should have a completed siteevaluation plan (identifying environmental conditions necessary to re-establish native vegetation), a revegetation plan (species, density, method of establishment), a short and long-term monitoring plan, including adaptive management guidelines to address needs for replacement vegetation.

Avoid/minimize wildlife impacts related to contacting hazardous and other human-made substances in facility water collection/storage basins, evaporation or settling ponds and/or facility storage yards. Design slopes to discourage wading birds and use fencing, netting, hazing or other measures to exclude wildlife.

#### Project Location and/or Species Recommendations:

HDMS records indicate that one or more native plants listed on the **Arizona Native Plant Law and Antiquities Act** have been documented within the vicinity of your project area. Please contact: Arizona Department of Agriculture 1688 W Adams St. Phoenix, AZ 85007 Phone: 602.542.4373 https://agriculture.az.gov/sites/default/files/Native%20Plant%20Rules%20-%20AZ%20Dept%20of%20Ag.pdf starts on page 44

HDMS records indicate that one or more **Listed**, **Proposed**, **or Candidate** species or **Critical Habitat** (Designated or Proposed) have been documented in the vicinity of your project. The Endangered Species Act (ESA) gives the US Fish and Wildlife Service (USFWS) regulatory authority over all federally listed species. Please contact USFWS Ecological Services Offices at <u>http://www.fws.gov/southwest/es/arizona/</u> or:

#### **Phoenix Main Office**

9828 North 31st Avenue #C3 Phoenix, AZ 85051-2517 Phone: 602-242-0210 Fax: 602-242-2513 **Tucson Sub-Office** 201 N. Bonita Suite 141 Tucson, AZ 85745 Phone: 520-670-6144 Fax: 520-670-6155

### Flagstaff Sub-Office SW Forest Science Complex 2500 S. Pine Knoll Dr. Flagstaff, AZ 86001 Phone: 928-556-2157 Fax: 928-556-2121

HDMS records indicate that **Sonoran Desert Tortoise** have been documented within the vicinity of your project area. Please review the Tortoise Handling Guidelines found at: <u>https://www.azgfd.com/wildlife/nongamemanagement/tortoise/</u>

HDMS records indicate that **Peregrine Falcons** have been documented within the vicinity of your project area. Please review the Peregrine Falcon Management Guidelines at: <u>https://s3.amazonaws.com/azgfd-portal-wordpress/Portallmages/files/wildlife/planningFor/wildlifeFriendlyGuidelines/peregrineFalconConservGuidelines.pdf</u>.

The analysis has detected one or more **Important Bird Areas** within your project vicinity. Please see <u>http://aziba.org/?page\_id=38</u> for details about the Important Bird Area(s) identified in the report.

Tribal Lands are within the vicinity of your project area and may require further coordination. Please contact: **Gila River Indian Community** PO Box 97 Sacaton, AZ 85247 (520) 562-2234 (520) 562-2245 (fax) This review has identified **riparian areas** within the vicinity of your project. During the planning stage of your project, avoid, minimize, or mitigate any potential impacts to riparian areas identified in this report. Riparian areas play an important role in maintaining the functional integrity of the landscape, primarily by acting as natural drainages that convey water through an area, thereby reducing flood events. In addition, riparian areas provide important movement corridors and habitat for fish and wildlife. Riparian areas are channels that contain water year-round or at least part of the year. Riparian areas also include those channels which are dry most of the year, but may contain or convey water following rain events. All types of riparian areas offer vital habitats, resources, and movement corridors for wildlife. The Pinal County Comprehensive Plan (i.e. policies *6.1.2.1* and *7.1.2.4*), Open Space and Trails Master Plan, Drainage Ordinance, and Drainage Design Manual all identify riparian area considerations, guidance, and policies. Guidelines to avoid, minimize, or mitigate impacts to riparian habitat can be found

at <u>https://www.azgfd.com/wildlife/planning/wildlifeguidelines/</u>. Based on the project type entered, further consultation with the Arizona Game and Fish Department and Pinal County may be warranted.

Analysis indicates that your project is located in the vicinity of an identified <u>wildlife habitat connectivity feature</u>. The **County-level Stakeholder Assessments** contain five categories of data (Barrier/Development, Wildlife Crossing Area, Wildlife Movement Area- Diffuse, Wildlife movement Area- Landscape, Wildlife Movement Area- Riparian/Washes) that provide a context of select anthropogenic barriers, and potential connectivity. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer

to: https://www.azgfd.com/wildlife/planning/habitatconnectivity/identifying-corridors/.

Please contact the Project Evaluation Program (pep@azgfd.gov) for specific project recommendations.

Analysis indicates that your project is located in the vicinity of an identified *wildlife habitat connectivity feature*. The **Statewide Wildlife Connectivity Assessment's Important Connectivity Zones** (ICZs) represent general areas throughout the landscape which contribute the most to permeability of the whole landscape. ICZs may be used to help identify, in part, areas where more discrete corridor modeling ought to occur. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer

to: <u>https://s3.amazonaws.com/azgfd-portal-wordpress/azgfd.wp/wp-</u> <u>content/uploads/0001/01/23120719/ALIWCA\_Final\_Report\_Perkl\_2013\_lowres.pdf</u>. Please contact the Project Evaluation Program (<u>pep@azgfd.gov</u>) for specific project recommendations. This page intentionally left blank.

# **APPENDIX G**

AGFD Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects

### GUIDELINES FOR HANDLING SONORAN DESERT TORTOISES ENCOUNTERED ON DEVELOPMENT PROJECTS Arizona Game and Fish Department Revised September 22, 2014

The Arizona Game and Fish Department (Department) has developed the following guidelines to reduce potential impacts to desert tortoises, and to promote the continued existence of tortoises throughout the state. These guidelines apply to short-term and/or small-scale projects, depending on the number of affected tortoises and specific type of project.

The Sonoran desert tortoise occurs south and east of the Colorado River. Tortoises encountered in the open should be moved out of harm's way to adjacent appropriate habitat. If an occupied burrow is determined to be in jeopardy of destruction, the tortoise should be relocated to the nearest appropriate alternate burrow or other appropriate shelter, as determined by a qualified biologist. Tortoises should be moved less than 48 hours in advance of the habitat disturbance so they do not return to the area in the interim. Tortoises should be moved quickly, kept in an upright position parallel to the ground at all times, and placed in the shade. Separate disposable gloves should be worn for each tortoise handled to avoid potential transfer of disease between tortoises. Tortoises must not be moved if the ambient air temperature exceeds 40° Celsius (105° Fahrenheit) unless an alternate burrow is available or the tortoise is in imminent danger.

A tortoise may be moved up to one-half mile, but no further than necessary from its original location. If a release site or alternate burrow is unavailable within this distance, and ambient air temperature exceeds 40° Celsius (105° Fahrenheit), contact the Department for guidance. Tortoises salvaged from projects which result in substantial permanent habitat loss (e.g. housing and highway projects), or those requiring removal during long-term (longer than one week) construction projects, may be placed in the Department's tortoise adoption program. *Managers of projects likely to affect desert tortoises should obtain a scientific collecting license from the Department to facilitate handling or temporary possession of tortoises*. Likewise, if large numbers of tortoises (>5) are expected to be displaced by a project, the project manager should contact the Department for guidance and/or assistance.

Please keep in mind the following points:

- Use the Department's <u>Environmental On-Line Review Tool Department</u> during the planning stages of any project that may affect desert tortoise habitat.
- Unless specifically authorized by the Department, or as noted above, project personnel should avoid disturbing any tortoise.
- Take is prohibited by state law.
- These guidelines do not apply to Mojave desert tortoises (north and west of the Colorado River). Mojave desert tortoises are listed as threatened under the Endangered Species Act, administered by the U.S. Fish and Wildlife Service.
- These guidelines are subject to revision at the discretion of the Department.