Forest Service
U.S. DEPARTMENT OF AGRICULTURE

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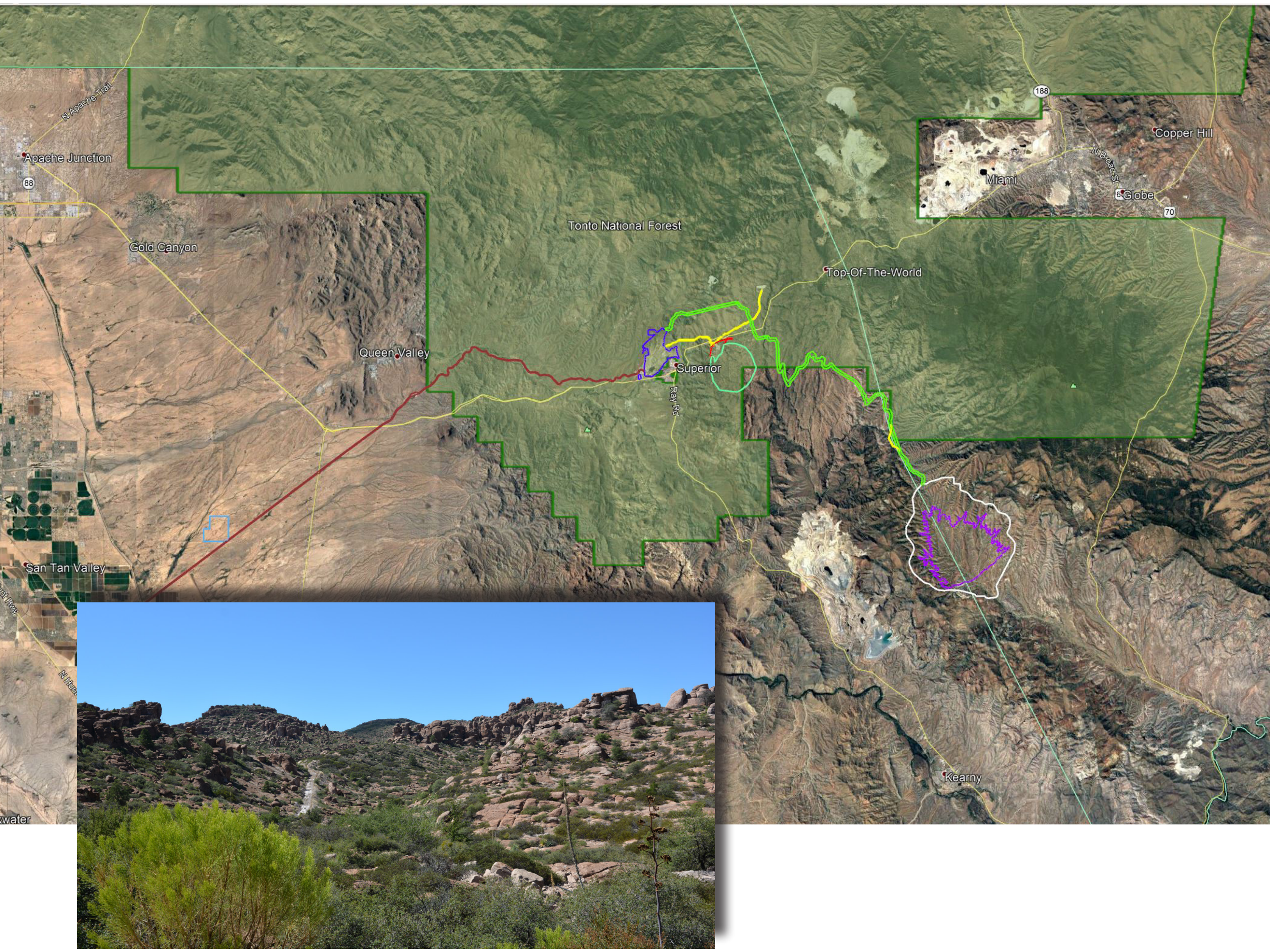
FINAL Environmental Impact Statement

Resolution Copper Project and Land Exchange

Coconino, Gila, Maricopa, Pinal, Santa Cruz, and Yavapai Counties, Arizona



Volume 3

Front Cover photo captions:

Top: Map of the Preferred Alternative Project location and the Tonto National Forest

Bottom Left: Oak Flat Federal Parcel

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3.13 Socioeconomics

3.13.1 Introduction

The analysis for social and economic concerns includes a discussion of current social and economic data relevant to the proposed project, including population, housing, financial resources, facilities and services, and quality of life. These elements are considered to help analyze potential impacts from the proposed project and alternatives to social and/or economic conditions. Further detail regarding the social and economic information is provided in "Socioeconomic Effects Technical Report: Resolution Copper Mine Environmental Impact Statement" (BBC Research and Consulting 2020). Potential socioeconomic impacts analyzed in this section include employment, earnings, state and local government revenue, demands for public services, risk of a mining boom/bust cycle, tourism, social impacts, and property values.

Overview

Large mines can be a boon to local economies through the influx of employees, spending on products and services, and increased tax revenue. These same increases can also stress basic services like hospitals, water and sewer systems, local housing stock, and roads and infrastructure. A large mine (or tailings facility) can also fundamentally change the quality of life of the surrounding communities, affect property values, and affect other industries, such as tourism and recreation. Historically, mining in Arizona has followed a "boom and bust" cycle, which potentially leads to great economic uncertainty.

3.13.1.1 Changes from the DEIS

The analysis of social and economic effects has been updated and revised in response to recent information and comments concerning the DEIS. The analysis incorporates the most recent projections of future labor and non-labor requirements from Resolution Copper and updates to local tax rates and other local information. The analysis presents a revised discussion regarding fiscal effects on the Town of Superior based on discussions between the Town and the Forest Service following the DEIS. This section, and the socioeconomic effects technical report, also present expanded analyses and discussions regarding potential "boom-bust cycle" effects and other potential social impacts on local communities, and effects on nature-based amenities and tourism-related economic activity. The expanded analysis also includes potential economic effects from water supply disruptions and projected economic impacts from changes in the availability of public grazing land.

3.13.1.2 Changes from the January 2021 Rescinded FEIS

For the socioeconomic section, the only changes since January 2021 are (1) revisions to the cumulative effects analysis based on updates to the list of potentially reasonably foreseeable actions and (2) an update to reflect the analysis of consistency with the new "Tonto National Forest Land Management Plan," implemented in December 2023.

3.13.2 Analysis Methodology, Assumptions, and Uncertain and Unknown Information

3.13.2.1 Analysis Area

The socioeconomic analysis focused primarily on the region informally known as the "Copper Triangle," which encompasses the location of the proposed mine, and most closely examined potential effects in the town of Superior, which is the closest community. Other communities within the Copper Triangle include the Queen Valley census designated place (CDP), Cutter CDP, city of Globe, town of Hayden, town of Kearny, town of Miami, San Carlos CDP, Bylas CDP, Peridot CDP, Top-of-the-World CDP, and town of

Winkelman. Whereas most of the Copper Triangle is located in Pinal and Gila Counties, Maricopa County was also included in the socioeconomic analysis because a substantial portion of the workforce for the proposed mine would be expected to commute from the Phoenix Metropolitan Area. Pima County is farther from the proposed mine and unlikely to be substantially affected by construction or operations but was included in the regional economic impact analysis (see section 3.13.4) based on information indicating that suppliers in Pima County would likely provide goods and services to support mining activity.

3.13.2.2 Analysis Methodology

Information regarding the social and economic affected environment was obtained from various sources, including the following: the U.S. Census Bureau; the State of Arizona; Impact Analysis for Planning (IMPLAN) data files;[125] Gila, Graham, Maricopa, Pima, and Pinal Counties; and the Town of Superior. Information on the potential social and economic effects of the proposed alternatives was based primarily on IMPLAN economic input-output analysis. This modeling incorporated the proposed GPO provided by Resolution Copper, current tax rates and tax policies of the relevant jurisdictions, interviews with local information sources, and information provided by the AGFD. The temporal bounds of analysis for socioeconomic resources is the three phases of activity associated with the mine: construction, operations, and closure/reclamation. The spatial analysis area for socioeconomics includes the communities most likely to be affected by the proposed project (figure 3.13.2-1).

Potential effects on local property values from proximity to the proposed tailings facility alternatives were evaluated based on previous published studies, including a quantitative analysis of impacts on property values in Green Valley, Arizona (near an existing mine). Estimated percentage changes in value were based on the proximity of residential properties to the proposed tailings locations using GIS analysis. These changes likely reflect a combination of factors including noise, dust, visual impacts, traffic, and other considerations. Possible effects from water supply disruption, including changes in quality and quantity of groundwater supplies, were evaluated qualitatively.

The potential risks to the proposed mine due to fluctuations in the price of copper, and the corresponding risk of temporary (or longer-term) closure due to market forces, were evaluated based on the mine's projected variable costs of production and anticipated productivity. Sensitivity analysis was conducted in regard to likely ranges of future prices and potential differences in future production relative to current expectations.

Where the mine's workforce would reside is an important element in the social and economic effects analysis. Projections were developed based on analyses of current commuting patterns in the area, the characteristics of the local labor force, the residence choices of current Resolution Copper employees, and the availability of housing in Superior and nearby areas.

The future price of copper over the projected life of the proposed mine is unknown, as well. Both of these issues are evaluated in detail in BBC Research and Consulting (2020), which also provides a more extensive description of the methods used in the social and economic effects analysis.

[125] IMPLAN is a widely used economic model and is used to quantify the direct and indirect economic effects of a project.

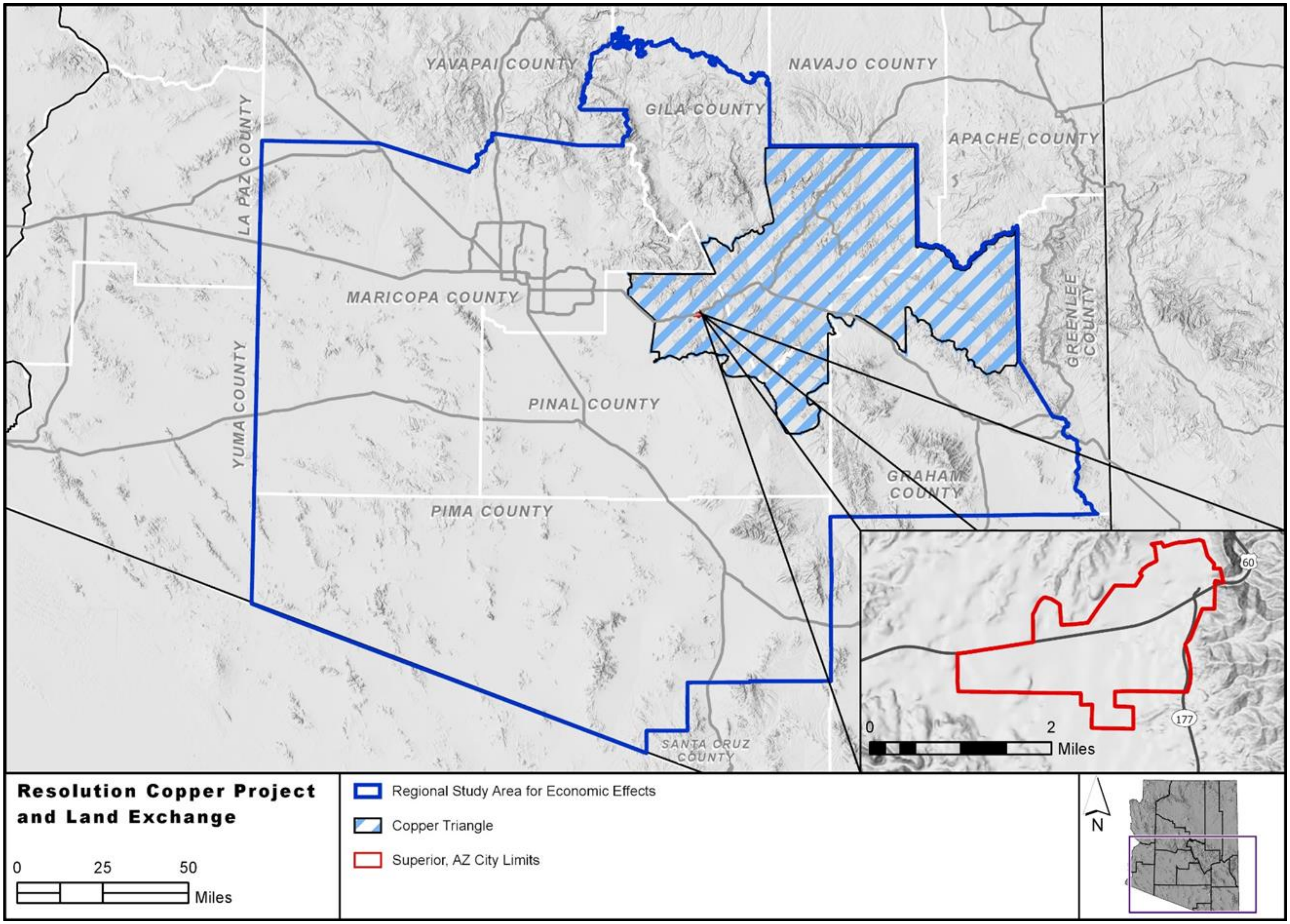

Figure 3.13.2-1. Socioeconomic resource analysis area

3.13.3 Affected Environment

One of the planning principles in the National Forest Management Act is “responsiveness to changing conditions in the land and changing social and economic demands of the American people” (U.S. Forest Service 1985b). Forest Service guidelines for socioeconomic analyses are outlined in the Forest Service “Economic and Social Analysis Handbook” (U.S. Forest Service 1985a). The handbook provides guidelines for evaluating socioeconomic impacts that may result from policy, program, plan, or project decisions on NFS lands. FSM 1970 directs how economic and social analyses should be conducted to aid Forest Service decision-making.

3.13.3.1 Relevant Laws, Regulations, Policies, and Plans

A complete listing and brief description of the legal authorities, reference documents, and agency guidance applicable to socioeconomics may be reviewed in Newell (2018f).

Primary Legal Authorities and Technical Guidance Relevant to the Socioeconomics Effects Analysis

- National Forest Management Act
- “Tonto National Forest Land and Resource Management Plan”
- Forest Service Economic and Social Analysis Handbook (FSH 1909.17)
- Chapter 1970, Social and Economic Evaluation (FSM 1970.1)

3.13.3.2 Existing Conditions and Ongoing Trends

Demographic and Socioeconomic Characteristics

Population. The population of the state of Arizona was approximately 7.3 million in 2019. In 2019, the counties closest to the proposed mine site (Pinal, Graham, and Gila Counties) had estimated populations of 462,789 (Pinal), 38,837 (Graham), and 54,018 (Gila). Between 2000 and 2019, Pinal County’s population grew at an average annual rate of 8.3 percent, compared with a rate of 0.3 percent in Gila County and 0.8 percent in Graham County. The population of Maricopa County, which lies approximately 60 miles west of the town of Superior, was 4.5 million in 2019 and grew at an average annual rate of 2.4 percent between 2000 and 2019.

The town of Superior had an estimated 3,178 residents in 2019, which represents an increase of 341 residents since 2010 (12.0 percent growth), but a decline of 76 residents since 2000 (2.3 percent reduction). In total, the Copper Triangle had approximately 50,000 residents in 2016.

Housing. The characteristics of the housing stock in the analysis area are shown in table 3.13.3-1. Maricopa County had the largest housing stock in the socioeconomic analysis area (an average of 1.7 million housing units between 2014 and 2018). Of the remaining counties, Pinal County had the second largest housing stock (171,368 housing units), followed by Gila County (33,411 housing units), and Graham County (13,416 housing units). The town of Superior had an average housing stock of 1,631 units between 2014 and 2018.

Between 2014 and 2018, there was an average of 198,390 vacant housing units in Maricopa County, compared with 34,082 in Pinal County, 11,703 in Gila County, and 2,634 in Graham County. The town of Superior had an average of 413 vacant housing units during this time. The vacancy rate in Superior (25.3 percent) was about 10 percentage points higher than the average vacancy rate across Arizona

(15.0 percent). Maricopa County had the highest median home values between 2014 and 2018 ($242,700), followed by Pinal County ($169,800) and Gila County ($157,600). Of the cities and towns in the socioeconomic analysis area, Globe had the highest median home values between 2014 and 2018 ($129,500), followed by Kearny ($91,400) and Superior ($79,400). Peridot had the lowest median home values between 2014 and 2018 ($22,800), followed by Bylas ($28,600).

Table 3.13.3-1. Housing characteristics of the socioeconomic analysis area, 2014–2018

Area	Average Housing Stock	Change in Housing Stock (%)*	Average Vacant Units	Average Vacancy Rate (%)
Gila County	33,411	18.5	11,703	35.0
Cutter	8	–	8	100.0
Globe	3,452	8.8	618	17.9
Hayden	325	-2.7	130	40.0
Miami	1,144	23.0	355	31.0
San Carlos	1,140	14.7	153	13.4
Graham County	13,416	17.4	2,634	19.6
Bylas	451	–	72	16.0
Peridot	361	4.3	64	17.7
Maricopa County	1,719,157	37.5	198,390	11.5
Pinal County	171,368	111.2	34,082	19.9
Kearny	957	9.6	207	21.6
Superior	1,631	11.0	413	25.3
Top-of-the-World	142	−22.8	0	0.0
Winkelman	127	−34.5	22	17.3
Arizona	*2,970,935*	*35.7*	*446,635*	*15.0*

Sources: U.S. Census Bureau (2000); U.S. Census Bureau American Community Survey 5-year estimates, 2014 to 2018 (U.S. Census Bureau 2015b)

* Percentage change was calculated with data from the 2000 U.S. Census and the American Community Survey 5-year estimates from 2014 to 2018. Information on the housing stocks of Cutter and Bylas was not available for the year 2000.

Employment. In 2018, there were approximately 2.7 million jobs in Maricopa County, compared with 99,749 jobs in Pinal County, 21,169 jobs in Gila County, and 12,526 jobs in Graham County. The retail trade sector was the largest single source of private employment in all four counties. While the mining industry is not among the largest employers in the socioeconomic analysis area, the industry still employed more than 10,000 people across all four counties in 2018. In percentage terms, Pinal County saw the largest change in total employment between 2001 and 2018 (approximately 83 percent), followed by Maricopa County (42 percent), Graham County (29 percent), and Gila County (6 percent).

Labor force, unemployment, and income characteristics. The labor force in each county, city, and town in the socioeconomic analysis area is shown for the period from 2014 to 2018 in table 3.13.3-2. Between 2014 and 2018, there was an average of approximately 2.1 million workers in Maricopa County, compared with 163,079 workers in Pinal County, 20,214 workers in Gila County, and 14,166 workers in Graham County. Between 2014 and 2018, the average unemployment rate was 10.2 percent in Gila County, 9.4 percent in Graham County, 5.5 percent in Maricopa County, and 7.8 percent in Pinal County. The average unemployment rate in the town of Superior was 9.3 percent during this time. Between 2014 and 2018, the median household income in Graham County was $51,352, compared with $61,606 in Maricopa County. During the same period, the median household income in Pinal County was $55,550.

In Gila County, the median household income was $42,092. The town of Superior had a median household income of approximately $30,395 between 2014 and 2018.

Table 3.13.3-2. Average labor force, unemployment rate, and median household income in the socioeconomic analysis area, 2014–2018

Area	Labor Force	Unemployment Rate (%)	Median Household Income
Gila County	20,214	10.2	$42,092
Cutter	0	–	–
Globe	3,509	10.3	$47,086
Hayden	176	14.8	$38,828
Miami	839	9.4	$26,639
San Carlos	1,337	33.4	$23,456
Graham County	14,166	9.4	$51,352
Bylas	612	38.7	$26,103
Peridot	566	39.9	$33,125
Maricopa County	2,121,295	5.5	$61,606
Pinal County	163,079	7.8	$55,550
Kearny	883	9.3	$54,875
Superior	1,220	9.3	$30,395
Top-of-the-World	188	31.4	$73,029
Winkelman	83	13.3	$38,661
Arizona	*3,256,192*	*6.5*	*$56,213*

Source: U.S. Census Bureau (2015a)

County taxes, revenues, and public expenditures. Table 3.13.3-3 shows the sources of revenue for Gila, Graham, Maricopa, and Pinal County governments for the most recent fiscal years for which data are available. Taxes, including property, income, sales, and vehicle license taxes, accounted for 56.2 percent of Gila County's tax revenues in fiscal year (FY) 2018, compared with 49.2 percent in Graham County in FY 2019, 38.2 percent in Maricopa County in FY 2019, and 63.0 percent in Pinal County in FY 2019. Grants, including unrestricted and operating grants, and other sources of revenue were other primary contributors of county government tax revenues. General government expenses; public safety; highways and streets; and health, welfare, and sanitation were the primary categories of expenditures in all four counties.

Table 3.13.3-3. General revenues and expenditures for Gila, Graham, Maricopa, and Pinal County governments

	FY 2014 Gila County (%)	FY 2014 Graham County (%)	FY 2015 Maricopa County (%)	FY 2015 Pinal County (%)
General Revenues				
Taxes	56.2	49.2	38.2	63.0
Intergovernmental	0.0	0.0	33.6	0.0
Charges for services	5.1	11.7	12.0	12.5
Grants	28.7	34.7	13.6	21.3
Other	10.0	4.4	2.7	3.3

	FY 2014 Gila County (%)	FY 2014 Graham County (%)	FY 2015 Maricopa County (%)	FY 2015 Pinal County (%)
Total (Millions, $)	$60.0	$33.5	$2,272.6	$304.8
General Expenditures				
General government	38.0	18.3	9.7	19.3
Public safety	31.0	38.6	52.6	45.4
Highway and streets	9.9	15.9	5.2	14.7
Health, welfare, and sanitation	14.4	14.0	28.1	15.0
Culture and recreation	2.0	2.3	2.7	0.8
Education	4.3	6.8	1.4	2.5
Interest	0.4	4.0	0.3	2.0
Total (Millions, $)	$66.2	$28.0	$1,867.8	$268.2

Sources: Arizona Auditor General (2017a, 2017b); Maricopa County (2017); Pinal County (2016)

Note: Tax revenues include property, income, sales, and vehicle license taxes.

Town of Superior taxes, revenues, and public expenditures. Table 3.13.3-4 shows the sources of revenue for the Town of Superior government during FY 2019 (July 1, 2018–June 30, 2019). During that time, the Town of Superior received approximately $3.9 million in revenue. The largest share of revenue collected came from local taxes (35.9 percent). The largest expenditures made were for public safety, which accounted for 36.4 percent of the Town's expenditures.

Table 3.13.3-4. General revenue and expenditures for the Town of Superior

General Revenues	Percentage of Total	General Expenditures	Percentage of Total
Taxes	35.9	General government	24.7
Intergovernmental	22.2	Public safety	36.4
Charges for services	8.3	Highways and streets	25.9
Grants	33.4	Culture and recreation	8.1
Other	0.1	Other	4.9
Total (Millions, $)	$3.9	Total (Millions, $)	$3.2

Source: HintonBurdick CPAs and Advisors (2017)

Public Facilities and Services

Transportation and road maintenance. The town of Superior can be accessed by road via U.S. 60, which is a major east-west transportation route through the region, and SR 177, which is a north-south route that runs between Superior and the town of Winkelman. Superior also has 25.6 miles of local streets that connect the town's different neighborhoods. A 2009 study commissioned by ADOT found that the 16-mile stretch of U.S. 60 between Superior and Miami/Globe was operating at capacity and expected the level of service to decline over time unless improvements were made to accommodate future demand (Logan Simpson Design Inc. 2009). A 2016 assessment of Superior's roads found that of the 25.6 miles of roads maintained by the Town of Superior, 17 miles were in poor or serious condition (Arizona Department of Transportation 2016). Estimates suggest it would cost the Town of Superior $1.25 million to repair all the roads in need of improvements.

Utility services. The Town of Superior contracts with the Arizona Water Company to supply the Town of Superior's municipal water. Arizona Water Company supplies Superior with municipal drinking water from Arizona Water Company's groundwater resources located near Florence Junction. Arizona Water

Company recently petitioned the Arizona Corporation Commission to raise water rates in the town of Superior, citing the need to raise revenue to cover investments in infrastructure as well as increasing operating and maintenance expenses. The Town of Superior provides sewer and wastewater treatment services for its residents. A recent study of the Town of Superior's wastewater treatment plant, originally built in 1974, found several inadequacies and noted that the plant may not meet State inspection standards (Duthie Government Advisors 2016). The Town of Superior has recently received a grant from the USDA to upgrade the wastewater treatment system (Jeavons 2018). Electricity is provided by APS.

Emergency and medical services. The Town of Superior funds and operates both fire and police departments. According to conversations with the Town of Superior's Fire Chief, the fire department has six full-time staff and 24 reserve staff that are paid on a per-call basis. The fire department has two type-1 engines, which are used for structure fires, one 1,800-gallon water tender, a type-6 brush truck used for fighting wildfires, and two rescue vehicles. The Town of Superior's police department has nine full-time officers, seven reserve officers, and one office manager that serve Superior's population.

Travel and Tourism

In Pinal County, tourists and visitors spent a total of $208 million in 1998, but by 2017, visitor spending had grown to $617 million, an increase of 197 percent (figure 3.13.3-1). During this same period, visitor spending grew by 87 percent across the state of Arizona, while visitor spending growth in Gila and Maricopa Counties amounted to 49 and 99 percent, respectively. The growth in visitor spending has been supported by an increase of out-of-state air travel arrivals in Arizona, which have increased by 5.5 percent per year since 2014 (Dean Runyan Associates 2018). The growth in visitor spending helped businesses in Pinal County earn $184.6 million from visitor spending in 2017, compared with $53.7 million in 1998. Visitor spending in the county also supports county and local governments by generating tax revenues. Estimates from Dean Runyan Associates (2017) show that visitor spending generated approximately $58.6 million in tax revenue in Pinal County in 2017, which is more than a 200 percent increase from the tax revenue generated from visitor spending in 1998. Overall, visitor spending supports an estimated 7,090 jobs in Pinal County (Dean Runyan Associates 2017). As a result, changes in visitation numbers or visitor spending in the county could have effects on the county's economy.

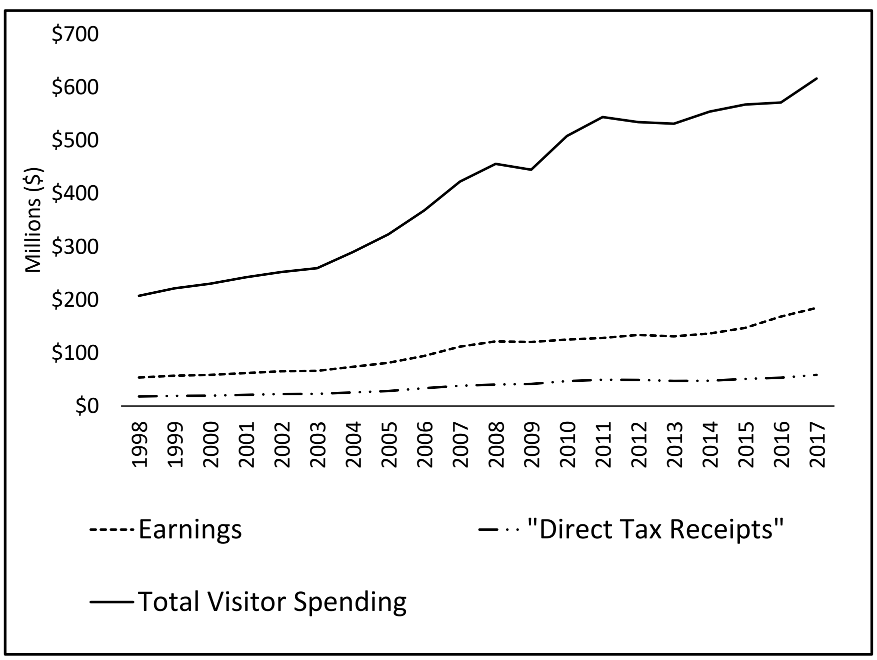

Figure 3.13.3-1. Total visitor spending, earnings, and direct tax receipts in Pinal County ($, millions). Source: Reproduced from Dean Runyan Associates (2018).

The tourism economy of the Copper Triangle, which includes Pinal and Gila Counties as well as the town of Superior, is dependent on natural amenities to draw visitors to the area. The southern portion of the Tonto National Forest includes areas around the town of Superior. Table 3.13.3-5 shows the primary activities of visitors to the Tonto National Forest.

Table 3.13.3-5. Activity participation in Tonto National Forest, 2016

Activity	% Participation	% Main Activity
Hiking/walking	29.3	15.3
Viewing wildlife	25.1	1.2
Relaxing	22.6	5.3
Viewing natural features	22.2	5.7
Fishing	17.9	11.8
Non-motorized water	14.9	13.6
Some other activity	14.5	10.9
Motorized water activities	12.5	8.5
Other non-motorized	11.1	6.7
Driving for pleasure	10.5	3.3
Developed camping	7.9	2.9
Picnicking	7.7	2.5
OHV use	7.5	5.8
Nature study	5.9	0
Primitive camping	4.1	1.1

Source: U.S. Forest Service (2016e)

In 2016, approximately 2,580,000 people visited Tonto National Forest to participate in recreation activities (U.S. Forest Service 2016e). Visitors to the Tonto National Forest spent an average of $115 per party per day on an average trip lasting approximately 4 days, but the economic impact depends on the activity that visitors participate in, whether they are local or non-local, and whether the trip is a day trip or an overnight trip (U.S. Forest Service 2016e).

On average, visitors participating in motorized activities like off-roading have the highest expenditures of nature-based tourists to National Forests. Their average expenditures per-party per trip in forests like Tonto National Forest range from a low of $63 for local day trips to more than $208 for non-local overnight trips. Expenditures from visitors participating in other activities such as hunting, fishing, and hiking range from lows of $26 for local day trips for hiking to more than $313 for non-local overnight trips to view wildlife. In total, recreational visitors to Tonto National Forest spend approximately $63.4 million per year in surrounding communities, generating $24.7 million in direct and indirect labor income, which sustains an annual average of approximately 760 jobs (U.S. Forest Service 2016c).

In addition to the travel, tourism, and recreation that occur on the Tonto National Forest, there is significant recreational activity—particularly OHV use and wildlife viewing—on land managed by the State of Arizona and the BLM. The Tonto National Forest is also one of the most heavily used National Forests for motorized recreation (Arizona Game and Fish Department 2018d). In Pinal County, OHV recreationists and tourists spend approximately $192 million per year within the county. Based on the only available data (from 2003), updated for inflation, the total spending within Pinal County supports an estimated 1,561 jobs, paying total annual wages of $34 million (Silberman n.d. [2003]). In Pinal County, wildlife viewing contributes approximately $89.5 million annually to the county's economy (Arizona Game and Fish Department 2018d).

3.13.4 Environmental Consequences of Implementation of the Proposed Mine Plan and Alternatives

3.13.4.1 Alternative 1 – No Action Alternative

Under the no action alternative, the mine would not be developed, and existing socioeconomic conditions and trends would continue, as described in the "Affected Environment" part of this resource section.

3.13.4.2 Direct and Indirect Effects Common to All Action Alternatives

Effects of the Land Exchange

The land exchange would have limited effects on socioeconomics. The Oak Flat Federal Parcel would leave Federal jurisdiction and would result in a reduction of wildlife-related recreation spending and expenditures by visitors to the Oak Flat campground, although the exact amount lost from visitors to Oak Flat has not been quantified. Another expected effect on socioeconomics could stem from slight changes in the tax base, but overall this would be limited. The admission of eight new parcels into Federal jurisdiction may increase recreational spending in those areas; however, it is likely to result in minimal overall effects. One of the planning principles in the National Forest Management Act is "responsiveness to changing conditions in the land and changing social and economic demands of the American people" (U.S. Forest Service 1985b). As such, the offered lands parcels entering NFS jurisdiction would then be managed under those principles.

Effects of Forest Plan Amendment

No components of the 2023 forest plan that directly relate to socioeconomics require amendment.

Effects of Compensatory Mitigation Lands

While some labor and equipment costs would be associated with the activities to take place on the compensatory mitigation lands, any socioeconomic effect would be short-lived and relatively small, based on the amount of earth-moving and vegetation restoration that would take place.

Effects of Recreation Mitigation Lands

The recreation mitigation lands are anticipated to positively affect socioeconomics. The planned trail system would benefit the local economy via long-term sustainable recreation and ecotourism.
The recreation mitigation lands boast a diverse range of scenic terrain within a relatively small area and have the potential to become a popular destination for the growing number of outdoor recreation enthusiasts from the Phoenix metropolitan area.

Summary of Applicant-Committed Environmental Protection Measures

Resolution Copper has entered into a number of agreements that would result in socioeconomic benefits within the analysis area. These are included here, and their effects are accounted for in the analysis of environmental consequences.

- In February 2019, Resolution Copper entered into an Entrepreneurship and Innovation Center Gift Agreement with the Town of Superior, to fund a number of programs meant to diversify the economic base of the community.

- In February 2019, Resolution Copper entered into a Multigenerational Center Development Gift Agreement with the Town of Superior, to help fund the final studies, design, and construction of a multigenerational center. The goal of the center is to improve the overall quality of life for Superior residents, local employers, and their employees, expand the quality of life amenities and services that are essential to retraining and attracting residents and employers, allow for consolidation of Town services and decrease the overall administrative burden of the Town, and further develop public, private, civic, and educational sectors of the community.
- In February 2019, Resolution Copper entered into an Education Funding Agreement with the Superior Unified School District, dedicating funding to a number of classroom enhancements and educational programs over the next 4 years.
- In February 2019, Resolution Copper entered into a Park Improvement Agreement with the Town of Superior, to fund improvements to the U.S. 60 Caboose Park.
- In March 2016, Resolution Copper entered into an Emergency Response Services agreement with the Town of Superior, to fund the provision of fire and other emergency services to the mine facilities by the Town.
- Resolution Copper has committed at a corporate level to hiring qualified candidates locally, and will track progress by employee proximity to the mine.
- Resolution Copper has committed at a corporate level to using local suppliers and services wherever possible.

Socioeconomic Impacts

Most of the direct and indirect effects are based on the proposed mine plan, including employment, earnings, output, and fiscal impacts, and do not differ in nature or magnitude between the action alternatives. Two indirect effects (effects on the tourism economy and property values) are similar in nature between alternatives but differ in magnitude. For those, the differences between each action alternative are summarized in the table 3.13.4-4 and table 3.13.4-5, later in this section.

Impact on employment, earnings, and value added. Table 3.13.4-1 summarizes the annual average economic and fiscal effects of the proposed mine based on projected employment and purchases of goods and services over the life of the mine. On average, the mine is projected to directly employ 1,434 workers, pay about $149 million per year in total employee compensation, and purchase about $490 million per year in goods and services (not shown in table 3.13.4-1). The IMPLAN results indicate that the proposed mine would create substantial "multiplier" effects (technically known as indirect and induced economic effects) in Arizona, supporting almost 2,200 indirect and induced jobs and about $130 million per year in indirect and induced labor income. Including direct and multiplier effects, the proposed mine is projected to increase average annual economic value added in Arizona by about $1.2 billion (not shown in table 3.13.4-1). However, most of the multiplier effects would occur outside of the "Copper Triangle." While nearly all of the direct mine employment is expected to be based in the ZIP Code encompassing Superior, only 14 percent of the multiplier effects are projected to occur within that ZIP Code. About 11 percent of the multiplier effects are projected to occur in other parts of Pinal County, about 13 percent in Gila County, and about 6 percent in Pima County. The majority of the multiplier effects are projected to occur in Maricopa County (56 percent).

Table 3.13.4-1. Summary of IMPLAN labor results based on projected average annual activity from proposed Resolution Copper Project

Geographic Area	Employment	Labor Income
Superior (ZIP Code 85173)		
Direct Effect	1,434	$148,862,798
Indirect Effect	109	$4,303,597
Induced Effect	191	$5,110,938
Total Effect, Superior	*1,734*	*$158,277,333*
Remainder of Copper Triangle *(Indirect and Induced Effects Only)*		
Other Pinal County areas	95	$3,244,360
Gila County areas	271	$9,910,537
Graham County areas	0	$0
Total Effect, Remainder of Copper Triangle	*366*	*$13,154,897*
Outside of Copper Triangle *(Indirect and Induced Effects Only)*		
Pinal County (remainder)	129	$6,990,981
Gila County (remainder)	0	$0
Graham County (remainder)	0	$0
Maricopa County	1,163	$93,994,934
Pima County	114	$7,431,631
Total Effect, Outside of Copper Triangle	*1,405*	*$108,417,545*
Total Regional Effects		
Direct Effect	1,434	$148,862,717
Indirect Effect	1,078	$89,291,018
Induced Effect	994	$41,696,040
Total Effect, Regional	*3,506*	*$279,849,775*

Note: Rounded to nearest whole number

Projected employment and procurement activity associated with the proposed mine is anticipated to vary over the life of the project. The largest direct employment at the proposed mine is projected to occur during the approximately 40-year period of production (potentially 2031–2071). The smallest direct employment levels, and the lowest spending on goods and services, are projected to occur during the closure and reclamation period (potentially 2072–2073), as shown in figure 3.13.4-1.

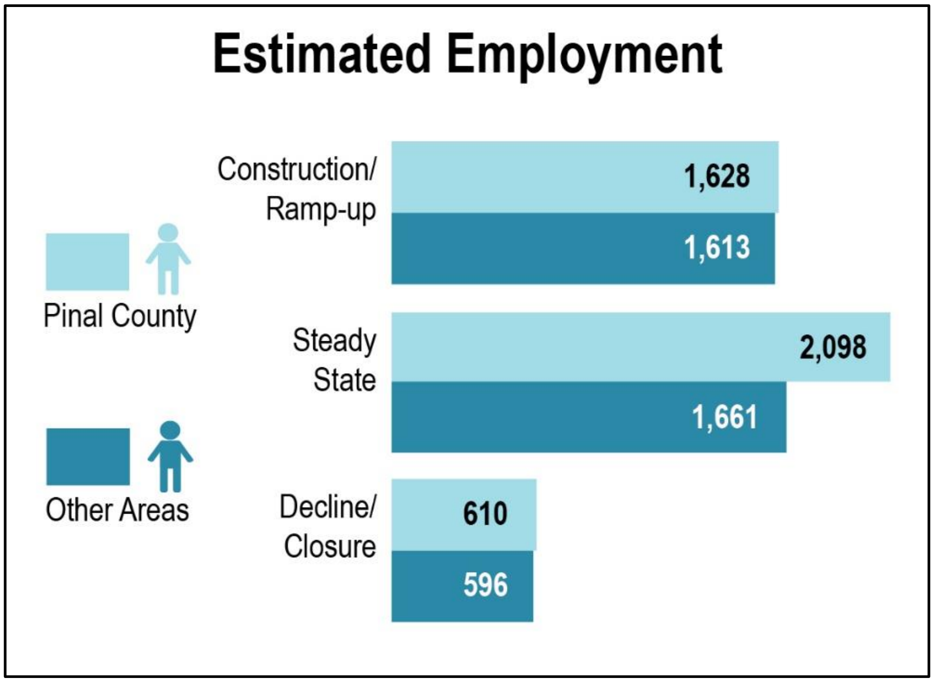

Figure 3.13.4-1. Comparison of projected total employment effects (direct and indirect/induced) during different phases of the proposed Resolution Copper Project

Where the mine's employees would live is important in evaluating impacts on Superior and the Copper Triangle area in terms of demographics, demands for public services, and other social and economic effects. Based on current commuting patterns and the residence choices of the mine's employees to date, it appears likely that approximately 25 percent of the workforce would seek to live in or near Superior, and about 10 percent would choose to live in or near other communities within the Copper Triangle. The remainder would likely commute primarily from eastern portions of Maricopa County.

During the first few years, the actual number of mine-related employees who would live in Superior is likely to be constrained by the size and condition of the town's available housing supply and the availability of local services. While an estimated 433 of the new workers projected to result from the proposed mine might prefer to live nearby, given current conditions in Superior, it is more likely that these new workers would absorb about one-half of the available, move-in-ready housing stock during the early years of mine construction and operations. This implies about 160 new households would move to Superior in the relatively near term. Additional housing demand from mine-related workers is likely to provide upward pressure currently on home prices in Superior (which are currently very low), and could create affordability challenges for some existing Superior residents.

Projected fiscal effects. Operation of the proposed mine would produce both direct revenues to state and local governments (paid by Resolution Copper) and secondary revenues for those governments (which would be paid by employees and vendors). While there are numerous minor government revenues that would be generated by operation of the proposed mine, more than 95 percent of the revenues that would accrue to the State of Arizona and the most affected local governments (those within Pinal and Gila Counties) would stem from six revenue sources—some of which would produce revenues for both the State government and local governments:

- Resolution Copper property taxes (property taxes on the mine itself, paid to Pinal County and other local taxing entities)

- Resolution Copper severance taxes (paid to the State of Arizona, with a portion shared to local governments based on population)
- Resolution Copper corporate income taxes (paid to the State of Arizona, with a portion shared to cities based on population through Urban Revenue Sharing Fund)
- Transaction privilege taxes (sales taxes paid to local governments and the State of Arizona, with a portion of the State revenues shared to local governments based on population)
- Employee income taxes (paid to the State of Arizona, with a portion shared to cities based on population through Urban Revenue Sharing Fund)
- Employee property taxes (paid to the jurisdictions in which the employees would reside)

State and local government revenue summary. Combining estimated revenues from the six primary revenue sources just described, the proposed mine is projected to generate an average of between $80 and $120 million per year in State and local tax revenues, as shown in table 3.13.4-2. The reported range of annual revenues reflects differences between tax revenue projections developed by consultants for Resolution Copper and revenue projections developed for the Forest Service, as described in BBC Research and Consulting (2018). The State of Arizona would be the largest recipient of tax revenues from the proposed mine, with projected average receipts of between $33 and $39 million per year. Pinal County Junior College and Pinal County would also receive large amounts of tax revenues (ranging from about $6 million to over $20 million), primarily from property tax revenues on the proposed mine.

Pinal County would, however, also experience a reduction in payments in lieu of taxes (PILT) from reductions in the Federal land base within the county due to the proposed mine. Based on a decrease in Federal land from the land exchange and proposed project features ranging from 3,400 acres under Alternative 6 to 10,600 acres under Alternative 5, the annual reduction in PILT revenue for Pinal County could be between $8,000 and $25,000.

While the Superior Unified School District would receive the largest amount of property tax revenue based on its current mill levy, the Arizona school finance equalization system would likely require the School District to either reduce its mill levy, distribute the additional tax revenues across other districts, or a combination of both. Statutory limits on increases in property tax revenues in Arizona mean that the additional property tax revenues for other entities included in the projected revenue estimates in table 3.13.4-2 would primarily benefit existing taxpayers by resulting in a reduction in local property tax rates.

Although Superior is by far the closest municipality to the proposed mine, the Town of Superior is projected to receive a small share of the total tax revenues (less than $0.4 million per year) in the near term, but this would increase to about $0.9 million per year if future development accommodates the full housing demand estimate of 433 workers living in Superior.

Table 3.13.4-2. Projected average annual State and local government revenues related to the proposed Resolution Copper Project

Location	Total by Jurisdiction	
	Low Estimate ($)	High Estimate ($)
Town of Superior		
Without new residents	$57,498	$57,699
With existing housing constraints	$187,526	$187,728
Longer term potential	$510,736	$510,937

Location	Total by Jurisdiction	
	Low Estimate ($)	High Estimate ($)
Superior Unified School District*	$16,255,627	$31,806,112
Pinal County Junior College	$6,098,926	$11,637,615
Pinal County	$10,784,109	$20,461,059
Gila County	$97,491	$103,651
Graham County	$23,598	$27,880
Other Arizona jurisdictions†		
Near term	$14,689,986	$18,262,547
Longer term	$14,019,701	$17,592,263
State of Arizona	$32,551,850	$38,639,999
Total‡	**$80,559,084**	**$120,059,516**

* School district revenues based on current mill levy. Arizona school finance equalization formula would likely result in either a reduction in the mill levy or a redistribution of revenues to other districts, or both.

† Includes all Arizona municipalities other than Superior; all Arizona counties other than Pinal, Gila, and Graham; and all property-taxing entities in Pinal County other than those identified in this table.

‡ Totals shown exclude the longer-term estimates for Town of Superior and other Arizona jurisdictions.

The proposed mine would also produce substantial revenues for the Federal Government, estimated at more than $200 million per year from corporate and employee Federal income taxes (Elliot D. Pollack and Company 2011). The revenues shown in table 3.13.4-2 would directly result from mine activity. However, growth in population resulting from mining activity would also lead to additional revenues from the State of Arizona's revenue sharing formulas, particularly in the town of Superior. In the near term, when current constraints would limit the number of new employees living in Superior, projected growth in Superior's population could result in an increase in intergovernmental revenue sharing from the State of approximately $140,000 per year. If and when housing and commercial development in Superior can accommodate the full mine-related housing demand (433 households), annual intergovernmental revenues from the State of Arizona would increase by about $384,000, relative to current conditions.

The ASLD would also receive royalty payments from the proposed mine for a small area of ASLD lands that would be mined. The minimum ASLD royalty payment is 2 percent of the gross value of the minerals produced from their lands, but ASLD royalties average between 5 and 6 percent of the value (Arizona State Land Department 2019b). With ASLD owning the rights to approximately 2 percent of the overall copper resource, average annual royalty payments to ASLD over the life of the proposed mine are projected to be between $0.5 million and $1.5 million.

Mine-related demands and costs for public services. Development and operations of the proposed mine could generate additional demands for public services, and additional costs to provide such services. Based on the location of the proposed mine in Pinal County, just outside the municipal boundaries of the Town of Superior, those two jurisdictions and the Superior School District could be the most affected by additional service requirements and costs.

In the DEIS, the study team developed estimates of Superior's potential additional costs based on an "effective service area" measure of the population it could serve, including non-residents who would commute to work at the proposed copper mine. Subsequent to the DEIS, the study team continued to work with the Town of Superior to refine the fiscal impact estimates and produced revised estimates based on the most recent Town of Superior budget for 2020 and input from the Town in September 2019 and February 2020. The Forest Service and the EIS team also engaged in a discussion regarding these estimates in October 2019 and June 2020.

Subsequent to these revised estimates and discussions, the Town of Superior and Resolution Copper worked together to develop agreed-upon estimates of the effects of the proposed mine on Superior's costs and revenues. Depending on the number of new residents who live in Superior as a result of the proposed mine, the projected impact on the Town's costs at the peak of construction was estimated to be between approximately $1.0 and $1.2 million per year. Those costs are projected to be offset by between $340,000 and $640,000 per year in offsetting revenues plus contributions from Resolution Copper of approximately $725,000 per year (see "Mitigation Effectiveness" section below for more discussion).

During operations, the Town's costs are projected to increase by between $0.8 and $1.3 million per year. Those cost increases could be offset by additional revenues of between $0.2 and $1.2 million—depending on the number of mine workers residing in Superior—as well as contributions from Resolution Copper of about $654,000 per year.

Development and operations of the proposed mine could also increase the demand for K–12 education services. However, schools in the Superior Unified School District are currently operating well below their designed capacity. Pinal County would also provide services to the proposed mine, including road maintenance, additional public safety services, and other county government activities. Based on projected changes in the effective population served by Pinal County, the proposed mine could increase the costs of county service provision by about $540,000 per year. As shown in table 3.13.4-2, the proposed mine is projected to increase Pinal County's revenues by an annual average of between $11 million and $20 million, which is likely to substantially exceed the increase in the costs of service provision for the county.

Potential effects on other communities. There are a number of other communities within the Copper Triangle or within a relatively short commuting distance from the proposed mine that could experience economic effects. These communities include:

- **Apache Junction.** Located primarily in Pinal County, but partially in Maricopa County. About 32 miles northwest of Superior and north of Queen Creek and the San Tan Valley. A potential residence location on the edge of the Phoenix Metropolitan Area for portions of the proposed mine's workforce. Effects included in remainder of Pinal County (outside of Copper Triangle) and Maricopa County estimates.
- **Florence.** County seat of Pinal County. Approximately 31 miles southwest of Superior. Largest Pinal County incorporated community in proximity to Superior. Also a potential residence location for some of the proposed mine's workforce. Approximately 20 miles west of Peg Leg tailings storage facility (Alternative 5). Outside of the Copper Triangle, but included in effects on remainder of Pinal County.
- **Gold Canyon.** A smaller census-designated place in Pinal County, located approximately 25 miles west of Superior and a few miles southeast of Apache Junction. Like the other communities on the eastern edge of the Phoenix Metropolitan Area, Gold Canyon is a potential residence location for workers at the proposed mine. Effects are included in "other Pinal County" estimates, outside of the Copper Triangle.
- **Hayden.** A declining former mining community located in both Gila and Pinal Counties. Founded by Kennecott Mining Company and located approximately 30 miles southeast of Superior and a few miles southeast of Kearny. Potentially, some former miners residing in Hayden could find employment at the proposed mine or at the relatively nearby proposed Skunk Camp or Peg Leg tailings storage facilities. Effects are included in estimates for the Copper Triangle and for Pinal and Gila Counties.

- **Kearny.** Founded by Kennecott Mining Company in 1958, and located within the Pinal County portion of the Copper Triangle. Approximately 22 miles southeast of Superior and a potential residence location for some of the proposed mine's workforce. Approximately 10 miles south of proposed Skunk Camp tailings storage facility (Preferred Alternative) and 10 miles east of Peg Leg tailings storage facility (Alternative 5). Effects are included in estimates for the Copper Triangle and for Pinal County.
- **Queen Creek.** Located in both Pinal and Maricopa Counties on the eastern edge of the Phoenix Metropolitan Area. Approximately 40 miles west of Superior and a few miles north of the San Tan Valley. A likely potential residence location for portions of the proposed mine's workforce. Effects included in remainder of Pinal County (outside of Copper Triangle) and Maricopa County estimates.
- **San Tan Valley.** Census-designated place in Pinal County, outside of traditional Copper Triangle. Substantial and growing population area about 40 miles west of Superior on the edge of the Phoenix Metropolitan Area. About 5 miles south of Queen Creek and 8 miles west of proposed location for the mine's filter plant. Included in effects on remainder of Pinal County.
- **Winkelman.** A small and declining former mining community in Gila County located near Kearny, about 32 miles southeast of Superior. Like Kearny and Hayden, could be a source of some workers for the proposed mine. Effects are included in estimates for the Copper Triangle and Gila County.

Vulnerability to boom-bust cycles. The global price of copper has historically been highly variable. Periods of low and/or declining copper prices have contributed to fluctuations in copper mining employment and wages in Arizona, and those fluctuations have created economic and fiscal hardships in smaller communities that are heavily dependent on mining. Presuming that Resolution Copper's projections of operational employment, labor costs, non-labor operating costs, and output prove reasonably accurate, the proposed Resolution Copper Mine would have lower operating costs than the typical conventional copper mines in the region. Based on analysis of historical copper prices since 1900, it appears unlikely that the proposed mine would have to suspend or substantially cut back its operations for purely economic reasons during either the 10-year ramp-up period or the following 20 years of full production. During the last 10 years of the mine's anticipated production life, the operational economics of the mine could be less advantageous, and there may be a greater likelihood that operations could be reduced or suspended for economic reasons. If the mine proves to be less productive than anticipated, or variable costs are substantially higher than anticipated, there would be a greater likelihood of potential shutdowns due to low copper prices.

Whether or not there are any temporary shutdowns during the operation of the proposed mine, the mine would have a finite life span, currently projected to span about 54 years from 2020 through 2073. When the mine closes, and reclamation is complete, the Town of Superior and the Copper Triangle would likely experience a decline in local employment and, potentially, either a decrease in population or an increase in the local unemployment rate. These changes could also have adverse impacts on local fiscal and social conditions as has been previously experienced in Superior and other former mining communities in Arizona.

Other social effects. In the public comments received on the DEIS, local residents and stakeholders indicated they have concerns about social impacts of the mine, such as increased demand for emergency services, impacts on crime and safety, demand for community services, and sense of community cohesion. The available literature on the social impacts of hard rock mining, primarily based on academic studies in other countries, suggests that some negative social impacts are unavoidable. Much closer to the proposed Resolution Copper Mine, the experience of the Town of Hayden—with an aging and dwindling population and increasing crime rates and drug use since the closure of the former ASARCO mine—

illustrates that these types of social impacts can and have occurred in Arizona (Ross 2017). Ongoing communication and coordination between the Town of Superior and Resolution Copper during the five decades of mine construction and operation could help anticipate and identify conflicts and craft cooperative mitigation strategies where feasible.

Potential effects on the nature-based tourism economy. The proposed mine would have operations located east and west of the town of Superior. The tailings produced by the proposed mine would be stored at one of four sites currently being considered as alternatives. The activities at each of the proposed sites would affect the region's nature-based tourism economy, which includes the economic activity of both local and non-local users of the area's natural amenities for tourism and recreation. Nature-based tourists may participate in one or more activities, including OHV use, camping, hiking, rock climbing, hunting, fishing, and picnicking. Based on survey data, it is likely that more than 80 percent of nature-based tourists visiting the portion of Tonto National Forest within the socioeconomic analysis area would visit sites outside of the two-county area, stay home, or choose a different activity to participate in under the proposed action and action alternatives unless measures were taken to mitigate potential negative impacts on recreational and natural amenities from the proposed mine.

Most of the effects would occur in the town of Superior and Pinal and Gila Counties. The proposed mine and its associated facilities would be distributed across a large amount of land in Pinal and Gila Counties, where nature-based tourism is the primary tourism activity. The projected loss of Federal land from project features and the land exchange could be as much as 110,600 acres, about 2 percent of the 618,000 acres of Federal land in Pinal County. However, the proposed action and action alternatives would directly impact less than 0.5 percent of the Tonto National Forest's total land area. As a result, the proposed mine's effects on nature-based tourism would vary by location and activity. AGFD projects that the tailings storage facilities would reduce wildlife-related recreation expenditures during the potential 60-year period[126] of construction, operations, and closure/reclamation of the proposed mine (Arizona Game and Fish Department 2018d). As shown in table 3.13.4-3, the magnitude of the effect varies by the location of the tailings storage facility. While AGFD used a 60-year period to quantify their analysis of effects on wildlife-related recreation spending, permanent damage to the area from subsidence and the anticipated lengthy period of reclamation for the tailings storage facility would likely result in persistent impacts extending well beyond this period. Other impacts are summarized in the following sections: transportation and access (see section 3.5), scenic resources (see section 3.11), noise and vibration (see section 3.4), and air quality (see section 3.6). Many of the potential economic effects on nature-based tourism are not quantified because of a lack of visitation data but are discussed in qualitative terms in the following text. If the proposed mine causes visitation and spending patterns to shift, it may result in lower tourism spending receipts for local businesses, which in turn could reduce tourism-related earnings and employment in the analysis area.

East Plant Site. The operations at the East Plant Site would affect some of the natural amenities that attract tourists to the area. The East Plant Site is located on approximately 1,543 acres of land managed by the Forest Service, including 1,458 acres of NFS land that would subside, ending the use of the area by the general public. The East Plant Site and subsidence area would alter the recreation experience adjacent to the Oak Flat campground and its surroundings, an area that is popular with campers, picnickers, hikers, and rock climbers. OHV activities would also be affected by the proposed mine's operations. Portions of NFS Road 315, a popular off-road loop between U.S. 60 and SR 177, would be eliminated by the activities at the East Plant Site and the eventual subsidence of the area. In total, AGFD estimates that about 6 miles of public access motorized routes would be lost in addition to 421 acres of dispersed camping. The loss of this area would have potentially large effects on nature-based tourism patterns

[126] The impacts disclosed in this section are based in part on an analysis conducted by the AGFD (a cooperating agency on the project) and provided to the Tonto National Forest. In that analysis, the AGFD used a mine life span of 60 years, which differs slightly from the mine life described in chapter 2 of 51 to 56 years.

around the town of Superior. The impact on the site could result in a loss of tourism spending in and around the town, depending on the location of substitute sites. The site is also used for hunting, although according to AGFD the area does not contain a disproportionate amount of habitat favoring any particular species of interest to hunters. In total, AGFD estimated that the effects of the proposed mine at the East Plant Site would result in 188 fewer hunter days per year. This would lead to a direct reduction of $10,510 annual wildlife-related recreation spending in the local economy, which would equal a nominal value of $630,480 over the 60-year life of the proposed mine (Arizona Game and Fish Department 2018d).

West Plant Site. The West Plant Site is located on private land near the town of Superior's northwestern edge. The West Plant Site was formerly used by the Magma Mine as the site of its copper concentrator. The proposed mine would increase the scale of industrial activity at the site, but the proposed activities would be consistent with the site's historical use. The increased industrial activity could create beneficial effects on the town's tourism economy for tourists interested in mining activity.

Alternatives 2 and 3 – Near West. The area on and around the Near West tailings alternative is used for a variety of activities, including OHV use, camping, and hunting, by visitors from outside Pinal County. AGFD estimates that the Near West tailings alternative would affect about 23 miles of motorized off-road trails and eliminate 1,737 acres of dispersed camping (Arizona Game and Fish Department 2018d). This would lead to more crowding and congested conditions elsewhere, with the potential to increase competition and conflict between activities at areas experiencing these new use patterns. This could negatively impact the number of nature-based tourist visits and tourism spending, resulting in lower tourism spending, earnings, and employment.

The area is popular with hunters due to its populations of mule deer, white-tailed deer, javelina, quail, dove, and coyotes and other predators. According to a survey and mapping exercise conducted by AGFD, the site has some of the highest rates of use among hunters. The Near West tailings alternative would reduce the number of hunting days on the site by approximately 1,200 hunter-days per year, amounting to a reduction in direct expenditures of $66,920 per year, or $4.0 million over the 60-year operational time horizon of the proposed mine (Arizona Game and Fish Department 2018d).

Alternative 4 – Silver King. The alternative would affect the aesthetics of the area, particularly for users of OHV routes and other tourists who value the views and vistas of the Superstition Mountains. The aesthetic effects could change people's desire to visit and recreate in the area, thereby shifting visitation and spending patterns and potentially reducing nature-based tourism expenditures in the region. In total, AGFD estimates that there are about 20 miles of public access motorized routes and 1,434 acres of dispersed camping that would be affected. The site at the proposed Silver King alternative receives a moderate to high number of hunters who use the area to hunt mule deer and predatory animals. The higher elevation areas of the site are the most valued by hunters because the quality of mule deer habitat increases with altitude at the site. According to AGFD, the proposed alternative would have a negative effect on mule deer populations, which would reduce the number of hunting days by about 1,078 per year. This would reduce the amount of direct expenditures of hunters by about $60,368 per year, or $3.6 million over the 60-year operational time horizon of the proposed mine (Arizona Game and Fish Department 2018d).

Alternative 5 – Peg Leg. Development of this alternative would have a negative effect on the aesthetics of the area, particularly for visitors driving from the Florence-Kelvin Highway and for outdoor enthusiasts who value pristine view of the Mineral Mountains and the Gila River. Other opportunities for sightseeing, viewing nature, and viewing historic sites would be affected in the Middle Gila Canyons area. AGFD estimates that there are about 45 miles of public access motorized routes and 1,009 acres of disperse camping within the tailings footprint (excluding pipeline corridors). The Peg Leg alternative site also contains a variety of species that are popular with hunters, including predators and small game. This also makes the site popular with wildlife-watchers. The AGFD estimates that the site supports about 219 hunting-days each year. Under this alternative, the hunting activity would be lost, resulting in a loss of direct economic activity amounting to $12,254 per year, or $735,269 over the 60-year life of the proposed mine (Arizona Game and Fish Department 2018d).

Alternative 6 – Skunk Camp. This alternative would have the largest negative effect on tourism and recreation of any of the proposed alternatives. AGFD estimates that there are about 32 miles of public access motorized routes and 861 acres of dispersed camping within the tailings footprint (excluding pipeline corridors). Hunting is permitted on State Trust lands within the proposed location of the Skunk Camp alternative, and the site is also popular with people who enjoy watching wildlife. Private lands at the site may or may not be open to public access at the discretion of the landowner. The area is characterized as excellent mule deer, javelina, and Gambel's quail habitat, and transitional white-tailed deer habitat. This area is one of three major areas most frequently hunted in this Game Management Unit and hunters tend to concentrate within these few areas to camp and stage for travel to nearby hunting destinations. Key to recreation in this area is access via Dripping Springs Road. According to a survey and mapping exercise conducted by AGFD, the Skunk Camp alternative would reduce the number of hunting days on the site by approximately 1,269 hunter-days per year, amounting to a reduction in direct expenditures of $70,554 per year, or $4.2 million over the 60-year operational time horizon of the proposed mine (Arizona Game and Fish Department 2018d).

Table 3.13.4-3. Total projected reduction in direct wildlife-related recreation expenditures under each tailings alternative

Tailing Alternatives	Projected Annual Reduction in Visitor Spending	Projected Reduction in Visitor Spending over 60-year Period
Alternative 2 – Near West Proposed Action	$66,920	$4.0 million
Alternative 3 – Near West – Ultrathickened	$66,920	$4.0 million
Alternative 4 – Silver King	$60,368	$3.6 million
Alternative 5 – Peg Leg	$12,254	$735,269
Alternative 6 – Skunk Camp	$70,554	$4.2 million

Source: AGFD (2018d)

Potential property value effects from tailings. While the proposed mine facilities at the East Plant Site and the West Plant Site could have some adverse effects on property values in Superior due to creating a more industrialized setting, those effects would likely be more than offset by the increased demand for housing and commercial space in the town. The primary adverse effects on property values from the proposed mine would likely be associated with the tailings storage facilities.

The proposed mine would likely affect residential property values within at least a 5-mile radius of the proposed location of the tailings facilities under each alternative. Table 3.13.4-4 summarizes the proposed mine's estimated effects on residential property values based on current development near the proposed locations of the mine tailings under each alternative and the current value of those properties. Estimates in table 3.13.4-4 indicate the magnitude of potential property value effects but are based on a limited body of directly relevant research. Any adjacent state lands could experience similar decreases in property values. For some alternatives, it is possible that Resolution Copper may purchase some residential parcels; this possibility was not incorporated into the analysis.

Reclamation and closure plans are anticipated to restore the tailings storage facility to support post-closure uses such as wildlife habitat and, potentially, livestock grazing. However, the level to which revegetation would be successful is uncertain and revegetation would likely take many years, if not decades, to achieve full success (see section 3.3). Consequently, localized effects on property values are likely to persist for an extended period after mine closure.

Table 3.13.4-4. Total projected property value reduction under each tailings alternative

Tailing Alternatives	Number of Residential Parcels within 5 Miles of Tailings Perimeter	Total Projected Property Value Reduction ($)	Change in Value (%)
Alternative 2 – Near West Proposed Action	1,370	$3,059,395	−4.1
Alternative 3 – Near West – Ultrathickened	1,370	$3,059,395	−4.1
Alternative 4 – Silver King	1,181	$5,472,374	−10.6
Alternative 5 – Peg Leg	8	$69,178	−6.3
Alternative 6 – Skunk Camp	31	$57,575	−4.0

Sources: BBC Research and Consulting (2018); Gila County Assessor's Office (2017); Pinal County Assessor's Office (2017)
Note: GIS data for residential parcel data were obtained from standard Pinal County and Gila County coverages.

To the extent that the tailings facility impacts nearby residential property values, it would also impact local property tax revenues. Combined effects on revenues for the Town of Superior, Pinal County, Pinal County Community College, and the Superior School District would be largest under Alternative 4, totaling about $102,000 per year across the four taxing entities. The smallest effect would be under Alternatives 5 and 6, totaling less than $1,000 per year. However, taxes on the tailings storage facility itself would more than offset these reductions. For example, Resolution Copper has estimated that the "Full Cash Value" of the proposed Skunk Camp tailings storage facility would be about $207 million, including $6 million in construction cost and about $201 million in equipment value. Based on that estimate, that facility would produce about $5.7 million per year in annual property tax revenues, which would be roughly split between applicable taxing entities in Pinal and Gila Counties (Resolution Copper 2020a, 2020h).

If the proposed mine is developed with the Forest Service preferred alternative for its tailings storage facility (Alternative 6 – Skunk Camp), about $3 million of the annual property tax revenues attributed to Pinal County in table 3.13.4-2 could go to Gila County instead.

A unique aspect of Alternative 4 is the relocation of the filter plant and loadout facility to the West Plant Site. The Town of Superior has indicated an interest in seeing the filter plant for the proposed mine be located within its municipal boundaries. Based on the projected full cash valuation of the plant and the current Town of Superior mill levy (6.7123 mills), if the filter plant were located within the town it could produce annual property tax revenues for the Town of Superior of over $900,000 per year (Pinal County 2020; Resolution Copper 2020h).

Potential economic effects from water supplies. Effects of the proposed mine, and the mine tailings storage facility, on water quality and water quantity could also have financial and economic impacts on water users dependent on local groundwater or surface water supplies.

Any of the proposed tailings storage facilities would lose seepage with poor water quality, and all are dependent on a suite of engineered seepage controls to reduce this lost seepage. Modeling indicates that seepage from tailings storage facilities under Alternatives 2 and 4 would result in water quality problems in Queen Creek. Alternative 3 would not, but requires highly efficient seepage control to achieve this (99.5 percent capture). Seepage from Alternatives 5 and 6 does not result in any anticipated water quality problems; these alternatives also have substantial opportunity for additional seepage controls if needed (see section 3.7.2).

Resolution Copper would have the responsibility to demonstrate to the State of Arizona that the regulated discharge would not violate water quality standards and would be required to obtain a permit under the AZPDES program for any discharges to surface waters, including stormwater runoff, as well as an APP for any discharges to groundwater, or discharges to the ground that could seep into groundwater. However, total dissolved solids and sulfate, which do not have numeric thresholds, are anticipated to increase in the downgradient aquifer. Increased levels of these contaminants could impact the desirability of groundwater, or its usability.

The issue of competing water uses, water scarcity, and regional water supplies was raised in many public comments on the DEIS. The use of water by the mine—from whatever source—takes place under a complex regulatory framework for management of limited water resources. This includes the authorities and restrictions put in place by the 1980 Groundwater Management Act, administered by the ADWR, for use of groundwater within AMAs, and the contracting and use of CAP water, which is administered by the Central Arizona Water Conservation District and the Bureau of Reclamation. Particularly in Arizona, every source of water has competing users. These laws and regulations were enacted to codify the value and priorities that the State of Arizona and society in general place on the use of a limited water supply. Any water used by Resolution Copper must adhere to this framework, whether direct use of CAP water, dewatering at the mine site (which lies within the Phoenix AMA), pumping from the Desert Wellfield (also within the Phoenix AMA), or acquisition and use of long-term storage credits. Note that further discussion of competing water uses and future water scarcity is included in Chapter 4, Cumulative Effects.

By definition, Resolution Copper's legally permitted use of water adheres to the norms and values placed on water by the State of Arizona. Analysis of the economic value of the water used by Resolution Copper, the other beneficial uses to which water could be put, or extrapolation of economic harm to other entities due to Resolution Copper's legally permitted use of water, is outside the scope of analysis of this EIS. Groundwater drawdown in the vicinity of the mine site could impact water supply availability for some existing users, including the Town of Superior, Boyce Thompson Arboretum, and Top-of-the-World CDP. However, Resolution Copper has committed to mitigating impacts on these users if necessary (see the "Mitigation Effectiveness" part of Section 3.7.1).

Groundwater quantity near the Desert Wellfield could also be impacted. Groundwater users in this area could experience increased pumping costs or potentially need to drill deeper wells to obtain their water supplies (see section 3.7.1). Higher pumping costs and deeper well requirements could also affect the desirability of properties in this area and, potentially, the value of those properties.

Other economic effects. Apart from effects on property values from proximity to the proposed tailings storage facilities, increased traffic and industrial development could also adversely impact the quality of life for residents in proximity to the proposed mine and tailings storage facilities.

Although mine-related pipelines would be buried, and are unlikely to affect ranchers' ability to move and graze livestock on their allotments, the proposed mine, and particularly the proposed tailings storage facility alternatives, would result in the loss of several thousand acres of public and private land currently available for livestock grazing. The "Livestock and Grazing" section of the EIS (see section 3.16) has quantified the potential reductions in the number of acres available for grazing on private land and on lands managed by NFS, ASLD, and BLM.

The potential economic implications of the reduction in available grazing land depend on several factors, including the extent to which the existing grazing allotments are being fully utilized by local ranchers and the availability of substitute pasture. At a minimum, the reduction in available grazing land likely would increase the costs of grazing for local ranchers if they substitute private pasture or more distant public grazing land for the decreased allotments available due to mine development. Although some livestock watering sources are anticipated to be lost due to dewatering near the mine site, mitigation is in place to replace these water sources.

The maximum economic effects from reduced availability of public grazing land would occur if ranchers had to reduce the size of their cattle herds in proportion to the decrease in the number of available grazing animal unit months (AUMs). Based on the projected reductions in grazing land under each tailings storage facility alternative, annual direct gross revenues from cattle production could be reduced by between $107,000 (under Alternatives 2 and 3) and $449,000 (under Alternative 6). These reductions could correspond to a loss of between 0.3 and 1.1 jobs directly and indirectly tied to local cattle ranching.

3.13.4.3 Cumulative Effects

Full details of the cumulative effects analysis can be found in chapter 4. The following represents a summary of the cumulative impacts resulting from the project-related impacts described in Section 3.13.4, Environmental Consequences, that are associated with socioeconomics, when combined with other reasonably foreseeable future actions.

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable, and have impacts that likely overlap in space and time with impacts from the Resolution Copper Project:

- ADOT Pinal County North-South Corridor
- LG Energy Solution Battery Production
- Florence Copper In-Situ Mining Project
- Merrill Ranch Master Planned Community Project
- Oak Wells Wind Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment

The cumulative effects analysis area for socioeconomic effects is the area encompassed by Maricopa, Pinal, Gila, and Pima Counties, as the economic changes caused by other projects would affect these same towns, economies, and public services. The metrics used to quantify socioeconomic cumulative impacts are (1) the overall change in labor workforce from baseline levels (percent), and (2) the overall effect on local housing and local community services, including emergency services. Industrial, commercial, and residential development has positive and negative impacts. These become cumulative mostly where residents see impacts from multiple projects on their communities, such as housing stock, housing prices, or services they rely upon such as schools, ambulance, fire department, or police services.

The ADOT Pinal County North-South Corridor, LG Energy Solution Battery Production, Merrill Ranch, and Oak Wells Wind RFFAs are deemed reasonably foreseeable, but have not advanced to design or any level of environmental or jurisdictional review that may include socioeconomic analysis. Therefore, at this time, no workforce or population estimates (construction or operations) for these projects have been completed. All four projects would generate jobs and economic stimulus during construction and could result in temporary worker in-migration. Furthermore, these projects would generate long-term workforce demands, economic stimulus, and permanent population to the area. Given the current lack of detail on these projects, estimating their cumulative contribution to socioeconomic impacts (both beneficial and adverse) would be speculative. However, all four projects are expected to cumulatively contribute both localized and regional population changes, as well as beneficial and adverse social change and economic effects. Of note is the ADOT Pinal County North-South Corridor, which will introduce a new transient population through the area and likely result in indirect population and economic growth due to providing a new regional transportation link.

For the rest of the RFFAs with available data, the size of the workforce is known with some certainty. For instance, the Pinto Valley Mine Expansion estimates a labor force of about 1,030 people, though the expansion would not change the overall labor force but would extend it for a longer time period. Florence Copper estimates a labor force of about 796 direct and indirect jobs. These would largely be drawing from the same labor pool as Resolution Copper, which anticipates over 3,700 direct and indirect/induced jobs during operations. There are about 60,000 jobs in Pinal County and Gila County combined; these projects together could represent as much as a 9 percent increase in the workforce in these two counties.

It is speculative to assign workforce numbers to the Ray Land Exchange, as no mine plans have been developed. Like the Pinto Valley Mine Expansion, it is likely the labor force would remain similar to current levels, but would shift from existing operations to new mining operations on the exchange lands.

In terms of use of impacts on local housing and local community services, Pinto Valley Mine Expansion and the Resolution Copper Project are in the closest vicinity to each other and would likely overlap in their use of services, both for the mines themselves as well as services used by employees in communities like the town of Superior and city of Globe.

In aggregate, these foreseeable and as-yet unknown actions would contribute to general socioeconomic conditions in the region in both positive and potentially negative terms. Large-scale mining development, in particular, tends to infuse relatively quick economic stimulus to local economies but can also create pressures on local infrastructure such as roads, schools, medical services, and the availability and affordability of housing. Large-scale mining projects such as the Resolution Copper Project and the mining developments described here may also adversely affect tourism, recreational opportunities, and what are considered desirable but less-tangible qualities of a rural setting and lifestyle.

3.13.4.4 Mitigation Effectiveness

Mitigation Identifier and Title	**Authority to Require**
FS-WR-01: GDEs and water well mitigation	Required – Forest Service
FS-WR-02: 404 compensatory mitigation plan	Required – U.S. Army Corps of Engineers
FS-WR-04: Replacement of water in Queen Creek	Required – Forest Service
FS-RC-02: Access to Oak Flat campground	Required – Forest Service
FS-RC-03: Mitigation for adverse impacts to recreational trails (Tonto National Forest multi-use trail plan)	Required – Forest Service
FS-SO-02: Establish foundations for long-term funding, including the Tribal Monitor Program	Required – Forest Service
RC-RC-04: Establish an alternative campground site (Castleberry) to mitigate the loss of Oak Flat campground	Committed – Resolution Copper
RC-RC-05: Mitigation for impacts on climbing resources	Committed – Resolution Copper
RC-SO-01: Community development fund	Committed – Resolution Copper
RC-SO-03: Establish a regional economic development entity for Copper Triangle communities (Superior, Hayden, Winkelman, and Kearney)	Committed – Resolution Copper
RC-SO-05: Continue funding Community Working Group	Committed – Resolution Copper
RC-SO-06: Agreement with Town of Superior to cover direct costs	Committed – Resolution Copper
RV-RC-06: Mitigation for public access to JI Ranch through AGFD cooperative agreement	Voluntary – Resolution Copper
RV-SO-04: Resolution Copper social investment program	Voluntary – Resolution Copper

We developed a robust monitoring and mitigation strategy to avoid, minimize, rectify, reduce, or compensate for resource impacts that have been identified during the process of preparing this EIS. Appendix J contains descriptions of mitigation measures that are being required by the Forest Service and mitigation measures voluntarily brought forward and committed to by Resolution Copper. Appendix J also contains descriptions of monitoring that would be needed to identify potential impacts and mitigation effectiveness.

This section contains an assessment of the effectiveness of design features associated with mitigation and monitoring measures found in appendix J that are applicable to socioeconomics. See appendix J for full descriptions of each measure noted below.

Mitigation Effectiveness and Impacts of Forest Required Mitigation Measures Applicable to Socioeconomics

Appendix J contains mitigation and monitoring measures being required by the Forest Service under its regulatory authority or because these measures are required by other regulatory processes (such as the Biological Opinion). These measures are assumed to occur, and their effectiveness and impacts are disclosed here. The unavoidable adverse impacts disclosed below take the effectiveness of these mitigations into account.

GDEs and water well mitigation (FS-WR-01). This measure would replace water sources for any riparian areas associated with springs or perennial streams (groundwater-dependent ecosystems) impacted by drawdown from the mine dewatering and block caving. Though this measure could change the overall natural character of riparian areas, it would be effective at preserving riparian vegetation and aquatic habitats, which are of importance to recreational users of the Tonto National Forest. Preserving recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Clean Water Act Section 404 compensatory mitigation plan (FS-WR-02). The compensatory mitigation parcels would offer conservation of riparian habitat, as well as overall improvement in the health and stability of riparian habitats, by minimizing invasive non-native species and returning conditions to a more natural state. This measure would be effective at replacing xeroriparian habitat lost within the project footprint. Whether recreation would be specifically allowed on these lands would be determined later, if compatible with conservation easements put in place to protect waters and habitat. The Queen Creek parcel would likely be effective at improving recreational opportunities in the immediate vicinity of Superior, when considered in combination with the Castleberry campground (FS-RC-04), implementing the Tonto National Forest multi-use trail plan (FS-RC-03), and replacement of water in Queen Creek (FS-WR-04). Preserving and enhancing recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Replacement of water in Queen Creek (FS-WR-04). This measure would replace the storm runoff in Queen Creek that otherwise would be lost to the subsidence area. It would be highly effective at minimizing the effects felt in Queen Creek caused by reduction in the watershed area, specifically impacts to surface water quantity and riparian habitat, which would prevent impacts to wildlife using this habitat. This would be effective at minimizing impacts to recreational users and birdwatchers drawn to riparian habitat in this area. Note that other stormwater losses would still occur under Alternatives 2, 3, and 4. Preserving and enhancing recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Access to Oak Flat campground (FS-RC-02). Maintaining access to Oak Flat campground, to the extent practicable with respect to safety, would be effective at reducing impacts caused by the loss of the Oak Flat area to subsidence. However, the user experience at the campground likely would not be the same, given the open space, trails, roads, and climbing opportunities that would no longer abut the campground.

Preserving recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Mitigation for adverse impacts to recreational trails (Tonto National Forest multi-use trail plan) (FS-RC-03). Implementation of this plan would replace over 20 miles of motorized and non-motorized trail on Tonto National Forest around Superior. The Oak Flat area is heavily used for recreation, and the loss of Federal land base due to the land exchange (and the tailings storage facilities for some alternatives) would put pressure on remaining recreation areas. This plan would be effective at expanding the motorized and non-motorized travel routes and recreational opportunities in a sustainable manner consistent with Tonto National Forest management direction. Replacing and enhancing recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Establish foundations for long-term funding, including the Tribal Monitor Program (FS-SO-02). Resolution Copper will establish a foundation or foundations for funding the continuation of the Tribal Monitor Program, long-term maintenance and monitoring of the Emory Oak Collaborative Tribal Restoration Initiative, and development of a Tribal Youth Program in partnership with the Forest Service and consulting Tribes. This measure would be effective at enhancing these other measures, as it would ensure that these programs have a long-term base of financial support, rather than short-term funding that would be eventually exhausted.

Mitigation Effectiveness and Impacts of Resolution Committed Mitigation Measures Applicable to Socioeconomics

Appendix J contains mitigation and monitoring measures committed by Resolution Copper in contractual, financial, or other agreements. These measures are assumed to occur, and their effectiveness and impacts are disclosed here. However, the unavoidable adverse impacts disclosed below do not take the effectiveness of these mitigations into account as they are not within the authority of the Forest Service to ensure.

Mitigation for impacts on climbing resources (RC-RC-05). The impacts to climbing resources are substantial, with the loss of the world-class climbing opportunities at Oak Flat, and these lost climbing areas cannot be replaced. The suite of mitigation measures voluntarily undertaken by Resolution Copper, after consultation with climbing groups, including the Queen Creek Coalition, would be effective at offsetting these impacts by improving access to other climbing areas in the vicinity and preventing impacts by maintaining access to existing climbing areas on Resolution Copper property. Preserving and enhancing recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Establish an alternative campground site (Castleberry) to mitigate the loss of Oak Flat campground (RC-RC-04). Establishing the replacement campground would be effective at offsetting impacts caused by loss of dispersed camping opportunities on the Tonto National Forest and the changes in the experience at Oak Flat campground. Replacing and enhancing recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Community development fund (RC-SO-01). Resolution Copper will establish a foundation for the communities of Superior, Miami, Globe, Kearny, Hayden, and Winkelman for the rehabilitation of historic buildings. This measure would be effective at helping prevent the loss of historic properties within the Copper Triangle, preserving them for future generations, and preserving the historic mining heritage of these towns. This would contribute to the long-term socioeconomic revitalization of these communities.

Establish a regional economic development entity for Copper Triangle communities (Superior, Hayden, Winkelman, and Kearney) (RC-SO-03). Through investment of an initial endowment, Resolution Copper will develop a sustainable regional economic development entity (or entities) to provide programming and investment in the Copper Triangle Communities (Superior, Hayden, Winkelman, and Kearney). This new community-based entity will partner with external organizations, local municipalities and stakeholders. Specifically, partnerships will be sought with organizations having certain expertise and tools to support and enhance the quality of life in the region, such as strategic planning for economic reinvestment and workforce development. This collaborative approach, with financial support, would be effective at developing projects that would offset potential socioeconomics impacts associated with the mine that are not yet identified, such as labor force issues, housing problems, or public services.

Continue funding Community Working Group (RC-SO-05). Continued funding of the Community Working Group ensures that a diverse set of viewpoints from the local community are engaged in issues related to the mine, which would be effective at identifying potential adverse impacts and potential remedies.

Agreement with Town of Superior to cover direct costs (RC-SO-06). The agreement with the Town of Superior that Resolution Copper directly pay for costs associated with municipal services that are a result of operation of them mine, such as use of public services and road maintenance, would be effective at ensuring the Town of Superior and its residents are not unduly burdened with the impacts of the mine without also engaging in economic benefits from the mine.

Mitigation Effectiveness and Impacts of Resolution Voluntary Mitigation Measures Applicable to Socioeconomics

Appendix J contains mitigation and monitoring measures brought forward voluntarily by Resolution Copper and committed to in correspondence with the Forest Service. These measures are assumed to occur but are not guaranteed to occur. Their effectiveness and impacts if they were to occur are disclosed here; however, the unavoidable adverse impacts disclosed below do not take the effectiveness of these mitigations into account.

Mitigation for public access to JI Ranch through AGFD cooperative agreement (RV-RC-06). This measure would be effective at offsetting the loss of open land base for recreation, including providing specific opportunities hunting and motorized recreation. Enhancing recreational opportunities is beneficial to the long-term socioeconomic stability of the Superior area.

Resolution Copper social investment program (RV-SO-04). This program is designed to help create a diverse local business community and focuses on projects that help build a healthier and safer community, including parks/pool facilities and schools. These projects would be effective at developing projects that would offset potential socioeconomics impacts associated with the mine that are not yet identified, including education and quality of life.

Unavoidable Adverse Impacts

Loss of jobs in the local tourism and outdoor recreation industries cannot be avoided or fully mitigated. Likewise, loss in property values for property close to the mine would constitute an impact that cannot be avoided or fully mitigated. The applicant-committed measures would be effective at expanding the economic base of the community and improving resident quality of life, and could partially offset the expected impacts, although many of the current agreements would expire prior to full construction of the mine. Many of the mitigation measures that would contribute to the recreational economy of the Superior area are required and these impacts would be offset, and recreational opportunities may even be enhanced. Many of the mitigation measures that would directly offset socioeconomic effects in the area are voluntary only. These mitigation measures would effectively offset impacts but cannot be guaranteed to take place.

3.13.4.5 Other Required Disclosures

Short-Term Uses and Long-Term Productivity

Socioeconomic impacts are both positive and negative and are primarily short term. The project would provide increased jobs and tax revenue from construction through final reclamation and closure. However, this would be offset by potential impacts on local tourism and outdoor recreation economies, and a decrease in nearby property values. As these effects are largely the result of the tailings storage facility, which is a permanent addition to the landscape, they could persist over the long term.

The long-term continued population and economic growth in areas of the Copper Triangle with existing copper mines indicates that these impacts are in the magnitude of being decades long and would not be permanent.

Irreversible and Irretrievable Commitment of Resources

Some changes in the nature of the surrounding natural setting and landscape would be permanent, including the tailings storage facility and the subsidence area. The action alternatives would therefore potentially cause irreversible impacts on the affected area regarding changes in the local landscape, community values, and quality of life.

3.14 Tribal Values and Concerns

3.14.1 Introduction

This project would occur across a landscape that is important to many Tribes, has been for many generations, and continues to be used for cultural and spiritual purposes. Tonto National Forest has consulted regularly with 11 federally recognized Tribes that are culturally affiliated with the lands that would be affected and have had the opportunity to be active in the consultation, review, and comment processes of the project. No Tribe supports the desecration/destruction of ancestral sites. Places where ancestors have lived are considered alive and sacred. It is a Tribal cultural imperative that these places should not be disturbed or destroyed for resource extraction or for financial gain. Continued access to the land and all its resources is necessary and should be accommodated for present and future generations. Participation in the design of this destructive activity has caused considerable emotional stress and brings direct harm to a Tribe's traditional way of life; however, it is still deemed necessary to ensure that ancestral homes and ancestors receive the most thoughtful and respectful treatment possible.

Overview

In accordance with treaties, laws, executive orders, regulation and policy, the Tonto National Forest consults formally (government-to-government) and collaborates informally (staff-to-staff) with federally recognized Tribal nations that may be affected by the federal decision-making process. Moreover, the NDAA requires within its stipulations specifically that the Forest Service consult with federally recognized Tribes that may be affected by the project to understand potential project impacts to resources and spiritual values of concern to federally recognized Tribes. The Resolution Copper Mine and Southeast Arizona Land Exchange has a high potential to directly and permanently adversely affect numerous cultural resources sites, including archaeological resources, areas with sacred values, and other places of spiritual and cultural significance to members of federally recognized Tribes. This section describes the formal government-to-government consultation and informal staff-to-staff collaboration conducted to date between the Tonto National Forest and the 15 federally recognized Tribes that have chosen to actively engage with the Forest Service on this project.

By law, Federal agencies must consult with Indian Tribes about proposed actions that may affect lands and resources important to them, in order to comply with the NHPA for NRHP-listed historic properties (see Section 3.14.3, Affected Environment, for the list of laws and regulations). Section 3003 of PL 113-291 also requires that the Secretary of Agriculture engage in government-to-government consultation with affected Tribes concerning issues related to the land exchange. The Secretary of Agriculture authorized the Forest Supervisor, Tonto National Forest, to consult with Resolution Copper to seek mutually acceptable measures to address the concerns of the affected Tribes and minimize the adverse effects from mining and related activities on the conveyed lands.

Beginning in 2015, the Tonto National Forest began consultation with 11 Tribes regarding the proposed mine, the land exchange, and the development of alternate tailings locations. Tonto National Forest also consulted the Tribes regarding the management of the Apache Leap SMA, as directed by Section 3003 of PL 113-291.

Government-to-government consultations are ongoing between Tonto National Forest and the Fort McDowell Yavapai Nation, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pueblo of Zuni, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, and Yavapai-Prescott Indian Tribe. The four O'odham Tribes (the Four Southern Tribes Cultural Committee) are represented by the Salt River Pima-Maricopa Indian Community and the Gila River Indian Community. The BLM identified four Tribes that may be affected if the alternative on BLM land is selected: the Ak-Chin Indian Community, Fort Sill

Apache Tribe, Pascua Yaqui Tribe, and Tohono O'odham Nation. See Chapter 5, Consulted Parties, for a full account of consultation to date.

Tribal values and concerns regarding the land exchange and the proposed GPO include resources with traditional or cultural significance, some of which are also described in Section 3.12, Cultural Resources. Resources of traditional or cultural significance can be traditional cultural places (TCPs) as defined by National Register Bulletin 38, "Guidelines for Documenting and Evaluating Traditional Cultural Properties" (Parker and King 1998); sacred places; and traditional knowledge places (TKPs)—including burial locations, landforms, viewsheds, and named locations in the cultural landscape; water sources; and traditional resource-gathering locations for food, materials, minerals, and medicinals.

3.14.1.1 Changes from the DEIS

Several changes were made to the "Tribal Values" section of the DEIS. We received numerous comments from Tribal members about the sacredness and importance of Oak Flat to them, their lives, their culture, and their children. Many expressed their sadness and anger that their sacred place would be destroyed and that they would lose access to their oak groves and ceremonial grounds. In response, we added information on the history of Oak Flat and its significance to the Tribes; expanded the plant resources list with information gathered by the Tribal monitors; included Tribal monitor survey results conducted since the DEIS for special interest areas; and disclosed information from the ethnographic report while respecting the sensitive nature of that data. We also included excerpts from Congressional testimony (outside designated public input periods), as well as personal perspectives and comments from Tribal members collected during the DEIS comment period.

3.14.1.2 Changes from the January 2021 Rescinded FEIS

One reason for the March 2021 withdrawal of the Notice of Availability and rescinding of the January 2021 FEIS was to allow the Forest Service to re-engage with consulting Tribes to fully understand their concerns. On September 20, 2021, the Forest Service notified Tribes that the Forest Service would reinitiate Tribal consultation. This was followed by a Tribal listening session on October 19, 2021, and subsequent consultation and staff meetings thereafter. The reinitiated Tribal consultation has informed the republished FEIS.

Since ACHP did not sign the PA, the PA was never executed. Therefore mitigation measures identified in the PA and any others identified subsequently will now be implemented through the final ROD and special use permit for use of NFS lands, and through enforcement by other State and Federal agencies as well as third parties in separate agreements. Changes in enforcement of the measures described in the draft PA are further described in appendix J.

Other changes since January 2021 are as follows: (1) revisions to the cumulative effects analysis based on updates to the list of potentially reasonably foreseeable actions, and (2) the section has been updated to reflect analysis of consistency with the new "Tonto National Forest Land Management Plan," implemented in December 2023.

3.14.2 Analysis Methodology, Assumptions, and Uncertain and Unknown Information

3.14.2.1 Analysis Area

The direct, indirect, and atmospheric analysis areas for Tribal values and concerns are the same as for cultural resources, found in section 3.12.2. The direct analysis area for the proposed project is defined by several factors: the acreage of ground disturbance expected for each mine component described in the

GPO and the acreage of land leaving Federal stewardship as a result of the land exchange. The direct analysis area for the proposed action (GPO and land exchange) is approximately 39,272 acres and consists of the following, which includes access roads and other linear infrastructure:

- 1,861-acre East Plant Site and subsidence area, including the reroute of Magma Mine Road;
- 2,422-acre Oak Flat Federal Parcel, which is NFS land to be exchanged with Resolution Copper;
- 953-acre West Plant Site and Silver King Road realignment;
- 6.96-mile Silver King to Oak Flat transmission line;
- 685-acre MARRCO railroad corridor and adjacent project components;
- 553-acre filter plant and loadout facility;
- Alternatives 2, 3, 4, 5, and 6 tailings storage facilities and tailings corridors; and
- Mitigations to reduce recreational impacts and compensatory mitigation associated with a 404 permit.

The indirect analysis area consists of a 2-mile buffer around all project and alternative components and is designed to account for impacts on resources not directly tied to ground disturbance and outside the direct analysis area.

The atmospheric analysis area consists of a 6-mile buffer around all project and alternative components. This distance is consistent with the indirect analysis area for visual impacts and the Section 106 APE as described in section 3.12, modified by the addition of a small portion of land south of Picketpost Mountain, a 1-mile extension farther east to the San Carlos Apache Indian Reservation boundary, and an extension to the southeast to encompass Kearny, Arizona, and historical use of that area. The indirect impacts analysis area encompasses approximately 752,229 acres. The analysis area for Tribal values is shown in figure 3.14.2-1.

Visual Impact Analysis

The visual impact analysis for Tribal values follows the scenic resources analysis presented in Newell, Grams, et al. (2018). The visual impacts analyzed are within the scenic resources analysis area (see section 3.11), which is defined by buffers around project components:

- 6 miles around tailings facility alternatives,
- 2 miles around slurry pipeline corridors, the East Plant Site and subsidence area, the West Plant Site, and transmission lines, and
- 1 mile on either side of the MARRCO corridor

For the 2-mile buffer around slurry pipeline corridor alternatives, the East Plant Site and subsidence area, the West Plant Site, and transmission lines, and the 1-mile buffer for the MARRCO corridor, it was assumed that those project components could be seen with their buffers with no obstructions.

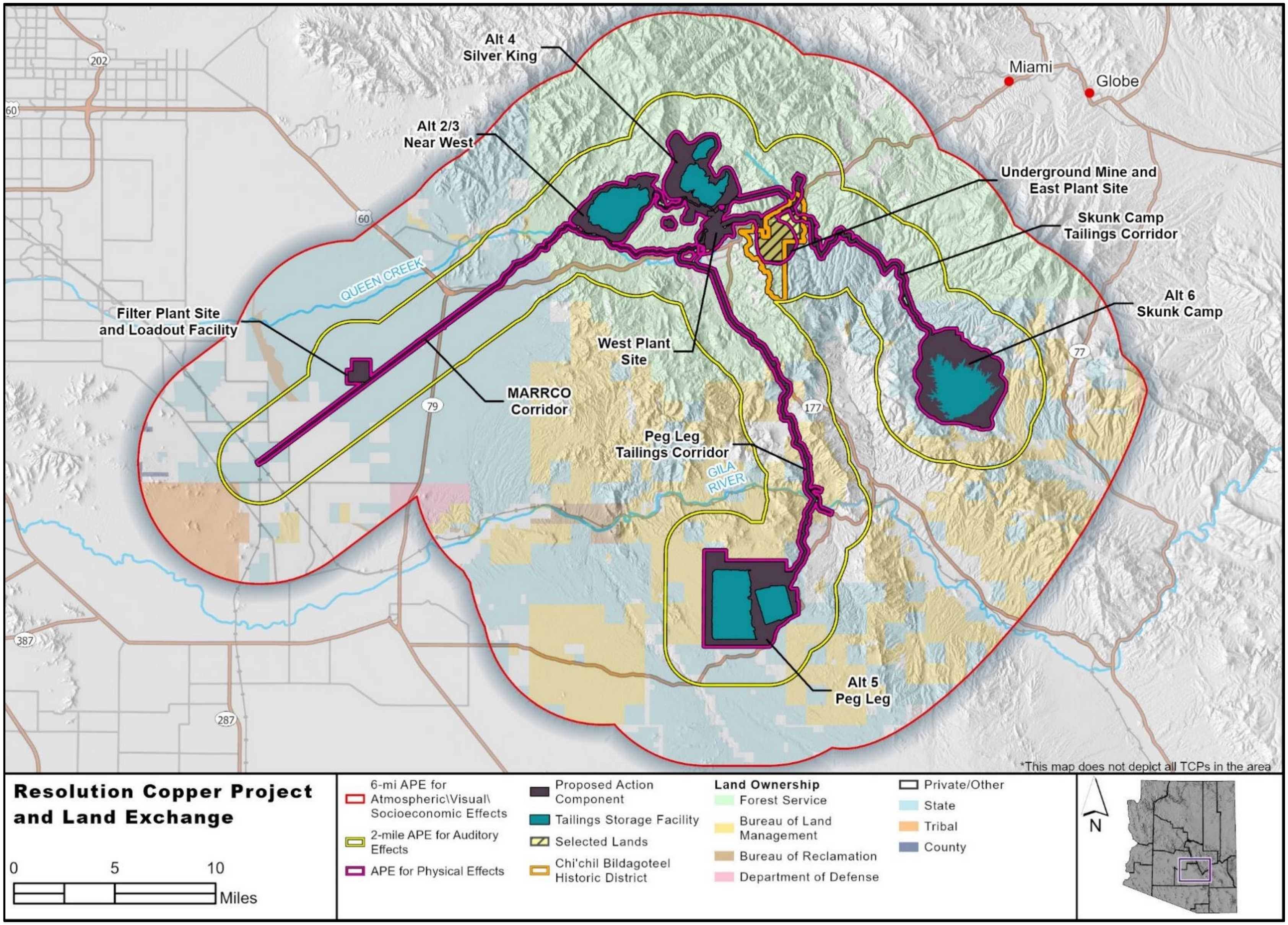

Figure 3.14.2-1. Tribal resources analysis area

3.14.2.2 Analysis Approach

The Forest Service worked collaboratively with the Tribes to gather information on Tribal values and resources via an ethnographic study (Hopkins et al. 2015) and through ongoing consultation. Resolution Copper funded the collection of cultural resources information important to Tribal members through Class I records searches and Class III pedestrian surveys. During consultation, several Tribes requested the inclusion of Tribal monitors in the archaeological survey to record areas of special interest. To honor that request, the Forest Service arranged for the archaeological contractors to employ Tribal monitors.

Impact Indicators

Direct impacts on resources of traditional cultural significance (archaeological sites; burial locations; spiritual areas, landforms, viewsheds, and named locations in the cultural landscape; water sources; food, materials, mineral, and medicinal plant gathering localities; or other significant traditionally important places) would consist of damage, loss, or disturbance that would alter the characteristic(s) that make the resource eligible for listing in the NRHP or sacred to the respective cultural group(s). The loss might be caused by ground disturbance, loss of groundwater or surface water, or by the erection of facilities that alter the viewshed. Indirect impacts would consist primarily of visual impacts from alterations to setting and feeling, auditory impacts, or inadvertent disturbance.

Impact indicators for this analysis include the following:

- Loss, damage, or disturbance to historic properties, including TCPs listed in or eligible for listing in State or Federal registers, that are significant to Native American Tribes.
- Loss, damage, or disturbance to burial sites; spiritual areas and viewsheds; cultural landscapes; sacred places; springs and other water resources; food and medicinal plants; minerals; and hunting, fishing, and gathering areas.
- Loss of access to burial sites; spiritual areas and viewsheds; cultural landscapes; sacred places; springs and other water resources; food and medicinal plants; minerals; and hunting, fishing, and gathering areas.
- Alterations to setting, feeling, or association of historic properties significant to Native American Tribes, including TCPs where those characteristics are important to their State or Federal register eligibility.

Assuming the land exchange occurs, as mandated by Congress in Section 3003 of PL 113-291, the selected lands would be conveyed to Resolution Copper no later than 60 days after the publication of the FEIS, and the Oak Flat Federal Parcel would become private property and no longer be subject to the NHPA or Forest Service management that provides for Tribal access. Under Section 106 of the NHPA and its implementing regulations (38 CFR 800), historic properties leaving Federal management is considered an adverse effect regardless of the plans for the land, meaning that as analyzed under NEPA, the land exchange will have an adverse impact on resources significant to the Tribes.

Adverse impacts on historic properties would be avoided, minimized, or mitigated through measures developed during the Section 106 process of the NHPA and through Tonto National Forest’s consultations with Resolution Copper in accordance with Section 3003 of PL 113-291. As noted above, since the PA was never executed, the measures developed during the Section 106 process may be required under different authorities, as discussed in appendix J. Adverse impacts on resources that may not be historic properties under Section 106 would be avoided, minimized, or mitigated through steps outlined in the FEIS and ROD.

3.14.3 Affected Environment

3.14.3.1 Relevant Laws, Regulations, Policies, and Plans

The primary legal authorities and agency guidance relevant to this analysis of anticipated project-related impacts on Tribal resources are shown in the accompanying text box.

A complete listing and brief description of the regulations, reference documents, and agency guidance used in this effects analysis may be reviewed in Newell (2018i).

Primary Legal Authorities and Technical Guidance Related to the Effects Analysis for Tribal Values and Concerns

- National Historic Preservation Act of 1966 (54 U.S.C. 300101 et seq.)
- Archaeological Resources Protection Act (16 U.S.C. 470aa–470mm)
- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Religious Freedom Restoration Act (42 U.S.C. 2000bb et seq.)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001–3013)
- U.S. Forest Service Region 3 First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities (executed December 24, 2003)
- Executive Order 13007 (May 24, 1996), “Indian Sacred Sites”
- Executive Order 13175 (November 6, 2000), “Consultation and Coordination with Indian Tribal Governments”
- Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 688–688d)
- Endangered Species Act (16 U.S.C. 1531–1543)
- Migratory Bird Treaty Act (16 U.S.C. 703–711)
- National Environmental Policy Act (42 U.S.C. 4321 et seq.)

3.14.3.2 Existing Conditions and Ongoing Trends

Resolution Copper funded cultural resources surveys of the proposed project area and tailings alternatives, as outlined in section 3.12. Tribal monitors resurveyed or accompanied archaeological survey crews in those areas to identify areas of Tribal interest to four cultural groups with ties to the area (Puebloan, O’odham, Apache, and Yavapai), to include springs and seeps, plant, animal, and mineral resource collecting areas, landscapes, and landmarks. All springs and seeps are considered sacred by all the consulting Tribes.

Tonto National Forest conducted Tribal monitor resource identification survey training sessions in January 2018, October 2018, and September 2019, as described in Section 5.7.1, Tribal Monitor Program. The method for identifying places of importance consisted of four steps (King and Shingoitewa 2020). First, Tribal monitors walked the survey areas looking for areas of interest, which were defined as special interest areas. The special interest areas were loosely grouped into categories: Settlement Areas, Resource-Gathering Areas, Agricultural Areas, and Natural Resources Areas. Second, if a special interest area was deemed to be particularly important, it was further recorded as a TKP. Then, the Tonto National Forest staff would present the TKP to the THPO or the designated Tribal representative as a potential TCP. Finally, the TKP would be evaluated by Tribal elders, THPOs, and/or other designated Tribal representative through field visits. Resulting TCP requests from the Tribes would then be shared with Tonto National Forest staff for evaluation under the NHPA.

As a result of completing the Tribal Monitoring Program resource identification surveys, more reports have been made available for consideration in the FEIS analysis. These reports include: the final Tribal Monitor report for Alternative 5 – Peg Leg; and the draft Tribal Monitor reports for the Oak Flat Federal Parcel, Near West (Alternatives 2 and 3), and Silver King (Alternative 4). For the Skunk Camp (Alternative 6), and the Peg Leg (Alternative 5) pipeline and power line corridor surveys, all fieldwork is complete and the data collected are presented and analyzed in this document.

In 2015, the Tonto National Forest, in partnership with the San Carlos Apache Tribe, composed a nomination for Oak Flat, the area originally known as *Chí'chil Biłdagoteel*, to be listed in the NRHP as a TCP (Nez 2016). This effort consisted of extensive literature research and interviews with Tribal members.

In addition, an ethnographic study was completed titled "Ethnographic and Ethnohistoric Study of the Superior Area, Arizona" (Hopkins et al. 2015). The study consisted of archival and existing literature review and compilation, as well as oral interviews and field visits with Tribal members to collect oral history and knowledge. Tribal members accompanied research staff to important places throughout the study area and shared information about those places. Members of the San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, Fort McDowell Yavapai Nation, Yavapai-Prescott Indian Tribe, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, Hopi Tribe, and Pueblo of Zuni contributed to the study. This study was used in the FEIS analysis.

History of Oak Flat

The concept of a cultural landscape must drive how we analyze the impacts of the proposed project (King 2003; National Park Service 2020; U.S. Forest Service 2015c). According to the National Park Service, a cultural landscape is "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person, or exhibiting other cultural or aesthetic values" (National Park Service 2020). For Tribes, a cultural landscape encompasses all of the places, resources, features, archaeological sites, springs, etc., that are associated with their history and way of life. Each of the Tribes associated with the project area has their own way of defining and understanding their cultural landscape which are described briefly below; however, all the Tribes share some places or resources that they feel are vital and sacred parts of their landscapes. Places like springs, ancestral (archaeological) sites, plants, animals, and mineral resource locations are sacred and should not be disturbed or disrupted.

The Oak Flat Federal Parcel slated to be transferred to Resolution Copper was once part of the traditional territories of the Western Apache, the Yavapai, the O'odham, and the Puebloan Tribes of Hopi and Zuni. They lived on and used the resources of these lands until the lands were taken by force 150 years ago. The following briefly describes their historic connection to the land and how they were removed from it and confined by the U.S. Government.

WESTERN APACHE

Apache oral tradition recounts that the first Western Apache clans emerged from the First World into what is now the Southwest (Goodwin 1994). The world was defined by the four cardinal directions and their associated mountains and winds (Goodwin 1994). The Apache call themselves Nde or "the People." The term "Western Apache" is used to refer to Apache groups that historically have lived in Arizona (Goodwin 1935), composed of the San Carlos Apache, the White Mountain Apache, the Cibecue Apache, and the Tonto Apache, according to Basso (1983). The San Carlos Apache ranged through the Pinal, Apache, Mescal, and Catalina Mountains and along the San Pedro River (Basso 1983; Hilpert 1996). The White Mountain Apache ranged from the White Mountains to the Pinaleño Mountains. The Cibecue Apache ranged from the Salt River north to the Flagstaff area; the Tonto Apache lived from around the Verde River north to the San Francisco Mountains (Basso 1983).

Each Western Apache group ranged across their territory gathering seasonal resources and moving camp as resources became available (Basso 1970; Buskirk 1949; Hilpert 1996). Mescal was gathered in the spring and summer and roasted in large pits (Basso 1983; Hilpert 1996; Watt 2004). Later in the spring, they would plant corn in canyons, returning periodically to check on the corn and water it (Basso 1971; Hilpert 1996). In the late summer and fall, the Apache gathered acorns and harvested the corn (Basso 1971).

When foods were scarcer from December to March, the Apache would focus on raiding for supplies and livestock (Basso 1983, 1971).To the Apache, raiding was different from warfare: raiding was an economic activity designed to obtain goods, while warfare was to kill enemies (Basso 1971). The Apache often raided the O'odham, as well as Mexican ranchers (Brooks 2016). They occasionally raided Yavapai groups but more often would ally with them against the O'odham. The O'odham raided the Apache and Yavapai in retaliation. The area around Superior-Globe was a meeting place for Apache and Yavapai who were headed south to raid the O'odham (Basso 1971).

The Spanish were the first Anglo people to encounter the Apache; however, the Spanish did not have much influence north of the Gila River (Sheridan 1995). After the signing of the Treaty of Guadalupe in 1848 (which ended the Mexican–American War and ceded the Southwest to the United States), Euro-American settlers began arriving in Western Apache lands in search of mineral wealth and ranching lands. Repeated conflicts between settlers and Apache prompted the U.S. Government to build forts on Apache lands (Basso 1983, 1971; Hilpert 1996; Thrapp 1967). The presence of these forts and their troops had a devastating effect on the Apache, as soldiers killed Apache they saw as a threat and the Apache retaliated (Basso 1971). Several massacres of Apache by soldiers and civilians occurred from the 1850s through the 1870s, including the reported events at Apache Leap. In the 1870s, the Apache were forced off their lands and onto reservations: Fort Apache, Camp Verde, Camp Grant (and later San Carlos), and Ojo Caliente (Basso 1983, 1971). This effort was led by General George Cook, who assumed command of the army in Arizona in 1871. In 1874, the U.S. government further embarked on a program to move the Western Apache, Chiricahua Apache, and Yavapai onto San Carlos with the idea that this would make them easier to control and would facilitate their transition to farming and ranching (Basso 1971). However, the different groups did not know one another, which led to friction, the settled agricultural life was the opposite of their lifeway, and they were not provided with adequate resources. Conflicts between the U.S. Army and Apache who escaped the reservations or had refused to go continued until 1890.

A reservation was eventually established in the lands of the Cibecue and White Mountain Apache in 1897. Apache and Yavapai who left San Carlos to return to the Verde Valley or the Payson area found they did not have land there as promised. A reservation at Camp Verde for Apache and Yavapai was established in 1937, which later became the Yavapai-Apache Nation in 1992. A small reservation was established in 1972 for the Tonto Apache in Payson. All these communities lost large portions of their homelands, including Oak Flat, and today live on lands that do not encompass places sacred to their cultures.

For the Western Apache, history and place-naming are an integral part of the cultural landscape (Basso 1996). Place names were originally spoken by the ancestors and invoke past events that occurred at that location (Basso 1996). History for the Apache is "written" across the landscape through place names; names can evoke those events so that they are also, in a sense, happening when they are being spoken of. Knowing these places is vital to understanding Apache history and, therefore, identity. For the Western

Apache, “the people’s sense of place, their sense of the tribal past, and their vibrant sense of themselves are inseparably intertwined” (Basso 1996).

The Apache landscape is imbued with diyah, or power (Basso 1996). Diyah resides in natural phenomenon like lightning, in things like water or plants, and in places like mountains. Gáán, or holy beings, live in important natural places and protect and guide the Apache people (Hilpert 1996). They come to ceremonies to impart well-being to Apache, to heal, and to help the people stay on the correct path.

YAVAPAI

The Yavapai once ranged a huge area from Flagstaff in the north, to the Colorado River to the west, to the Salt and Gila Rivers to the south, and the Tonto Basin to the east (Khera and Mariella 1983). Yavapai people belong to one of four groups, each with its own lands: the Tolkepaya (Western People), Kwevkepaya (Southeastern People), Wipukepa (Northeastern People), and Yavapé (Northwestern People) (Braatz 2007; Khera and Mariella 1983).The Kwevkepaya lived in and around the analysis area (Gifford 1932). The Yavapai have occupied these lands from the beginning. According to their oral history, the Yavapai emerged from the underworld into the current world on the first maize plant from Montezuma’s Well (Khera and Mariella 1983).

Like the Apache, the Yavapai traveled across the landscape to take advantage of seasonally available resources, as well as some farming (Braatz 2007; Gifford 1932). Among the many plant resources that the Yavapai sought were acorns (Khera and Mariella 1983). Also like the Apache, the Yavapai would raid their neighbors for supplies and they sometimes joined with the Apache to raid the O’odham (Basso 1971; Braatz 2007).

After the signing of the Treaty of Guadalupe, the influx of Euro-American settlers began to impact the Yavapai way of life as they were forced off their lands. The Yavapai generally avoided conflicts with the newcomers; however, by the 1860s, they began to have conflicts as more settlers invaded their lands (Khera and Mariella 1983). In 1865, a group of Yavapai were settled on a reservation near the Colorado River but did not have enough resources to survive. Other attempts to settle Yavapai on reservations were also unsuccessful until the early 1870s when General Crook ordered that they be moved to the newly established Rio Verde Reservation (Khera and Mariella 1983); however, this policy led to a horrible massacre. In December of 1872, the U.S. Army, which had been tasked with rounding up the Yavapai, killed a group of Kewevkapaya in the Salt River Canyon (Thrapp 1967). The Yavapai were moved onto the Rio Verde Reservation by 1873; however, just 2 years later in the winter of 1875 they were moved again to the San Carlos Reservation along with the Apache. Conditions along the 180-mile route to San Carlos were very harsh, and over 100 Yavapai died during the march (Khera and Mariella 1983). The Yavapai lived with the Apache at San Carlos until the 1890s when they were allowed to return home; however, it took several decades for reservations for the Yavapai to be established.

O’ODHAM

The “O’odham” or “the People” consists of the Akimel O’odham (River People), Tohono O’odham (Desert People), the Sobaipuri, and the Hia-Ced O’odham (Sand People). They lived across an area encompassing the Gila and Salt River valleys to the north, the Sonoran Desert to the south, the San Pedro River to the east, and to the Gulf of California to the west.

According to O’odham oral traditions, the world was created by the Earth Medicine Man. The Earth Medicine Man created beings such as Coyote and Elder Brother (Bahr 2001). Although Earth Medicine Man made people, they were flawed and were destroyed in a flood. Elder Brother then created the O’odham out of mud or clay (Bahr 2001). Elder Brother taught people how to farm and irrigate their crops in the desert (Bahr 2001); he charged the people to care for the land and live in the desert which "is the center of all things" (Fontana 1989). The archaeological remains that are found across central and southern Arizona are the villages of these early ancestors and are known as Huhugam or "past peoples," "The-finished-ones," or "something that is used up" (Bahr 2001; Lopez 2007).

Contact with Europeans was more intensive for the O'odham than for the Apache or Yavapai. In the sixteenth century, the Spanish arrived and established missions in southern Arizona to convert Native peoples to Catholicism (Bolton 1936). When Mexico gained independence from Spain in 1821, the O'odham lands became part of Mexico; however, after the signing of the Treaty of Guadalupe in 1848, O'odham lands were split between Mexico and the United States. Not long after the treaty was signed, Euro-Americans began to arrive in search of gold, silver, and in search of land to farm or graze livestock (Ahlstrom 2000; Sheridan 1995). In response to the pressure of these new arrivals on O'odham land, reservations were established. Along the Gila River, two reservations, the Gila River Indian Community and the Salt River Pima-Maricopa Indian Community, were established for the Akimel O'odham and members of the Maricopa (Pee Posh) from the lower Colorado River who had joined the Akimel O'odham in the 1840s in response to conflicts with other Tribes along the Colorado. Two more reservations were established to the south: the Ak-Chin Indian Community and the Tohono O'odham Nation. Although the O'odham live across four reservations, they consider themselves to be one people.

The O'odham use songscapes to remember and understand their cultural landscape (Darling and Lewis 2007). O'odham song series often describe places and their relationships to one another; they create a map that follows a cognitive trail across the landscape. A song series will reference places in a "linear, circular, or meandering path without repeated returns to the same location" (Darling and Lewis 2007). These songs follow particular trails or routes to important ritual places; they serve as a guide for the traveler and incorporate time and history into the landscape (Darling and Lewis 2007).

PUEBLOAN

For the Hopi, Hopitutskwa or Hopi Land comprises everywhere they have lived in the past (Hedquist et al. 2018; Koyiyumptewa and Colwell-Chanthaphonh 2011). According to Hopi oral tradition, the Hopi emerged from the Fourth World into the current world through the Sipapuni, which is found along the Little Colorado River (Courlander 1971). Once they arrived in the Fourth World, they encountered Masaaw, the "Ruler of the Upper World, Caretaker of the Place of the Dead and the Owner of Fire" (Courlander 1971). Masaaw charged the Hopi to take care of the earth and journey until they found the Earth Center or Tuuwanasavi (Colwell and Koyiyumptewa 2018; Ferguson and Colwell-Chanthaphonh 2006). The Hopi clans moved throughout the Southwest in this quest, sometimes living in places for a while before moving on, until they all reached the Hopi Mesas where the Hopi live today. These ancestors are collectively referred to as the Hisatsinom or "people of long ago" (Dongoske et al. 1997). As the Hopi moved across the lands, they left "footprints" in the form of archaeological remains.

Of significance to the project area, is the Hopi oral tradition of Palatkwapi or "red walled city" from which the Water Clan, and related clans, migrated (Teague 1993). Palatkwapi was to the south of the Hopi Mesas, somewhere in south-central Arizona, and within the Hohokam region. The city was located near a river that always had water in it, and there were regular rains for the corn to grow (Courlander 1971). People in Palatkwapi began to lose their way and behave improperly. Flooding destroyed the city, and the clans were forced to leave. Eventually, they made their way to Hopi Mesa. The analysis area is both within the lands of Water Clans and associated clans, as well as the regions through which the Hopi clans traveled during their migration.

The Hopi clan migration stories as they journeyed to the Earth Center Place define their cultural landscape (Ferguson and Colwell-Chanthaphonh 2006). When Masaaw charged the Hopi to find the Tuuwanasavi, he also instructed them to leave *itaakuku* or "footprints" to show that they done what they were charged to do (Ferguson and Colwell-Chanthaphonh 2006). These footprints consist of the archaeological remains seen today in the Southwest. These footprints create “complex spatial and temporal patterns on the land” (Ferguson and Colwell-Chanthaphonh 2006), creating a map showing the clan journeys.

For the Zuni, after the world was created, the Zuni ancestors, *A:łashshina:kwe*, emerged from the lower worlds into the Fourth World at *Chimik’yana’kya deya’a*, a canyon on the Colorado River (Ferguson and Colwell-Chanthaphonh 2006; Ferguson and Hart 1985). From there, the clans set off on a journey to find the Middle Place, or *Itiwana*, in three groups. One group traveled north, one east, and one south. The Zuni traveled all over the Southwest up to the Jemez Mountains (*He:mushina Yalla:we*) and beyond and south to Escudilla Peak (*Shohk’ona Im’a*); one group went more directly to *Itiwana* up the Zuni River (Ferguson and Hart 1985). During the journey, they built villages along their routes and left “memory pieces,” artifacts and other archaeological remains, to show they had been there (Ferguson and Colwell-Chanthaphonh 2006). The Zuni were shown the location of *Itiwana* by a water spider, *K’yan’asdebi*, who spread himself across the land so that his heart was directly over *Itiwana* and his legs showed the four cardinal directions and the zenith and nadir.

One group of Zuni, *A’lahonakwin da’na don a:wanuwa* or “Ancient Ones Who Journeyed to the Land of Everlasting Sun” traveled south and stayed there (Ferguson and Colwell-Chanthaphonh 2006). The Zuni had long-standing contacts with groups to the south through many avenues. Zuni trails run south all the way to Mexico and they maintained trade relationships with many peoples, including the O’odham (Ferguson and Colwell-Chanthaphonh 2006; Ferguson and Hart 1985). Zuni also traveled to the south to gather plants and minerals, and to hunt (Ferguson and Hart 1985). All of these areas are part of the Zuni cultural landscape.

3.14.3.3 Adjudicated Boundaries

Figure 3.14.3-1 shows the proposed project and alternatives, as well as the analysis area/APE, with the 1978 adjudicated boundaries from the Indian Claims Commission (1978) mapping. Three groups have land areas that intersect with the project area or the analysis area: Western Apache, Pima-Maricopa, and Yavapai.

The Western Apache territory stretches from the San Francisco Peaks just north of Flagstaff south to the Rincon Mountains southeast of Tucson. The western border of the Western Apache area is just east of the Verde River along the Mazatzal Mountains down to the Gila River at Winkelman and south to the Rincon Mountains. To the east, the border runs from the San Francisco Peaks southeast across the Colorado Plateau along the Little Colorado River to the San Francisco Mountains and the New Mexico border and then roughly southwest to the Rincon Mountains.

The Pima-Maricopa territory (Akimel O’odham) consists of all of the Phoenix Valley (Gila and Salt River basins) and extending to the east to the Pinal Highlands, south to Avra Valley, west to the Gila Bend Mountains, and north to Lake Pleasant.

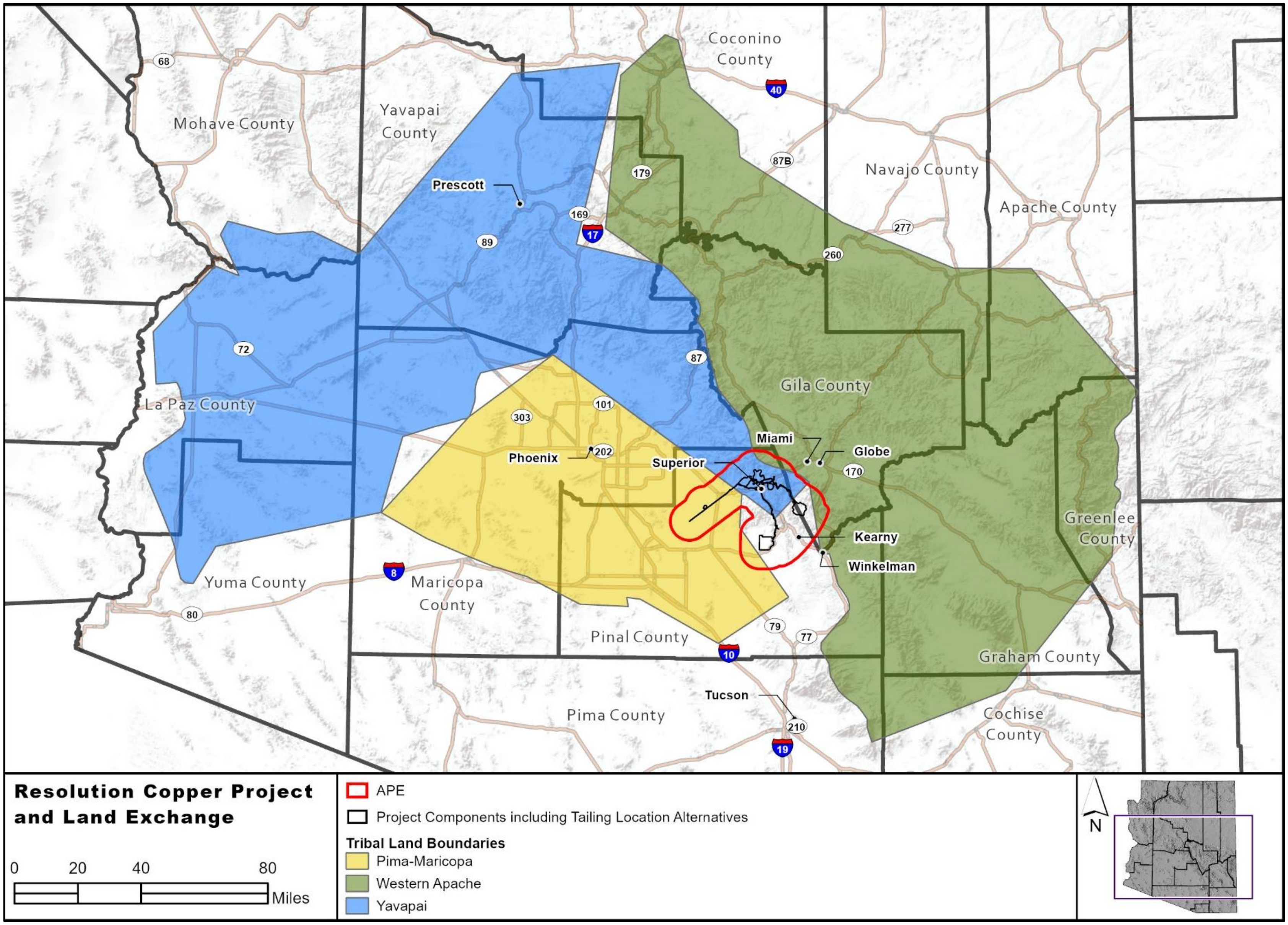

Figure 3.14.3-1. Adjudicated Tribal boundaries

The Yavapai territory stretches from just south of the San Francisco Peaks at the north to just east of the Colorado River at the west, then east along the border of the Pima-Maricopa territory to north of Phoenix. It then extends southeast between the Pima-Maricopa and the Western Apache almost to the Gila River.

3.14.3.4 Direct Analysis Area

Archaeological Sites

In section 3.12, we discuss the 644 archaeological sites recorded to date in the direct analysis area. Eighteen of those sites have components attributed to Apache/Yavapai peoples; 423 are attributed to Hohokam, Hohokam/Salado, or Salado. The remaining sites or components are attributed to Archaic, Native American, or Euro-American peoples.

Traditional Cultural Places and Cultural Landscapes

A portion of the direct analysis area is within the *Chí'chil Biłdagoteel* Historic District, which is listed in the NRHP as an Apache TCP. Apache Leap, Oak Flat, and 38 archaeological sites that contribute to the eligibility of the district are within the *Chí'chil Biłdagoteel* Historic District. Apache Leap is within the indirect analysis area, but access to the Protohistoric/Historic Apache village at its summit is through the direct analysis area.

Consistent with the direction in the land exchange legislation, the Tonto National Forest set aside Apache Leap, a sacred landscape for the Apache and Yavapai and other Tribes, as a special management area totaling 839 acres (Apache Leap SMA). The Tonto National Forest was also directed in PL 113-291 Section 3003 to develop a management plan in consultation with the Tribes. Meetings were held individually with Tribes, with cultural groups, and an all-Tribes meeting to discuss the management options for this sacred landscape. Tribes made the following requests regarding the Apache Leap SMA:

1. Leave it in its natural state;
2. Guarantee access, including possibly developing a new road, so that Tribal members can reach the top to perform ceremonies once the current access route is closed due to subsidence;
3. Do not renew or reissue the extant grazing permits; and
4. Allow day-use only (no overnight camping), and do not permit any rock-climbing.

These requests were integrated into the management plan as part of the environmental assessment of the SMA. A final decision notice, special area management plan, and corresponding forest plan amendment were issued December 26, 2017. When a new access route is designed, it will require an environmental review to determine whether the route poses any adverse effects on cultural and/or Tribal resources.

Places of Traditional and Cultural Importance

Additional resources (special interest areas or resources) were recorded during the ethnographic study within the analysis areas (Hopkins et al. 2015) and by the Tribal Monitor surveys.

During their surveys, the Tribal Monitors recorded 594 special interest areas in the direct analysis area. Of the 594, 523 are described as cultural resources, 66 as natural resources, and five as both cultural and natural resources. The cultural resources generally correspond to prehistoric archaeological sites and were categorized by the Tribal Monitors as cultural areas, settlement areas, resource gathering areas, resource processing areas, agricultural areas, and other. The natural resources areas are landforms, rockshelters, springs, water sources, vantage points, plant resources areas, and mineral resources areas. Special interest areas that are categorized as both cultural and natural resources include rockshelter, plant resources and processing areas, a tinaja with plant processing areas, and a quarry. Please note that information regarding special interest areas constitutes sensitive data, and resources will only be discussed in general terms.

Research conducted for the ethnographic study identified seven places of traditional and cultural importance within the direct analysis area (Hopkins et al. 2015). The places include springs, canyons, an archaeological site, a rock art site, and Oak Flat.

Springs

Up to 15 springs or seeps (Bitter, Bored, Hidden, McGinnel Mine, McGinnel, Walker, Grotto, Rancho Rio, KP Reservoir, Benson, Bear Canyon, Perlite, Iberri, DC-6.6W, and Kane) and three ponds (Above Grotto, SS-1, and Anxiety Fault Pond) are located within the direct analysis area that could be directly disturbed or impacted by dewatering (see section 3.7.1). Springs are sacred to all the consulting Tribes. These are springs with known persistence that have been monitored in the field and either would be directly disturbed or potentially dewatered by drawdown in the regional aquifer. Other springs and seeps have been mapped in the area from a variety of sources; many of these are likely to be seasonal and not associated with regional groundwater.

Plant and Mineral Resources

In total, 115 plant species of special interest have been identified to date within the direct impacts analysis area (table 3.14.3-1). Several of these plants have been identified as a component of natural resources special interest areas.

Table 3.14.3-1. Plants within the Analysis Area

Common Name	Scientific Name	In a Special Interest Area (Y/N)
Agave	*Agave* sp.	N
Aloe vera	*Aloe vera*	N
Arizona juniper	*Juniperus arizonica*	Y
Arizona lupine	*Lupinus arizonicus*	N
Arizona thistle	*Cirsium arizonicum*	Y
Banana yucca	*Yucca baccata*	Y
Barberry	*Mahonia fremontii*	N
Barrel cactus	*Ferocactus acanthodes*	N
Beargrass	*Nolina microcarpa*	Y
Blue bonnet	*Lupinus texensis*	N
Blue palo verde	*Parkinsonia florida*	N
Brittlebush	*Encelia farinosa*	N
Buckhorn cholla	*Cylindropuntia acanthocarpa*	N
Buckwheat	*Eriogonum* sp.	N
Buffalo gourd	*Cucurbita foetidissima*	N
Burrobush	*Hymenoclea salsola*	N
California buckthorn	*Frangula californica*	N
Canyon ragweed	*Ambrosia ambrosioides*	Y
Catclaw	*Senegalia greggii*	N
Century plant	*Agave* sp.	N

Common Name	Scientific Name	In a Special Interest Area (Y/N)
Chainfruit cholla	*Cylindropuntia fulgida*	Y
Cholla	*Cylindropuntia* spp.	N
Christmas cactus	*Schlumbergera bridgesii*	N
Christmas cholla	*Cylindropuntia leptocaulis*	N
Clock-face prickly pear	*Opuntia chlorotica*	N
Creosote	*Larrea tridentata*	Y
Crucifixion thorn	*Castela emoryi*	N
Cryptantha	*Cryptantha angustifolia*	N
Deergrass	*Muhlenbergia rigens*	N
Desert agave	*Agave deserti*	Y
Desert blazingstar	*Mentzelia laevicaulis*	N
Desert hackberry	*Celtis pallida*	Y
Desert honeysuckle	*Anisacanthus thurberi*	N
Desert lavender	*Condea emoryi*	Y
Desert rue	*Thamnosma montana*	N
Desert sage	*Salvia dorrii*	Y
Desert senna	*Senna covesii*	N
Desert tobacco	*Nicotiana obtusifolia*	N
Desert trumpet	*Eriogonum inflatum*	N
Desert wishbonebush	*Mirabilis laevis*	N
Desert zinnia	*Zinnia grandiflora*	N
Devil’s claw	*Proboscidea parviflora*	*Y*
Dock	*Rumex hymenosepalus*	N
Fairyduster	*Calliandra eriophylla*	Y
Fiddleneck	*Amsinckia intermedia*	N
Filaree	*Erodium cicutarium*	N
Flattop buckwheat	*Eriogonum fasciculatum*	N
Foothill palo verde	*Parkinsonia microphylla*	N
Fragrant sumac	*Rhus aromatica*	N
Fringed twinevine	*Sarcostemma cynanchoides*	N
Gambel oak	*Quercus gambelii*	N
Globemallow	*Sphaeralcea* sp.	N
Gooding’s willow	*Salix gooddingii*	Y
Graythorn	*Ziziphus obtusifolia*	N
Hedgehog cactus	*Echinocereus fasciculatus*	Y
Holly grape	*Mahonia aquifolium*	N
Hollyleaf buckthorn	*Rhamnus ilicifolia*	N
Indian paintbrush	*Castilleja coccinea*	N
Indian mallow	*Abutilon* sp.	Y
Ironwood	*Olneya tesota*	N

Common Name	Scientific Name	In a Special Interest Area (Y/N)
Jojoba	*Simmondsia chinensis*	Y
Lupin	*Lupinus* sp.	N
Manzanita	*Arctostaphylos* sp.	N
Mediterranean grass	*Schismus barbatus*	N
Mesquite	*Prosopis glandulosa*	Y
Miniature woollystar	*Eriastrum diffusum*	N
Mormon tea	*Ephedra trifurca*	Y
Narrowleaf yucca	*Yucca angustissima*	Y
Nightblooming cereus	*Peniocereus greggii*	N
Ocotillo	*Fouquieria splendens*	Y
Palo verde	*Parkinsonia aculeata*	Y
Pincushion cactus	*Mammillaria* sp.	N
Pine	*Pinus* sp.	N
Plains bristlegrass	*Setaria vulpiseta*	N
Popcorn flower	*Cryptantha angustifolia*	N
Poreleaf	*Porophyllum gracile*	N
Prickly pear	*Opuntia chlorotica*	Y
Primrose	*Oenothera primiveris*	N
Purple threeawn	*Aristida purpurea*	N
Queen of the night cactus	*Epiphyllum oxypetalum*	Y
Rabbitbush	*Ericameria nauseosa*	Y
Ratany (trailing ratany)	*Krameria lanceolata*	N
Ratany (white ratany)	*Krameria grayi*	N
Resurrection fern	*Pleopeltis polypodioides*	Y
Rock lotus	*Lotus rigidus*	N
Saguaro	*Carnegiea gigantea*	Y
Scorpionweed	*Phacelia* sp.	N
Scrub oak	*Quercus turbinella*	N
Shamrock	*Oxalis* sp.	N
Singlewhorl burrobush	*Ambrosia monogyra*	N
Skunk bush	*Rhus trilobata*	Y
Soaptree yucca	*Yucca elata*	N
Sotol	*Dasylirion wheeleri*	Y
Staghorn cholla	*Cylindropuntia versicolor*	Y
Sunflower	*Helianthus* sp.	Y
Sweetbush	*Bebbia juncea*	N
Tansy mustard	*Descurainia pinnata*	N
Teddybear cholla	*Cylindropuntia bigelovii*	Y
Thorn-apple	*Datura* sp.	N
Threeawn grass	*Aristida purpurea*	N

Common Name	Scientific Name	In a Special Interest Area (Y/N)
Timber oak	*Quercus* sp.	N
Triangle bur ragweed	*Ambrosia deltoidea*	N
Turpentine bush	*Ericameria* sp.	N
Velvet mesquite	*Prosopis velutina*	N
White tackstem	*Calycoseris wrightii*	N
Whitethorn acacia	*Vachellia constricta*	Y
Wild spinach	*Chenopodium* sp.	Y
Wild onion	*Allium macropetalum*	N
Willow	*Chilopsis linearis*	Y
Wire lettuce	*Stephanomeria pauciflora*	N
Wolfberry	*Lycium berlandieri*	Y
Woodsorrel	*Oxalis* sp.	N
Yellow palo verde	*Parkinsonia microphylla*	Y
Yucca	*Yucca* spp.	Y

Eight minerals or types of minerals important to Tribal groups were identified in the direct impacts analysis area: Apache tear obsidian, caliche, mica, red ore, polishing stones, quartz crystals, iron sand deposits, and schists.

3.14.3.5 Indirect Analysis Area

A portion of the *Chí'chil Biłdagoteel* Historic District TCP is within the indirect analysis area outside the direct analysis area. Specifically, Apache Leap to the west of Oak Flat is adjacent to the direct analysis area. Ten places of traditional and cultural importance have been identified in the ethnographic report within the indirect analysis area.

In total, 147 springs or surface water sources are found in the indirect analysis area. These springs and water sources are within the Queen Creek watershed, Devil's Canyon watershed, and the Gila River watershed.

3.14.3.6 Atmospheric Analysis Area

Tonto National Forest's consultations and ethnohistoric study of the general area around Oak Flat have identified many named Western Apache locations and special interest areas, as well as Yavapai band traditional territories. This applies particularly to the areas within the U.S. 60 corridor—for example, the Superstition Mountains, Picketpost Mountain, Apache Leap, and Devil's Canyon are all named sacred locations. A portion of the *Chí'chil Biłdagoteel* Historic District is within the atmospheric analysis area. The ethnographic report identified 13 places of traditional and cultural importance to Tribes within the atmospheric analysis area. These places include springs, ridges, mountains and mountain ranges, resource collection sites, and archaeological sites.

The atmospheric analysis area also contains prehistoric sites and resources of interest to the Tribes that are related to the prehistoric occupation of the area—descendant communities include the Gila River Indian Community, Hopi Tribe, Salt River Pima-Maricopa Indian Community, and Pueblo of Zuni.

3.14.3.7 Testimony about the Spiritual Significance of Oak Flat

Appendix U contains portions of the congressional testimony by members of the San Carlos Apache Tribe (given outside designated public input periods), as well as a selection of representative comments on the DEIS, which emphasize the cultural importance of Oak Flat to Native peoples.

3.14.4 Environmental Consequences of Implementation of the Proposed Mine Plan and Alternatives

3.14.4.1 Alternative 1 – No Action

Direct Impacts

Under the no action alternative, the Forest Service would not approve the GPO, current management plans would remain, and Resolution Copper would continue current activities on private property and previously permitted activities on the Tonto National Forest. As described in section 2.2.3, the no action alternative analysis analyzed the impacts of (1) the Forest Service's not approving the GPO, and (2) the land exchange's not occurring.

If the Forest Service does not approve the GPO, the mining operation as defined in the GPO would not occur; if the land exchange does not occur, the selected lands would remain under Forest Service management. Under either scenario, no direct impacts are anticipated to archaeological sites, TCPs, springs, or other resources significant to the Tribes, including loss of access to resources.

Indirect and Atmospheric Impacts

If either the land exchange does not occur or the GPO is not approved, no adverse indirect or atmospheric impacts are anticipated to resources other than to some springs. With or without the land exchange, the continued dewatering of mine shafts on private land would occur, lowering the water table in the area, which may have adverse indirect impacts on six springs. See section 3.7.1 for more information on dewatering and its potential effects on area resources.

3.14.4.2 Impacts Common to All Action Alternatives

Under all action alternatives, the Oak Flat parcel will be adversely impacted by the proposed mining operation. Extraction of the ore via block caving will eventually lead to the subsidence of the parcel; access to Oak Flat and the subsidence zone will be curtailed once it is no longer safe for visitors. Several springs located on the Oak Flat Federal Parcel will be lost due to the development of the subsidence area. The subsidence has a high potential to directly and permanently adversely affect numerous cultural resources sites, including the following: archaeological resources; areas with sacred values such as springs, seeps, and prayer locations; resource gathering sites; ancestor burial sites; traditional ceremonial and dance locations; and other places of spiritual and cultural significance to members of federally recognized Tribes.

Effects of the Land Exchange

Assuming that the land exchange occurs, as mandated by Congress in the Southeast Arizona Land Exchange Act, the selected lands will be conveyed to Resolution Copper no later than 60 days after the publication of the FEIS, and the Oak Flat Federal Parcel would become private property and no longer be subject to the NHPA. Under Section 106 of the NHPA and its implementing regulations (38 CFR 800), historic properties leaving Federal management is considered an adverse effect, regardless of the plans for the land, meaning that as analyzed under NEPA, the land exchange would have an adverse effect on resources significant to the Tribes.

The Oak Flat Federal Parcel contains 41 NRHP-eligible historic properties and one NRHP-listed TCP. Distinctive features of the TCP include an Emory oak stand that the Apache and Yavapai use to harvest acorns, plus a nearby campground, constructed by the Civilian Conservation Corps, that provides a convenient place for family gatherings. Four of the places of traditional and cultural importance identified in the ethnographic report are found within the Oak Flat Federal Parcel; they are all part of the TCP. Two additional places of traditional and cultural importance are found within the East Plant Site of the GPO. All of these resources would be adversely affected by leaving Federal management, which would result in a high potential to directly and permanently adversely affect numerous cultural resources sites, including the following: archaeological resources; areas with sacred values such as springs, seeps, and prayer locations; resource gathering sites; ancestor burial sites; traditional ceremonial and dance locations; and other places of spiritual and cultural significance to members of federally recognized Tribes.

Effects of Forest Plan Amendment

No components of the 2023 forest plan directly relate to Tribal values and concerns that require amendment. However, a great number of forest plan components are related to resources considered important or sacred by Tribes, including wildlife, water resources, and scenic resources. The need for a forest plan amendment for these resources is discussed in the appropriate section.

Effects of Compensatory Mitigation Lands

The compensatory mitigation lands are intended for conservation and overall improvement of riparian areas and are not anticipated to have any impact on Tribal values or concerns. One compensatory mitigation land is located on Tribal lands and is being undertaken in cooperation with the Gila River Indian Community.

Effects of Recreation Mitigation Lands

The recreation mitigation lands are anticipated to have an adverse effect on Tribal values. Although preliminary trail alignments and trailhead areas were surveyed for impacts to cultural resources that are eligible for the NRHP and trail designs were refined to reduce conflict with cultural resources, the trails would be visible from known TCPs, and any ground disturbance is deemed to be an adverse effect on cultural and Tribal resources.

Summary of Applicant-Committed Environmental Protection Measures

A number of environmental protection measures are incorporated into the design of the project that would address the loss of resources of Tribal value and concern. These are non-discretionary measures, and their effects are accounted for in the analysis of environmental consequences. Many of these are related to other resources, such as minimizing ground disturbance or loss of habitat, and are not reiterated here.

Measures to reduce impacts on Tribal resources are described in the “Mitigation Effectiveness” section below.

3.14.4.3 Alternatives 2 and 3 – Near West

Direct Impacts

Under Alternatives 2 and 3, the land exchange would occur, and the Forest Service would approve the GPO. For both alternatives, there are variations of the footprint and the type of storage facility proposed in the modified GPO location; however, the direct effects would be the same for both. Section 3.12.4.2 contains a description of the location of the 138 prehistoric and historic archaeological sites (18 of which have eligibility yet to be determined) that would be impacted by these alternatives and their associated mine operation areas (East Plant Site, subsidence area, West Plant Site, tailings facility and corridor, Silver King Mine Road, MARRCO corridor, and roads) (see table 3.12.4-1).

Twenty-three special interest areas were recorded in the tailings facility and corridor proposed for Alternatives 2 and 3; all of the special interest areas are cultural and are categorized as settlement or cultural areas. Several special interest areas are deemed to be related and are grouped together into three larger areas of importance. Each of these incorporates an active spring and archaeological sites. The area also contains many plants and minerals of use to Tribes. Specifically, 67 plant species are found within the tailings facility; 17 of those are found in special interest areas. All alluvial deposits would be removed to expose bedrock for the tailings storage facility, so all of these soil and vegetation resources would be destroyed by construction and use of the facility. Resources in the direct analysis area may be lost completely because of ground disturbance, or Tribes may lose access to those resource once they are part of the mine.

Eight persistent springs are anticipated to be dewatered by mine drawdown. In addition, three springs and three ponds within the subsidence area and three springs in the Alternative 2 and 3 tailings facility footprint will be directly disturbed.

Indirect Impacts

For both alternatives, a portion of the *Chí'chil Biłdagoteel* Historic District TCP found outside the project area may be indirectly impacted from inadvertent damage from construction activities in the area. In addition, 10 places of traditional and cultural importance identified in the ethnographic report are within the indirect impacts analysis area. Fifty springs or other water sources are within the indirect analysis area. Either tailings storage facility configuration would adversely reduce and affect the flow of water into Queen Creek; the long-term effects on groundwater quality due to tailings seepage are discussed in section 3.7.2.

Atmospheric Impacts

The tailings location for Alternatives 2 and 3 is located directly opposite Picketpost Mountain, a mountain sacred to Western Apache bands, and the presence of the nearly 500-foot-high tailings would constitute an adverse visual effect on the landscape.

Plotting the visual effects buffers against the results of the ethnographic study, two identified places of traditional and cultural importance are within 1 mile of the MARRCO corridor, eight are within 2 miles of the GPO mine facilities (i.e., East Plant Site, West Plant Site, etc.), and five are within 6 miles of the tailings facility. Adverse visual effects are expected for these places.

3.14.4.4 Alternative 4 – Silver King

Direct Impacts

This alternative contains a total of 147 prehistoric and historic archaeological sites that would be adversely impacted by the combined areas of the mine; two of these archaeological sites have eligibility yet to be determined (see table 3.12.4-2). As noted earlier in this section, impacts on resources on Oak Flat would be the same for Alternative 4 as for Alternatives 2 and 3. Resources in the direct analysis area may be lost completely because of ground disturbance, or Tribes may lose access to those resources once they are part of the mine.

Thirty-three special interest areas were recorded in the Silver King tailings facility and corridor: 28 are cultural resources areas and five are natural resources areas. The cultural resource areas consist of settlement areas, resource processing areas, cultural areas, and agricultural areas. One of the natural resource areas was a mineral source; there is no information available on the other four. Several of the cultural areas are grouped into two larger areas of interest; an additional area consisting of a spring, riparian area, and grinding features was also defined. In addition, 70 plant species are found within the Silver King tailings alternative; 16 of these species are found within special interest areas. Eight persistent springs are anticipated to be dewatered by mine drawdown. In addition, three springs and three ponds within the subsidence area and one spring in the Alternative 4 tailings facility footprint would be directly disturbed.

Indirect Impacts

Like under Alternatives 2 and 3, for Alternative 4, a portion of the *Chí'chil Biłdagoteel* Historic District TCP outside the project area may be indirectly impacted from inadvertent damage from construction activities. In addition, the same 10 places of traditional and cultural importance are located in the indirect impacts analysis area. Sixty springs, seeps, or other water sources are within the indirect impacts analysis area. A tailings storage facility at the Alternative 4 location would reduce the surface area of the local watershed and have long-term effects on local groundwater quality within the Queen Creek watershed due to tailings seepage (see sections 3.7.2 and 3.7.3).

Atmospheric Impacts

The Silver King tailings storage facility is east of Alternatives 2 and 3, but still within the area of sacred landscapes that would be visually compromised by the 1,040-foot-high tailings. Plotting the visual effects buffers against the results of the ethnographic study, two identified places of traditional and cultural importance are within 1 mile of the MARRCO corridor, eight are within 2 miles of the GPO mine facilities, and 12 are within 6 miles of the tailings facility. Adverse visual effects are expected for these places.

3.14.4.5 Alternative 5 – Peg Leg

Direct Impacts

Alternative 5, including the pipeline corridor, contains 157 prehistoric and historic archaeological sites; three of these archaeological sites have eligibility yet to be determined (see table 3.12.4-3). In total, 133 special interest areas have been recorded by Tribal monitors in the Alternative 5 tailings facility and pipeline. Eighty-four of the special interest areas are cultural; they consist of settlement areas, resource processing areas, and agricultural areas. Forty-seven are natural resources; they are springs, landforms, vantage points, and plant and mineral resource areas. Two special interest areas are categorized as both cultural and natural resource areas; they are a water source and a quarry. Three larger areas of special interest have been identified by grouping several of the special interest areas: two focus on cultural resources and one focuses on natural resources.

In addition, 56 plant species are found in the Alternative 5 tailings facility and pipeline; seven of these species can be found in special interest areas. Seven minerals of special interest would also be impacted. These resources may be lost completely because of ground disturbance, or Tribes may lose access to these resources once they are part of the mine. Direct impacts to water sources in the subsidence area are the same as under Alternatives 2, 3, and 4.

Indirect Impacts

Indirect impacts to the TCP are the same as under Alternatives 2, 3, and 4.

Sixty-five springs or other water sources are found within the indirect impacts analysis area for Alternative 5. The surface area of the Gila River watershed would be reduced due to the permanent tailings storage facility, and water quality may also be impaired due to future tailings seepage. For more details, see sections 3.7.2 and 3.7.3.

Atmospheric Impacts

Plotting the visual effects buffers against the results of the ethnographic study, two identified places of traditional and cultural importance are within 1 mile of the MARRCO corridor, and nine are within 2 miles of the GPO mine facilities. Adverse visual effects are expected for these places.

3.14.4.6 Alternative 6 – Skunk Camp

Direct Impacts

Under Alternative 6 and associated pipeline, 380 archaeological sites would be impacted; three of these archaeological sites have eligibility yet to be determined (see table 3.12.4-4). The Tribal Monitors identified 383 special interest areas in the Alternative 6 tailings facility, pipeline corridor, and 115-kV transmission line. Of the 383 special interest areas, 372 are cultural areas and include settlement areas, resource gathering and processing areas, agricultural areas, and cultural areas. The nine natural resources areas include springs and other water sources, plant resource areas, and a rockshelter. Two special interest areas are classified as both cultural and natural resource areas; they are both plant processing locations.

In addition, 62 plant species are found in the Alternative 6 tailings facility and pipeline; four of these species can be found in special interest areas. These resources may be lost completely because of ground disturbance, or Tribes may lose access to these resources once they are part of the mine facility.

Direct impacts to water sources in the subsidence crater are the same as under Alternatives 2, 3, 4, and 5. The surface area of the watershed would be reduced due to the permanent tailings storage facility (see section 3.7).

Indirect Impacts

Indirect impacts to the TCP are the same as for Alternatives 2, 3, 4, and 5. Indirect impacts to places of traditional and cultural importance are the same as Alternatives 2, 3, 4, and 5. In total, 106 springs or other water sources are within the indirect impacts analysis area for Alternative 6. The Alternative 6 tailings facility is within the Dripping Springs watershed, which would reduce the surface area of the local watershed and may also have long-term effects on local groundwater quality within the Dripping Springs watershed due to tailings seepage (see sections 3.7.2 and 3.73).

Atmospheric Impacts

Plotting the visual effects buffers against the results of the ethnographic study, two identified places of traditional and cultural importance are within 1 mile of the MARRCO corridor, and eight are within 2 miles of the GPO mine facilities. Adverse visual effects are expected for these places.

3.14.4.7 Cumulative Effects

The full details of the cumulative effects analysis can be found in chapter 4. The following represents a summary of the cumulative impacts resulting from the project-related impacts described in Section 3.14.4, Environmental Consequences, that are associated with Tribal values and concerns, when combined with other reasonably foreseeable future actions.

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable, and have impacts that likely overlap in space and time with impacts from the Resolution Copper Project:

- ADOT Pinal County North-South Corridor

- Merrill Ranch Master Planned Community Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project
- Silver Bar Mining Regional Landfill and Cottonwood Canyon Road

The cumulative effects analysis area for Tribal concerns and values is considered to be the ancestral homelands of the affected Tribes, which is assumed to be the southwestern United States. The metric used to quantify cumulative impacts to Tribal values and concerns is the physical footprint of the projects. Given the long time period in which Tribal members have occupied these lands, and their religious and community connections to the landscape, there are many areas on the natural landscape that represent sacred sites for Tribal members, or for which general disturbance of the natural landscape represents an impact to their Tribal values. These types of impacts are difficult to quantify. Physical footprint is used as a proxy for the level of disturbance occurring to the natural landscape, assuming that effects on Tribal values would stem from these disturbances.

The six reasonably foreseeable future actions above, combined with the Resolution Copper Project, represent about 37,000 acres of the 730,000-acre cumulative effects analysis area, or about 5.1 percent. This represents the overall cumulative level of disturbance that can be anticipated to affect the overall landscape with its connections to Tribal values and heritage. As described previously in this section, impacts to Tribal values and concerns are inadequately expressed through percentages and numbers. The impacts of the Resolution Copper Project alone are substantial and irreversible due to the changes that would occur at Oak Flat. The other projects listed have not been identified as exhibiting the same level of Tribal concern; however, the combined disturbance across a wide region contributes to an overall disruption of the landscape and erosion of traditional places important to Tribes.

3.14.4.8 Mitigation Effectiveness

Mitigation Identifier and Title	Authority to Require
FS-SV-01: Resource salvage	Required – Forest Service
FS-WR-01: GDEs and water well mitigation	Required – Forest Service
FS-RC-02: Access to Oak Flat campground	Required – Forest Service
FS-CR-01: Implementation of Oak Flat HPTP	Required – Forest Service
FS-CR-02: GPO research design	Required – Forest Service
FS-CR-03: Visual, atmospheric, auditory, socioeconomic, and cumulative effects mitigation plan	Required – Forest Service
FS-CR-05: Emory Oak Collaborative Tribal Restoration Initiative	Required – Forest Service
FS-CR-06: Tribal cultural heritage fund	Required – Forest Service
FS-CR_08: Tribal education fund	Required – Forest Service
FS-SO-02: Establish foundations for long-term funding, including the Tribal Monitor Program	Required – Forest Service
RC-CR-04: Increase size of Apache Leap SMA	Committed – Resolution Copper
RC-CR-07: Archaeological database funds	Committed – Resolution Copper
RC-SO-01: Community development fund	Committed – Resolution Copper

We developed a robust monitoring and mitigation strategy to avoid, minimize, rectify, reduce, or compensate for resource impacts that have been identified during the process of preparing this EIS. Appendix J contains descriptions of mitigation measures that would be completed and identifies who is responsible for those measures. Appendix J also contains descriptions of monitoring that would be needed to identify potential impacts and mitigation effectiveness.

This section contains an assessment of the effectiveness of design features associated with mitigation and monitoring measures found in appendix J that are applicable to Tribal values and concerns. See appendix J for full descriptions of each measure noted below.

Mitigation Effectiveness and Impacts of Forest Required Mitigation Measures Applicable to Tribal Values and Concerns

Appendix J contains mitigation and monitoring measures that are required by law or policy. These measures are assumed to occur, and their effectiveness and impacts are disclosed here. The unavoidable adverse impacts disclosed below take the effectiveness of these mitigations into account.

Measures FS-CR-01 (Oak Flat HPTP), FS-CR-02 (GPO research design), and FS-CR-03 (Visual, atmospheric, auditory, socioeconomic, and cumulative effects mitigation plan) were all described in Section 3.12, Cultural Resources. These measures have in common that they are primarily aimed at mitigating historic properties. While these measures are effective at reducing, but not preventing, impacts associated with destruction of historic properties, it is important to note that historic properties are not synonymous with Tribal values and concerns.

According to the Tribes consulted, adverse impacts on TCPs, special interest areas, and other places or resources of significant interest to Tribes cannot be mitigated; therefore, mitigation strategies for Tribal resources are designed to provide benefits to affected Tribes. The mitigation strategies will have, and are having, positive impact on Tribal communities such as providing jobs, funding Tribal visits for evaluation of special interest areas, and increasing access to Emory oak resources. Specific mitigations include the following.

Resource salvage (FS-SV-01). This measure allows for Tribal access for salvage of culturally important resources within the mine footprint prior to disturbance. This measure would not replace those areas lost to cultural resource collection in perpetuity, but would be effective at preventing loss of these resources.

GDEs and water well mitigation (FS-WR-01). This measure would replace water sources for any riparian areas associated with springs or perennial streams (groundwater-dependent ecosystems) impacted by drawdown from the mine dewatering and block caving. Springs are considered sacred to many Tribes. Though this measure would replace water, it may not replace the significance of the springs in the overall cultural landscape.

Access to Oak Flat campground (FS-RC-02). Maintaining access to Oak Flat campground, to the extent practicable with respect to safety, would be effective at reducing impacts caused by the loss of the Oak Flat area to subsidence. However, this represents only a small portion of Oak Flat and would not reduce the impact on Tribal cultural heritage caused by the destruction of the broader landscape due to the subsidence area.

Emory Oak Collaborative Tribal Restoration Initiative (FS-CR-05). In partnership with the Tonto National Forest, Resolution Copper will fund the Emory Oak Collaborative Tribal Restoration Initiative, a multi-year restorative fieldwork program for Emory oak groves located in the Tonto National Forest and the Coconino National Forest. The program is designed to restore and protect Emory oak groves that are accessed by Apache communities for traditional subsistence gathering and ensure their sustainability for future generations. This would replace one culturally important resource, but would not reduce the impact on Tribal cultural heritage caused by the destruction of the broader landscape of Oak Flat due to the subsidence area.

Tribal cultural heritage fund (FS-CR-06). Resolution Copper will establish a cultural heritage foundation for consulting Native American Tribes for long-term funding of cultural heritage projects. While not preventing the impacts to cultural heritage caused by the mine, these projects could be effective at preventing impacts from other projects, or preserving aspects of Tribal cultural heritage that otherwise would be jeopardized.

Tribal education fund (FS-CR-08). Resolution Copper will establish a fund dedicated to funding scholarships for Tribal members pursuing post-high school education, at a college, university, vocational school, or accredited 2-year program. Scholarships will be awarded based upon a committee's review of applicants. These scholarships would be effective at reducing economic impacts to Tribal members but would not directly offset any of the impacts to Tribal values disclosed.

Establish foundations for long-term funding, including the Tribal Monitor Program (FS-SO-02). Resolution Copper will establish a foundation or foundations for funding the continuation of the Tribal Monitor Program, long-term maintenance and monitoring of the Emory Oak Collaborative Tribal Restoration Initiative, and development of a Tribal Youth Program in partnership with the Forest Service and consulting Tribes. This measure would be effective at enhancing these other measures, as it would ensure that these programs have a long-term base of financial support, rather than short-term funding that would be eventually exhausted.

Mitigation Effectiveness and Impacts of Resolution Committed Mitigation Measures Applicable to Tribal Values and Concerns

Appendix J contains mitigation and monitoring measures committed by Resolution Copper in contractual, financial, or other agreements. These measures are assumed to occur, and their effectiveness and impacts are disclosed here. However, the unavoidable adverse impacts disclosed below do not take the effectiveness of these mitigations into account as they are not within the authority of the Forest Service to ensure.

Mitigation measures RC-CR-07 (Archaeological database funds) and RC-SO-01 (Community development fund) were described in Section 3.12, Cultural Resources. These measures have in common that they are primarily aimed at mitigating historic properties. While these measures are effective at reducing, but not preventing, impacts associated with destruction of historic properties, it is important to note that historic properties are not synonymous with Tribal values and concerns.

According to the Tribes consulted, adverse impacts on TCPs, special interest areas, and other places or resources of significant interest to Tribes cannot be mitigated; therefore, mitigation strategies for Tribal resources are designed to provide benefits to affected Tribes. The mitigation strategies will have, and are having, positive impact on Tribal communities, such as providing jobs, funding Tribal visits for evaluation of special interest areas, and increasing access to Emory oak resources. Specific mitigations are as follows.

Increase size of Apache Leap Special Management Area (RC-CR-04). The addition of acreage to the Apache Leap SMA would help expand this protected area and reduce management conflicts. This would not reduce the impact on Tribal cultural heritage caused by the destruction of the broader landscape of Oak Flat due to the subsidence area.

Mitigation Effectiveness and Impacts of Resolution Voluntary Mitigation Measures Applicable to Tribal Values and Concerns

Appendix J contains mitigation and monitoring measures brought forward voluntarily by Resolution Copper and committed to in correspondence with the Forest Service. These measures are assumed to occur but are not guaranteed to occur. Their effectiveness and impacts if they were to occur are disclosed here; however, the unavoidable adverse impacts disclosed below do not take the effectiveness of these mitigations into account. No additional mitigation measures were voluntarily brought forward for Tribal values and concerns.

Unavoidable Adverse Impacts

Significant Tribal properties and uses would be directly and permanently impacted. These impacts cannot be avoided within the areas of direct impact, nor can they be fully mitigated.

3.14.4.9 Other Required Disclosures

Short-Term Uses and Long-Term Productivity

Physical and visual impacts on TCPs, special interest areas, and plant and mineral resources caused by construction of the mine would be immediate, permanent, and large in scale. Mitigation measures cannot replace or replicate the Tribal resources and TCPs that would be destroyed by project construction and operation. The landscape, which is imbued with specific cultural attributions by each of the consulting Tribes, would also be permanently affected.

Irreversible and Irretrievable Commitment of Resources

The direct impacts on the TCP and special interest areas from construction of the mine and associated facilities constitute an irreversible commitment of resources. TCPs cannot be reconstructed once disturbed, nor can they be fully mitigated. Sacred springs would be eradicated by subsidence or construction of the tailings storage facility, and affected by groundwater drawdown. Changes that permanently affect the ability of Tribal members to access the TCP and special interest areas for cultural and religious purposes also consist of an irreversible loss of resources. For uses such as gathering traditional materials from areas that would be within the subsidence area or the tailings storage facility, the project would constitute an irreversible loss of resources.

3.15 Environmental Justice

This section has been removed in compliance with Executive Orders 14148 and 14173.

3.16 Livestock and Grazing

3.16.1 Introduction

There are currently 17 established grazing allotments totaling approximately 462,000 acres within the analysis area on lands managed either by the Forest Service, BLM, or ASLD, or on privately owned lands. Most allotments are some combination of land management and/or ownership, where multiple grazing permits are held by a single permittee for the allotment.

Within the analysis area, all action alternatives would affect vegetation and/or water sources and cause direct or indirect impacts that would render portions of the current grazing allotments unavailable for livestock grazing. Impacts are expected throughout the full life cycle of the mine, including construction, operations, closure and reclamation, and post-closure phases.

Overview

The Resolution Copper Mine project area and alternative tailings locations comprise public lands under both Federal and State jurisdiction as well as privately owned lands. Federal lands are managed by the Forest Service and the BLM, while State Trust lands are under the stewardship of the ASLD. As described in the sections that follow, approval of either the GPO or any of the alternatives presented in this EIS would result in the loss to public use of substantial areas of Federal and State lands, including recreational use, livestock grazing, and other uses. Some roads, fencing, range improvements, boundary markers, and other existing features would be permanently eliminated or altered.

3.16.1.1 Changes from DEIS

We have made several changes to the livestock and grazing analysis in response to comments received on the DEIS. Several new water sources were identified by public comments or by further field inventories at the Skunk Camp location and these have been incorporated. Alternatives 5 and 6 no longer have alternative pipeline routes to reach the tailings storage facility. Each has a single route as described in chapter 2. In addition, we revised the Alternative 6 pipeline route, in part to address comments on grazing impacts to Government Springs Ranch. As a result of these changes, we also revised all calculations of impacts to animal unit months (AUMs).[127]

The cumulative effects analysis was revised for the FEIS to better quantify impacts. It is described in detail in chapter 4 and summarized in this section. Any mitigations developed between the DEIS and FEIS are summarized in appendix J and, if applicable to livestock grazing, are analyzed for effectiveness in this section.

3.16.1.2 Changes from January 2021 Rescinded FEIS

Since January 2021, some information about water sources has been updated in this section and revisions were made to the cumulative effects analysis based on updates to the list of potentially reasonably foreseeable actions. The section has also been updated to reflect the analysis of consistency with the new "Tonto National Forest Land Management Plan," implemented in December 2023.

[127] An "animal unit month" metric used to identify the amount of forage required to feed one mature cow weighing approximately 1,000 pounds and a calf up to weaning age.

3.16.2 Analysis Methodology, Assumptions, and Uncertain and Unknown Information

3.16.2.1 Analysis Area

The analysis area for livestock and grazing includes the entirety of all allotments that overlap spatially, in full or in part, with the primary GPO-proposed mine components (East Plant Site and subsidence area, West Plant Site, MARRCO corridor, filter plant and loadout facility, Near West tailings storage facility and pipeline corridors, and transmission lines) and each alternative tailings storage facility analyzed in this EIS (figure 3.16.2-1). Temporal analysis of impacts on livestock and grazing includes all portions of grazing allotments over the period in which mine activities could occur (50–55 years), including the construction, operations, closure and reclamation, and post-closure phases.

3.16.2.2 Methodology

This analysis documents the potential for acreages of grazing allotments to change, the potential for AUMs to be reduced, and the potential for loss of grazing-related facilities (e.g., stock watering sources).

Grazing allotments intersecting with the analysis area were identified through geospatial data obtained from the Tonto National Forest, BLM, and ASLD. Where necessary, the datasets were reconciled to one another and to available geospatial land ownership data, in order to make data from the different sources comparable for analysis. The total acreages of each allotment and the acres potentially impacted by project-related activities were then determined through GIS spatial analysis. AUM values were calculated based on the original AUMs per acre of the entire allotment and were extrapolated to the anticipated acreage of impact to yield a proportional estimate of reduction in AUMs (e.g., 100 AUMs are allowed on a 1,000-acre allotment; if reduced by 500 acres, the available AUMs become 50). Data on ownership, lease agreements, AUMs, etc., were identified and evaluated where available. Impacts on springs, as well as livestock and wildlife water sources, were identified by evaluation of publicly available geospatial data retrieved from several sources: Tonto National Forest, BLM Tucson Field Office, and AGFD, as well as various environmental resource surveys prepared under contract for Resolution Copper. Data on existing rangeland conditions, where available, were taken from environmental assessments and allotment management plans, but range conditions have not been recorded for most grazing allotments in the analysis area.

It should be noted that the water sources described as being lost in this section may differ from the GDEs that are described as being impacted in section 3.7.1, but for which mitigation is anticipated to maintain or replace the water sources described in this analysis. Section 3.7.1 focuses on GDEs with persistent, perennial water tied to regional aquifers. This section focuses on water for wildlife from a variety of sources, including tanks and springs that would be directly impacted and may rely on temporary or seasonal sources of water. In addition, some impacts on livestock access from fencing may not be considered in section 3.7.1, which focuses on direct disturbance instead of loss of access.

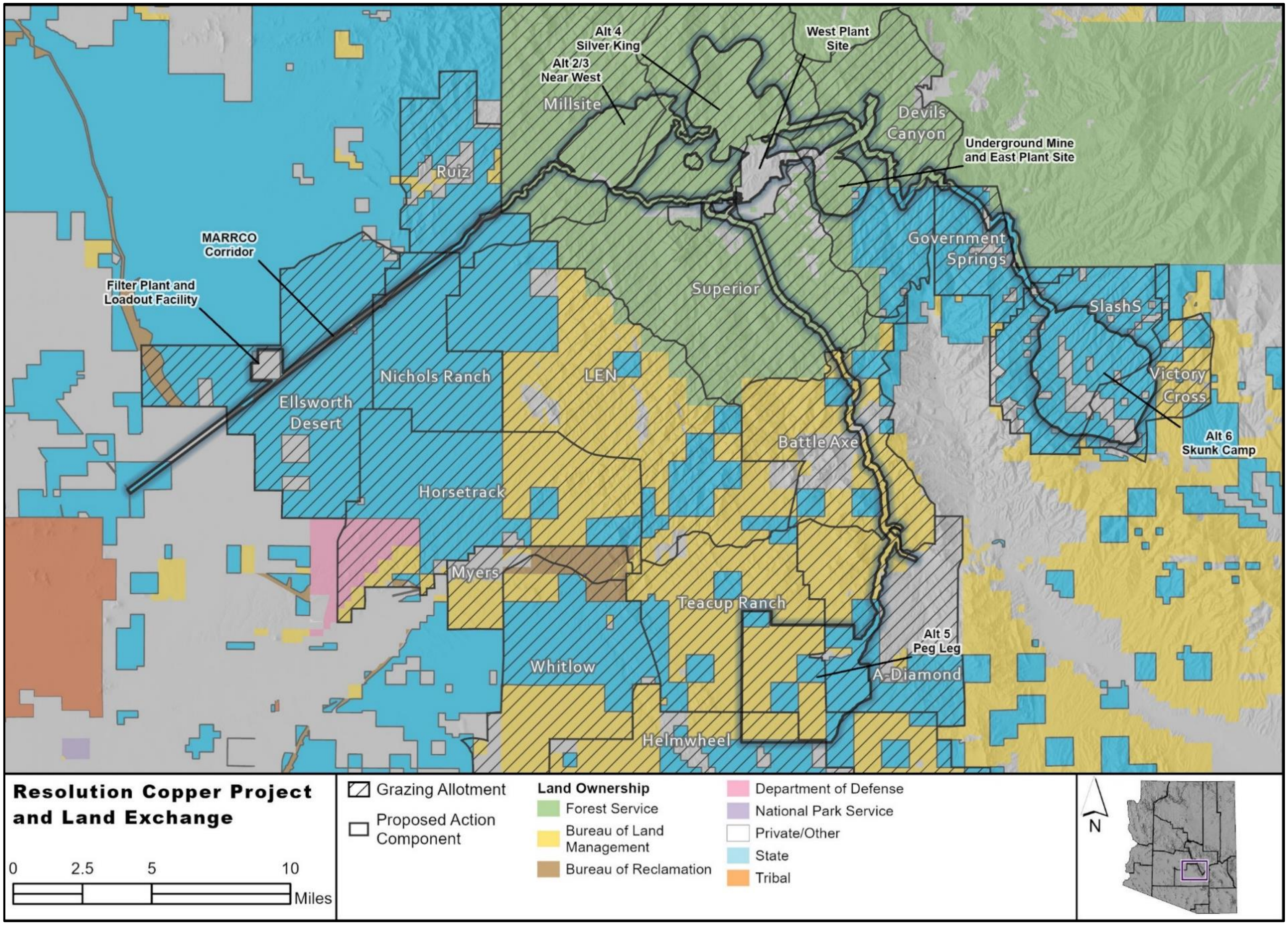

Figure 3.16.2-1. Analysis area for evaluating existing rangeland conditions and livestock grazing allotments

3.16.3 Affected Environment

3.16.3.1 Relevant Laws, Regulations, Policies, and Plans

Primary Legal Authorities and Technical Guidance Relevant to the Livestock and Grazing Effects Analysis

- Taylor Grazing Act of 1934
- Federal Land Policy and Management Act of 1976
- Multiple-Use Sustained-Yield Act of 1960
- "Tonto National Forest Land and Resource Management Plan"
- Forest and Rangeland Renewable Resources Planning Act of 1974

A complete listing and brief description of the legal authorities, reference documents, and agency guidance used in this livestock and grazing analysis may be reviewed in Newell (2018c).

3.16.3.2 Existing Conditions and Ongoing Trends

There are currently 17 established grazing allotments totaling approximately 462,000 acres in the analysis area. The proposed action and its alternatives intersect only about 10 percent of these allotments by area. This section summarizes existing conditions for the entirety of each allotment to the extent that existing conditions can be described.

Because of their relatively large and complex geographic areas, each grazing allotment is of varying size and varying land management; however, allotments are typically leased by a single entity that must obtain grazing rights (a permit or authorization) from each respective land manager/owner.

Rangelands in the analysis area are typically Sonoran desertscrub dominated by large cacti and tall shrubs at lower elevations (below 3,500 feet) and are chaparral dominated by dense shrub species such as oak, manzanita, and mountain mahogany above 4,000 feet. Semi-arid grasslands predominate in the transition zone between these type primary ecozones (Arizona Roadside Environments 1999).

Given the complex relationship between livestock grazing and land management, allotments are discussed in this section by land-managing agency. The level of detail provided is based on available data.

Forest Service Grazing Allotments

The Forest Service manages grazing permits within three allotments in the analysis area: Devil's Canyon (18,576 acres), Millsite (44,573 acres), and Superior (56,164 acres), for a total of approximately 119,313 acres of permitted grazing on NFS lands (table 3.16.3-1). Permitted grazing uses for Forest Service grazing allotments are summarized in this section.[128] Actual use may be less than permitted use, mainly as a result of periods of extended drought (U.S. Forest Service 2010c).

[128] There is overlap between the delineated boundaries of Forest Service grazing allotments and BLM grazing allotments. A portion of Alternative 6 lies within the delineated boundaries of the Forest Service Lyons Fork grazing allotment. However, most of the surface management of this land is under the jurisdiction of BLM, which manages it as the Government Springs grazing allotment (as shown in figure 3.16.2-1). Because almost all of the potential footprint of Alternative 6 in this grazing allotment is on BLM land, the Government Springs allotment has been analyzed in the EIS. As shown in figure 3.16.2-1, small portions of the Alternative 6 pipeline and transmission line corridor cross the eastern boundary of the Government Springs allotment onto NFS land. These corridors will not exclude cattle and are anticipated to have a negligible impact on any AUMs or grazing management within the Forest Service Lyons Fork allotment. The Forest Service Lyons Fork allotment is therefore not analyzed further in the EIS.

Table 3.16.3-1. Acreages of Forest Service livestock grazing leases by allotment

Allotment Name	Grazing Lease Acreage*	Livestock Type / Number	Authorized AUMs
Devil's Canyon	18,576	Cattle / 200	1,104
Millsite	44,573	Cattle / 307	4,374
Superior	56,164	Cattle / 314	5,300

Note: Livestock type/number and AUMs were taken from the Forest Service livestock grazing records.

* Acreages are estimates based on available spatial data.

DEVIL'S CANYON ALLOTMENT

The grazing permit for the portion of the Devil's Canyon Allotment on NFS land is held by Integrity Land and Cattle, of which Resolution Copper is a principal owner. Integrity Land and Cattle operates JI Ranch and runs approximately 200 head of cattle on this allotment as of the GPO (2016c). The carrying capacity for this allotment is 1,104 AUMs.

Devil's Canyon serves as a natural barrier south of U.S. 60 and splits this portion of the allotment into east and west halves. The highway itself splits the allotment into north and south halves, thus resulting in three large pastures—North pasture, Southeast pasture, and Southwest pasture (U.S. Forest Service 2015d). The allotment's carrying capacity is limited by the existing water locations and area used. At present, the water sources in this allotment are used 60 to 70 percent during the season of use. The allotment is managed using a 3-pasture/6-month rest rotation for the base herd, with a complementary system for bulls and horses. This allows for complete yearlong rest following grazing (U.S. Forest Service 2015d).

Recent inspections of the Southeast pasture indicated that general ecological conditions were stable or trending toward a higher seral state (that is, ecological conditions were transitioning toward a climax community). Forage and browse species were abundant with favorable frequency grouping and age classes of higher-stage plants. Sideoats grama (*Bouteloua curtipendula*) and Lehmann lovegrass (*Eragrostis lehmanniana*) are key species monitored in this allotment. Soil conditions also were stable or trending toward stable, with uniform ground cover dispersion and no detectable soil movement at the time of inspection in 2017 (U.S. Forest Service 2017a).

MILLSITE ALLOTMENT

The grazing permit for the portion of the Millsite Allotment on NFS land is held by William and Lynn Martin. William and Lynn Martin own JF Ranch and are permitted to graze 307 cows/bulls year-round and 197 yearlings between January 1 and May 31. In 1983, a production-utilization study showed 36,806 acres of the Millsite Allotment as being at full-capacity range; the remaining 6,815 acres were identified as having no capacity. As of 1983, the lessees of the Millsite Allotment were using 17,359 of the full-capacity range acreage for livestock use, or 47.7 percent of available rangeland (U.S. Forest Service 2010c). The 1983 study also estimated that, with improved management, capacity for the Millsite Allotment is 4,374 AUMs.

Sonoran desertscrub covers approximately 75 to 80 percent of the Millsite Allotment and has been heavily impacted by the area's history of livestock grazing. An analysis was performed on data collected between 1991 and 2003 at seven sample clusters in the allotment to create a vegetation condition rating (U.S. Forest Service 2010c). Overall, vegetation conditions on the allotment were poor, and nearly one-half are deteriorating (table 3.16.3-2). As a result, the Forest Service prescribed a deferred and/or rest rotation method for the Millsite Allotment management plan (U.S. Forest Service 2016d). Soil conditions for the allotment were evaluated in 2004, 2008, and 2009, and are shown in table 3.16.3-3.

Table 3.16.3-2. Vegetation condition rating, Millsite Allotment, 1991–2003

Cluster Number	Pasture	Vegetation Rating and Trend
C1	Cottonwood	Very poor, stable
C2	Woodbury	Fair, stable
C3	Bear Tank	Poor, stable
C4	Millsite	Poor, downward
C5	Millsite	Poor, downward
C6	Hewitt	Fair, downward
C7	Cottonwood	Poor, stable

Source: U.S. Forest Service (2010c)

Note: Rating system given on a scale from "Poor" to "Excellent"

Table 3.16.3-3. Soil condition in acres, Millsite Allotment

Condition	Acres*	Relative Percentage
Satisfactory	34,724	78
Impaired	3,592	8
Unsatisfactory–Impaired	265	1
Unsatisfactory	5,992	13
Total	**44,573**	**100**

Source: U.S. Forest Service (2010c)

Notes: The soil rating system is based on the Natural Resources Conservation Service Soil Condition Rating Guide. These ratings are defined as follows (U.S. Forest Service 1999):

Satisfactory – Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of soil to maintain resource values and sustain outputs is high.

Impaired – Indicators signify a reduction in soil function. The ability of soil to function properly has been reduced and/or there exists an increased vulnerability to degradation.

Unsatisfactory – Indicators signify that loss of soil function has occurred. Degradation of vital soil functions results in the inability of soil to maintain resource values, sustain outputs, and recover from impacts.

* Acreages are estimates based on available spatial data.

SUPERIOR ALLOTMENT

The grazing permit for the portion of the Superior Allotment on NFS land is held by DNH Cattle Company, which is permitted to graze 314 cows/bulls throughout the year and 174 yearlings between January 1 and May 31. Most full-capacity range within this allotment is located at higher elevations.

In 1961, an allotment analysis determined the carrying capacity to be 5,300 AUMs (U.S. Forest Service no date). The soil and vegetation conditions on the Superior Allotment are considered poor, especially at low elevations, resulting from improper grazing in the past, with irreversible effects in some areas.

The current management practice of a 6-month pasture/6-month rest rotation schedule, outlined in the Superior Allotment management plan, intends to provide extended rest to the stressed lowland areas and allow spring/summer rest for two consecutive years out of three (U.S. Forest Service 2016d). A summary of the Superior Allotment's 2018 authorized use is presented in table 3.16.3-4 (U.S. Forest Service no date).

Table 3.16.3-4. Authorized use for Superior Allotment, 2018, DNH Cattle Company

Grazing Unit	Authorized Livestock
North Side	
Montana	180 cow/calf 14 bulls 22 yearlings
Silver Canyon	180 cow/calf 14 bulls
88	180 cow/calf 14 bulls
South Side	
Town, North TU	101 cow/calf 24 yearlings 6 bulls
Wildhorse	5 bulls
TU Trap, Holding	101 cow/calf 24 yearlings
South TU	101 cow/calf 6 bulls

Source: Sando (2018)

Note: Silver Canyon and 88 grazing units were deferred for 2018. No other pastures rested or deferred during 2018.

Each individual allotment management plan outlines a monitoring program with the intent of determining whether the currently prescribed management practices are properly implemented and effective for the improvement of rangeland conditions. The Tonto National Forest implements compliance monitoring to ensure livestock are distributed correctly, and to inspect improvements and maintenance, and forage utilization, among other variables, with an inspection scheduled each grazing year. Other monitored aspects are the presence of noxious weeds and riparian conditions, which may be monitored on longer time intervals (5–10 years) as needed (U.S. Forest Service 2016d). Monitoring practices may be modified if there are significant changes to livestock use patterns.

Bureau of Land Management Grazing Allotments

The BLM authorizes grazing permits within nine allotments in the analysis area, totaling about 111,876 acres. Detailed grazing conditions and documentation for most of these grazing permits are not available; however, the NEPA process for the Teacup and Whitlow Allotments were initiated in 2017 (Bureau of Land Management 2017a). The Land Health Evaluation for the LEN, Teacup, and Whitlow grazing leases indicated that the general range conditions met the standards set for them by the BLM. BLM also suggested that LEN could support 357 cattle under 2,964 AUMs, Teacup could support 392 cattle under 3,058 AUMs, and Whitlow could support 136 cattle under 588 AUMs. BLM's Rangeland Administration System data were queried for acreage and AUMs for the remaining BLM grazing leases. Table 3.16.3-5 provides acreages for the grazing permits that BLM manages in the analysis area, the number of livestock, and authorized AUMs.

Table 3.16.3-5. Acreages for BLM livestock grazing leases by allotment

Allotment Name	Grazing Lease Acreage*	Livestock Type / Number	Authorized AUMs
LEN	23,110	Cattle / 357	2,964

Allotment Name	Grazing Lease Acreage*	Livestock Type / Number	Authorized AUMs
Teacup	28,775	Cattle / 392	3,058
Helmwheel	14,820	Cattle / 119	1,428
A-Diamond	6,589	Cattle / 301	686
Victory Cross	2,858	Cattle / 163	411
Battle Axe	13,081	Cattle / 210	1,562
Horsetrack	11,058	Cattle / 102	1,224
Meyers	2,518	Cattle / 47	564
Whitlow	9,067	Cattle / 136	588

Note: Livestock type/number and AUMs were taken from the BLM Rangeland Administration System (Bureau of Land Management 2019a).

* Acreages are estimates based on available spatial data.

Arizona State Land Department Grazing Leases

The ASLD manages grazing permits within 14 allotments in the analysis area totaling 181,768 acres. ASLD does not maintain detailed documentation on rangeland conditions for specific grazing permit areas; however, this analysis assumes that rangeland conditions for State Trust lands would be similar to those found on neighboring NFS and BLM lands. Rangeland data summarized in table 3.16.3-6 were taken from the Arizona Land Resources Information System (ALRIS), a spatial data viewer maintained by the ASLD.

Table 3.16.3-6. Acreages for ASLD grazing leases by allotment

Allotment Name	Grazing Lease Acreage*	Authorized AUMs
LEN	14,294	1,346
Teacup	12,099	1,583
Helmwheel	30,634	2,843
A-Diamond	7,980	955
Victory Cross	4,485	1,048
Battle Axe	3,262	425
Horsetrack	16,818	1,414
Whitlow	11,275	1,066
Devil’s Canyon	6,592	1,104
Ellsworth Desert	26,378	2,250
Ruiz	11,554	1,246
Slash S	15,358	5,757
Nichols Ranch	13,807	1,300
Government Springs	7,232	924

Note: AUMs were taken from Arizona Land Resources Information System (Arizona State Land Department 2019a).

* Acreages are estimates based on available spatial data.

3.16.4 Environmental Consequences of Implementation of the Proposed Mine Plan and Alternatives

3.16.4.1 Alternative 1 – No Action Alternative

Under the no action alternative, no alterations would be made to current grazing access or allotments, nor would there be any direct loss of stock tanks, seeps, and springs. However, six springs in the Superior Allotment are anticipated to be impacted by continued dewatering pumping of mine infrastructure. Management would continue as outlined per the allotment management plans and rangeland conditions would improve or deteriorate contingent upon the plans' effectiveness, combined with future meteorological trends. These trends are expected to result in droughts that are more frequent and of longer duration, which could stress vegetation and require adjustments to allotment management plans in the future.

3.16.4.2 Impacts Common to All Action Alternatives

Impacts on Allotments

All action alternatives would result in direct and indirect impacts on livestock and grazing within the analysis area because all areas within project facility footprints would become inaccessible to grazing. Impacts are expected throughout the full life cycle of the mine, including the construction, operations, closure and reclamation, and post-closure phases. Direct impacts of any action alternatives include the following:

- Reduction in acreage of grazing allotments
- Reduction in available AUMs within individual grazing allotments
- Loss of grazing-related facilities (water sources or infrastructure)

All action alternatives would see impacts on grazing allotments located in the East Plant Site, subsidence area, and MARRCO corridor. An area within the East Plant Site and Oak Flat Federal Parcel would be fenced off at the commencement of the construction phase of the mine, and the perimeter would be extended every 10 years following the start of operations to account for the additional area impacted by subsidence. Presently, there is no plan to make the area within the subsidence area accessible after Resolution Copper has ownership of the parcel (Resolution Copper 2016c); this would result in a reduction of at least 1,856 acres in the Devil's Canyon Allotment and a direct impact on Integrity Land and Cattle, which currently owns the grazing permit on that allotment. In addition, all action alternatives would see a reduction of at least 38 acres on the Millsite Allotment and some reduction in acreage on the Superior Allotment, although the amount varies by alternative.

Implementation of any action alternative would result in loss of the livestock water sources identified in table 3.16.4-1. The water sources listed in this section reflect springs, tanks, and stock wells that were identified in allotment documentation or from other mapping sources. Unlike the GDEs discussed in section 3.7.1, the springs disclosed in this section may or may not have persistent water, may be seasonal or transitory, and many lacked water when visited in the field. Some of these springs or tanks have water right filings associated with them, as shown in the tables in this section. See section 3.7.1 for more discussion on potential impact to surface water rights.

The impacts shown in this section reflect physical disturbance from mine construction as well as dewatering impacts to GDEs (as discussed in section 3.7.1). GDEs identified as impacted in section 3.7.1 are listed in this section. Note that monitoring and mitigation were implemented to replace water sources if dewatering impacts occur as anticipated.

Stream segments identified as impacted in section 3.7.1 or 3.7.3 (Devil's Canyon, Queen Creek, Dripping Spring Wash, Gila River, Donnelly Wash) are not listed in this section. The anticipated reductions in flow do not result in substantial water loss or drying. The water source still would be available for livestock or wildlife use.

Table 3.16.4-1. Livestock water sources impacted under all action alternatives

Name	Type	Nearest Project Area	Grazing Allotment	Water Right Filing
Rancho Rio Spring	Spring	Subsidence area	Devil's Canyon	36-24139
KP Reservoir	Seep	Subsidence area	Devil's Canyon	None identified
Above Grotto	Pond	Subsidence area	Devil's Canyon	None identified
SS-1	Pond	Subsidence area	Devil's Canyon	None identified
Anxiety Fault Pond	Pond	Subsidence area	Devil's Canyon	None identified
Queen Seeps*	Spring	Transmission line	Devil's Canyon	None identified
The Grotto	Spring	Subsidence area	Devil's Canyon	None identified
Apache Leap Stock Tank	Dugout/pit tank	East Plant Site	Devil's Canyon	38-23975
Oak Flat Stock Tank	Dugout/pit tank	Subsidence area	Devil's Canyon	38-23888 (38-65060)
Reservoir Tank 2	Stock tank, intermittent	Subsidence area	Devil's Canyon	38-23890
No Name	Tanks	MARRCO corridor	Millsite	None identified
Bitter Spring	Spring	Dewatered by pumping†	Superior	See table 3.7.1-6
Bored Spring	Spring	Dewatered by pumping†	Superior	See table 3.7.1-6
Hidden Spring	Spring	Dewatered by pumping†	Superior	See table 3.7.1-6
McGinnel Spring	Spring	Dewatered by pumping†	Superior	See table 3.7.1-6
McGinnel Mine Spring	Spring	Dewatered by pumping†	Superior	See table 3.7.1-6
Walker Spring	Spring	Dewatered by pumping†	Superior	See table 3.7.1-6
DC-6.6W	Spring	Dewatered by pumping†	Devil's Canyon	See table 3.7.1-6
Kane Spring	Spring	Dewatered by pumping†	Devil's Canyon	See table 3.7.1-6

Sources: Montgomery and Associates Inc. (2017a); WestLand Resources Inc. (2018d); WestLand Resources Inc. and Montgomery and Associates Inc. (2018)

* As transmission lines span many areas, this water source may or may not be physically impacted during construction.

† Mitigation would be implemented to replace these water sources if lost as anticipated.

Grazing has a complex effect on the surrounding plants and habitat, with positive and negative effects. In some cases, grazing removes cover that allows other plant species to grow, potentially reducing fire risk. However, grazing can disturb soil and biotic crusts and spreads seeds of weeds and other non-native species. Over time, grazing puts pressure on plants that are palatable while unpalatable plants (such as cholla or prickly pear) are undisturbed and can increase on the landscape. Grazing of non-native plants temporarily lessens biomass but also can lead to the spread of seeds of those non-native species within and from one area to another, thus increasing the long-term effects on native species on the landscape. Areas where livestock congregate (tanks, riparian areas, other water sources) may be completely stripped of vegetation, depending on the level of grazing.

Overall, while the change in grazing patterns on the landscape has the potential to affect plant distribution, the relative grazing pressure on the unimpacted portions of the allotments remains relatively similar. We do not anticipate major changes in habitat from loss of one part of the allotment.

Effects of Reclamation

The tailings storage facility represents a large area of disturbance (approximately 2,300 to approximately 5,900 acres, depending on the selected tailings storage facility location) that would be reclaimed after closure. The success of reclamation and the ability to reestablish vegetation on the tailings storage facility surface would have a large effect on the ability to sustain livestock grazing as a post-mine land use. Potential reclamation success is analyzed in detail in section 3.3. Overall, in areas where ground disturbance is relatively low, and soil resources (e.g., nutrients, organic matter, microbial communities) and vegetation propagules (e.g., seedbank or root systems to resprout) remain relatively intact, it would be expected that vegetation communities could rebound to similar pre-disturbance conditions in a matter of decades to centuries. In contrast, for the tailings storage facility, which would be covered in non-soil capping material (such as Gila Conglomerate), biodiversity and ecosystem function may never reach the original, pre-disturbance conditions even after centuries of recovery. Allowing grazing as a post-mine land use would need to be weighed against the potential sustainability of the soil and vegetation ecosystem.

Effects of the Land Exchange

The selected Oak Flat Federal Parcel would leave Forest Service jurisdiction, and approximately 1,856 acres of the existing Devil's Canyon Allotment on Tonto National Forest lands (presently permitted to Integrity Land and Cattle Company) would become unavailable for grazing, resulting in an overall reduction of available AUMs. This is an approximately 7 percent loss in total size of the grazing allotment.

The offered lands parcels would come under Federal jurisdiction. The Forest Service supports livestock grazing as a valuable resource to promote on the landscape, provided that it is responsibly performed and managed and does not injure plant growth. BLM's rangeland program places an emphasis in multi-jurisdictional ecosystem management in Arizona. This involves interdisciplinary resource management in consultation and coordination with other Federal, State, and local agencies and Indian Tribes. The specific management of livestock and grazing on the offered lands would be determined by the agencies upon transference of the parcels, but in general, when the offered lands enter Federal jurisdiction, the parcels would have the potential to be permitted for grazing where there currently is none. The Apache Leap South End Parcel would be exempt from grazing as it would become part of a management area that has no new grazing allowed. Allotments on the Forest Service that surround some of the offered lands parcels include Cartwright, Red Creek, and Tonto Basin, among others. Allotments managed by the BLM that surround some of the offered lands parcels are Dripping Springs and Steamboat Mountain.

Changes in Grazing on Compensatory Mitigation Lands

Grazing currently takes place on the H&E Farm compensatory mitigation land. After restoration, use will likely cease in order to sustain mitigation improvements to the parcel. As this is a relatively small private parcel (500 acres), and would remain privately held, there would be no impacts to grazing allotment holders and overall, no impact to livestock grazing on Federal lands.

Grazing does not currently take place at the Queen Creek or MAR-5 compensatory mitigation lands.

Forest Plan Amendment

No components of the 2023 forest plan that directly relate to livestock and grazing require amendment.

Effects of Recreation Mitigation Lands

The recreation mitigation lands are anticipated to minimally affect livestock and grazing. The recreation mitigation is located within the Superior grazing allotment and would affect less than 1 percent of the grazing allotment acreage. Livestock grazing is a currently approved land use that occurs alongside the existing formal and user-created roads and trails, and grazing practices are not expected to change as a result of the recreation mitigation.

Summary of Applicant Committed Environmental Protection Measures

No environmental protection measures were identified as being incorporated into the design of the project that would act to reduce potential impacts on livestock grazing. However, note that a number of measures meant to reduce impacts on water resources could be applicable to livestock grazing as well. These are described primarily in sections 3.7.1 and 3.7.3.

3.16.4.3 Alternative 2 – Near West Proposed Action

Implementation of this alterative would result in the reduction of available grazing within six allotments under various management or ownership. Table 3.16.4-2 summarizes the anticipated reduction in acres of land available for livestock grazing from this alternative by allotment and by land manager/owner, and reductions in AUMs by allotment are estimated where data were available.

Table 3.16.4-2. Reduction in available grazing by allotment and ownership – Alternative 2

Grazing Allotment	Private (acres)	NFS (acres) / AUMs	ASLD (acres) / AUMs	Total Grazing Reduction (acres)
Devil's Canyon	324	1,906 / 113	142 / 24	**2,372**
Ellsworth Desert	664	0	50 / 4	**714**
Millsite	58	4,203 / 414	0	**4,261**
Nichols Ranch	47	0	37 / 4	**84**
Ruiz	29	0	45 / 5	**74**
Superior	3	1,065 / 100	0	**1,068**
Total				**8,573**

Under Alternative 2, approximately 8,573 acres of land currently authorized for livestock grazing use would be forfeited, with the greatest impacts occurring on the Devil's Canyon and Millsite Allotments, with relatively lesser impacts on the Ellsworth Desert and Superior Allotments, and minor impacts on the Nichols Ranch and Ruiz Allotments. For the Devil's Canyon Allotment, Resolution Copper currently holds the grazing rights via permits with the Tonto National Forest and the ASLD over Oak Flat, the mine area, and a portion of the pipeline/power line corridor and intends to continue grazing (Resolution Copper 2020e).

Implementation of Alternative 2 would also result in the loss of access to six natural springs, as well as five constructed stock watering and/or wildlife watering features (table 3.16.4-3).

Table 3.16.4-3. Water sources impacted under Alternative 2

Name	Type	Nearest Project Area	Grazing Allotment	Water Right Filing
Bear Tank Canyon Spring	Spring	Tailings facility	Millsite	36-105437
Benson Spring	Spring	Tailings facility	Millsite	36-14696
Lower Bear Tank Canyon Spring	Spring	Tailings facility	Millsite	None identified
Perlite Spring	Spring	Tailings facility	Superior	36-24044
Benson Spring (other)	Unknown	Tailings facility	Millsite	None identified

Name	Type	Nearest Project Area	Grazing Allotment	Water Right Filing
Hackberry Tank	Dugout/pit tank	Tailings facility	Millsite	None identified
Noble Windmill	Windmill/well	Tailings facility	Millsite	None identified
Pilot Tank	Dugout/pit tank	Tailings facility	Millsite	None identified
No Name	Spring, trough	Tailings facility	Millsite	None identified
No Name	Well	Tailings facility	Millsite	None identified
Conley Spring	Spring	Tailings facility	Millsite	36-103353

Sources: Montgomery and Associates Inc. (2017a); WestLand Resources Inc. (2018d); WestLand Resources Inc. and Montgomery and Associates Inc. (2018)

3.16.4.4 Alternative 3 – Near West – Ultrathickened

Implementation of Alternative 3 would result in the same impacts on lands currently authorized for livestock grazing and water sources use and access as described for Alternative 2.

3.16.4.5 Alternative 4 – Silver King

Implementation of the Silver King alternative would result in reduction of available grazing within six allotments under various management or ownership. Table 3.16.4-4 summarizes the anticipated reduction in acres of land available for livestock grazing from this alternative by allotment and by land manager/owner, and reductions in AUMs by allotment are estimated where data were available.

Table 3.16.4-4. Reduction in available grazing by allotment and ownership – Alternative 4

Grazing Allotment	Private (acres)	NFS (acres) / AUMs	ASLD (acres) / AUMs	Total Grazing Reduction (acres)
Devil's Canyon	324	1,906 / 113	142 / 24	**2,372**
Ellsworth Desert	664	0	50 / 4	**714**
Millsite	17	111 / 11	0	**128**
Nichols Ranch	47	0	37 / 3	**84**
Ruiz	29	0	45 / 5	**74**
Superior	49	5,757 / 543	0	**5,806**
Total				**9,178**

Under Alternative 4, approximately 9,178 acres of land currently authorized for livestock grazing would be forfeited, with the greatest impacts occurring on the Superior Allotment. Relatively moderate impacts would occur on the Devil's Canyon Allotment, with more minor impacts occurring on the Ellsworth Desert, Millsite, Nichols Ranch, and Ruiz Allotments. For the Devil's Canyon Allotment, Resolution Copper currently holds the grazing rights via permits with the Tonto National Forest and the ASLD over Oak Flat, the mine area, and a portion of the pipeline/power line corridor and intends to continue grazing (Resolution Copper 2020e).

Implementation of Alternative 4 would also result in the loss of access to five natural springs, as well as six constructed stock watering and/or wildlife watering features (table 3.16.4-5).

Table 3.16.4-5. Water sources impacted under Alternative 4

Name	Type	Nearest Project Area	Grazing Allotment	Water Right Filing
McGinnel Mine Spring	Spring	Tailings facility (note this spring is already impacted by pumping)	Superior	See table 3.7.1-6
Mud Spring 2	Spring	Fence line*	Superior	36-24050
Rock Horizontal Spring	Spring	Fence line*	Superior	36-103348
Iberri Spring	Spring	Tailings facility	Superior	None identified
McGinnel Spring	Spring	Tailings facility	Superior	See table 3.7.1-6
Cedar Tank	Stock tank, intermittent	Fence line*	Superior	38-23954
Comet Tank	Stock tank, intermittent	Tailings facility	Superior	None identified
Dugan Tank	Stock tank, intermittent	Fence line*	Superior	None identified
Javelina Tank	Stock tank, intermittent	Fence line*	Superior	38-23953
Peachville Tank	Stock tank, intermittent	Fence line*	Superior	38-23952
No Name	Well	Fence line*	Superior	None identified

Sources: Montgomery and Associates Inc. (2017a); WestLand Resources Inc. (2018d); WestLand Resources Inc. and Montgomery and Associates Inc. (2018)

* For the purposes of the NEPA analysis, 100% physical disturbance is assumed within the fence line of the tailings storage facility. However, when constructed, some areas between the tailings storage facility footprint and the fence line would not be impacted. Thus, this water source may or may not be physically impacted during construction.

3.16.4.6 Alternative 5 – Peg Leg

Implementation of the Peg Leg alternative would result in the reduction of available grazing within 10 grazing allotments. Table 3.16.4-6 summarizes the anticipated reduction in acres of land available for livestock grazing from this alternative by allotment and by land manager/owner, and reductions in AUMs by allotment are estimated where data were available.

Table 3.16.4-6. Reduction in available grazing by allotment and ownership – Alternative 5

Grazing Allotment	Private (acres)	NFS (acres) / AUMs	ASLD (acres) / AUMs	BLM (acres) / AUMs	Total Grazing Reduction (acres)
A-Diamond	186	0	2,430 / 291	285 / 30	**2,901**
Battle Axe	38	0	32 / 4	428 / 51	**498**
Devil's Canyon	324	1,906 / 113	142 / 24	0	**2,372**
Ellsworth Desert	664	0	50 / 4	0	**714**
Helmwheel	4	0	24 / 2	1,265 / 122	**1,293**
Millsite	17	111 / 11	0	0	**128**
Nichols Ranch	47	0	36 / 3	0	**83**
Ruiz	29	0	45 / 5	0	**74**
Superior	20	715 / 68	0	0	**735**
Teacup	3	0	1,832 / 240	5,075 / 539	**6,907**
Total					**15,705**

Under Alternative 5, approximately 15,705 acres of land currently authorized for livestock grazing would be forfeited over 10 allotments, with the greatest impacts to acreage occurring on the Teacup Allotment. Slightly fewer acres on each of the Devil's Canyon, A-Diamond, and Helmwheel Allotments would be affected, with relatively lesser impacts on the remaining allotments. For the Devil's Canyon Allotment, Resolution Copper currently holds the grazing rights via permits with the Tonto National Forest and the ASLD over Oak Flat, the mine area, and a portion of the pipeline/power line corridor and intends to continue grazing (Resolution Copper 2020e).

BLM commented on the DEIS that implementation of the Peg Leg alternative would result in the removal of the ranch headquarters for the Teacup Allotment, including residences, barns, corrals, fences, and stock watering features. This would constitute a total loss of ranching infrastructure and would directly affect ranching operations for this allotment.

Additionally, this alternative would result in the loss of access to natural springs, as well as constructed stock watering and/or wildlife watering features, but none outside those shown in impacts common to all (see table 3.16.4-1). Constructed stock watering and/or wildlife water facilities in the tailings pipeline corridor could be present yet are not listed. It is expected that the water sources would be avoided during micro-siting or would be replaced as per water resources mitigation. Impacts associated with water sources in the tailings pipeline corridor would be associated with construction and therefore would be short term and temporary.

3.16.4.7 Alternative 6 – Skunk Camp

Implementation of the Skunk Camp alternative would result in reduced grazing opportunities within nine grazing allotments. Table 3.16.4-7 summarizes the anticipated reduction in available grazing from this alternative by allotment and by land manager/owner, and reductions in AUMs by allotment are estimated where data were available.

Table 3.16.4-7. Reduction in available grazing by allotment and ownership – Alternative 6

Grazing Allotment	Private (acres)	NFS (acres) / AUMs	ASLD (acres) / AUMs	BLM (acres) / AUMs	Total Grazing Reduction (acres)
Devil's Canyon	200	2,047 / 122	270 / 45	0	**2,517**
Ellsworth Desert	664	0	50 / 4	0	**714**
Government Springs	45	0	191 / 24	0	**236**
Millsite	17	111 / 11	0	0	**128**
Nichols Ranch	47	0	37 / 3	0	**84**
Ruiz	29	0	45 / 5	0	**74**
Slash S	1,304	0	5,726 / 2,146	0	**7,030**
Superior	55	268 / 25	0	0	**323**
Victory Cross	909	0	1,766 / 412	0	**2,675**
Total					**13,781**

Under Alternative 6, approximately 13,781 acres of existing livestock grazing would be lost over nine allotments, with the largest grazing impacts to acreage occurring on the Slash S Allotment. Slightly fewer acres on each of the Devil's Canyon and Victory Cross Allotments would be affected, with relatively minor impacts on the remaining allotments. For the Devil's Canyon Allotment, Resolution Copper currently holds the grazing rights via permits with the Tonto National Forest and the ASLD over Oak Flat, the mine area, and a portion of the pipeline/power line corridor and intends to continue grazing (Resolution Copper 2020e).

Resolution Copper currently holds the grazing rights via permits with the ASLD (and BLM) for a portion of the Skunk Camp tailings storage facility (Victory Cross Grazing Allotment) and intends to continue grazing (Resolution Copper 2020e).

BLM commented on the DEIS that implementation of the Skunk Camp alternative would result in the removal of the ranch headquarters for the Slash S Allotment, including residences, barns, corrals, fences, and stock watering features. This would constitute a total loss of ranching infrastructure and directly affect ranching operations for this allotment. However, Resolution Copper holds grazing rights through a future interest in the Slash S Allotment and intends to continue grazing, regardless of impacts to infrastructure (Resolution Copper 2020e).

This alternative would result in the loss of access to five additional natural springs (table 3.16.4-8). Constructed stock watering and/or wildlife water facilities in the tailings pipeline corridor could be present even if not listed in table 3.16.4-8. It is expected that the water sources would be avoided during micro-siting or would be replaced in accordance with water resources mitigation. Impacts associated with water sources in the tailings pipeline corridor would be associated with construction and therefore short term and temporary.

Table 3.16.4-8. Water sources impacted under Alternative 6

Name	Type	Nearest Project Area	Grazing Allotment	Water Right Filing
Big Spring 3	Spring	Fence line*	Victory Cross	None identified
Looney Spring 2	Spring	Fence line*	Slash S	36-1878
Dry Spring	Spring	Tailings facility	Slash S	36-1889
Haley Spring	Spring	Tailings facility	Slash S	4A-3882.1
Mill Spring†	Spring	Underground boring	Government Springs	4A-919.2

Sources: Montgomery and Associates Inc. (2017a); WestLand Resources Inc. (2018d); WestLand Resources Inc. and Montgomery and Associates Inc. (2018)

* For the purposes of NEPA analysis, 100% physical disturbance is assumed within the fence line of the tailings storage facility. However, when constructed, some areas between the tailings storage facility footprint and the fence line would not be impacted. Thus, this water source may or may not be physically impacted during construction.

† This spring is in the vicinity of underground boring for the slurry pipelines to cross under Mineral Creek. Impacts to this spring from the boring could occur but are not anticipated.

3.16.4.8 Cumulative Effects

Full details of the cumulative effects analysis can be found in chapter 4. The following represents a summary of the cumulative impacts resulting from the project-related impacts described in Section 3.16.4, Environmental Consequences, that are associated with livestock grazing, when combined with other reasonably foreseeable future actions.

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable, and have impacts that likely overlap in space and time with impacts from the Resolution Copper Project:

- ADOT Pinal County North-South Corridor
- APS Herbicide Use within Authorized Rights-of-Way on Tonto National Forest lands
- Grazing Allotment Permit Renewals (Various)[129]

[129] While not an identified RFFA, these have been included because the cumulative analysis assumes existing grazing allotment permits would be renewed.

- LEN Range Improvements
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

The cumulative effects analysis area for livestock and grazing encompasses the same grazing allotments as those used for the direct and indirect analysis area, as any effects on livestock from other projects would be felt within these same allotments. The metric used to quantify cumulative impacts to livestock and grazing are (1) the area of individual grazing allotments lost or disturbed by RFFA footprints, and (2) loss of water supplies within allotments. The FEIS analysis uses reduction in animal unit months as a measure of impact, but the estimate of reduction in AUMs is based on the area lost from individual allotments either by physical disturbance or loss of access. Physical disturbance is a direct proxy for the loss of supporting capacity of the allotments, and the resulting reduction in AUMs. Loss of water supplies (tanks, springs, streams) within allotments also reduces the supporting capacity of those allotments.

The cumulative effects analysis area for livestock and grazing is approximately 462,062 acres and is composed of the following grazing allotments:

- A-Diamond
- Battle Axe
- Devil's Canyon
- Ellsworth Desert
- Government Springs
- Heber
- Helmwheel
- Hicks-Pikes Peak
- Horsetrack
- Meyers
- Nichols Ranch
- Ruiz
- Slash S
- Superior
- Teacup Ranch
- Victory Cross
- Whitlow

The six reasonably foreseeable future actions above, combined with the Resolution Copper Project, represent about 22,000 acres of the 462,000-acre cumulative effects analysis area, or about 4.7 percent. This represents areas where changes in land use or vegetation could inhibit grazing use. Note that the above calculations exclude the grazing allotment permit renewals, which account for over 99 percent of the cumulative effects analysis area. Fundamentally, these renewals would not result in a material change in the use of the lands, reduction in AUMs, or loss of livestock grazing areas.

Specific loss of water sources for specific grazing allotments is not known for any of the reasonably foreseeable future actions.

3.16.4.9 Mitigation Effectiveness

Mitigation Identifier and Title	Authority to Require
FS-SV-03: Revised reclamation and closure plans	Required – Forest Service
FS-WR-01: GDEs and water well mitigation	Required – Forest Service
RV-LG-01: Mitigation for impacts to ranching and grazing leases	Voluntary – Resolution Copper

We developed a robust monitoring and mitigation strategy to avoid, minimize, rectify, reduce, or compensate for resource impacts that have been identified during the process of preparing this EIS.

Appendix J contains descriptions of mitigation measures that are being required by the Forest Service and mitigation measures voluntarily brought forward and committed to by Resolution Copper. Appendix J also contains descriptions of monitoring that would be needed to identify potential impacts and mitigation effectiveness.

This section contains an assessment of the effectiveness of design features associated with mitigation and monitoring measures found in appendix J that are applicable to livestock grazing. See appendix J for full descriptions of each measure noted below.

Mitigation Effectiveness and Impacts of Forest Required Mitigation Measures Applicable to Livestock Grazing

Appendix J contains mitigation and monitoring measures being required by the Forest Service under its regulatory authority or because these measures are required by other regulatory processes (such as the Biological Opinion). These measures are assumed to occur, and their effectiveness and impacts are disclosed here. The unavoidable adverse impacts disclosed below take the effectiveness of these mitigations into account.

Revised reclamation and closure plans (FS-SV-03). Implementing reclamation and closure plans ensures that the post-closure landscape is successfully revegetated to the extent practicable and that the landforms are stable and safe. This measure is effective at partially replacing habitat and vegetation over the long term within the footprint of all mine components, reducing long-term effects on surface water quality from erosion, and improving long-term resilience and safety of the tailings storage facility. Long-term use of the landforms for livestock grazing may be a possible future use.

GDEs and water well mitigation (FS-WR-01). This measure would replace water sources for any riparian areas associated with springs or perennial streams (groundwater-dependent ecosystems) impacted by drawdown from the mine dewatering and block caving. Though this measure could change the overall natural character of riparian areas, it would be effective at preserving riparian vegetation and aquatic habitats. This would be effective at preserving some water sources for livestock.

Mitigation Effectiveness and Impacts of Resolution Committed Mitigation Measures Applicable to Livestock Grazing

Appendix J contains mitigation and monitoring measures committed by Resolution Copper in contractual, financial, or other agreements. Due to these commitments these measures are assumed to occur, and their effectiveness and impacts if they were to occur are disclosed here. However, there are no committed mitigations for livestock grazing, which is reflected in the unavoidable adverse impacts disclosed below.

Mitigation Effectiveness and Impacts of Resolution Voluntary Mitigation Measures Applicable to Livestock Grazing

Appendix J contains mitigation and monitoring measures brought forward voluntarily by Resolution Copper and committed to in correspondence with the Forest Service. These measures are assumed to occur but are not guaranteed to occur. Their effectiveness and impacts if they were to occur are disclosed here; however, the unavoidable adverse impacts disclosed below do not take the effectiveness of these mitigations into account.

Mitigation for impacts to ranching and grazing leases (RC-LG-01). Resolution Copper has and will continue to work collaboratively with ranchers who hold private property and/or grazing leases/rights in the vicinity of the proposed project footprint. While not effective at the reduction in acreage available for livestock grazing—primarily leased by Resolution Copper—these measures would reduce the impact of the project on day-to-day operations on grazing allotments.

Unavoidable Adverse Impacts

Grazing would be impacted by a reduction in the area available for livestock grazing (a permanent reduction for the area of the subsidence area and tailings storage facility; a temporary reduction for the area within the perimeter fence until reclamation returns the area to a condition that is compatible with livestock grazing), and by impacts on seeps, springs, and stock tanks that are used by livestock. Water source enhancement measures may offset some of the impacts on seeps, springs, and stock tanks used by livestock on current grazing allotments. These impacts cannot be avoided or fully mitigated.

3.16.4.10 Other Required Disclosures

Short-Term Uses and Long-Term Productivity

Livestock grazing and long-term productivity would be permanently impacted within the tailings storage facility and subsidence area. Although reclamation would eventually return some level of vegetation to the tailings storage facility, productivity would be unlikely to recover to current conditions. There would be short-term losses of existing grazing around the MARRCO corridor and other linear corridors, ending with reclamation at the end of mine life, with no impact on long-term productivity.

Irreversible and Irretrievable Commitment of Resources

Vegetation on the site would be continually changing as reclamation procedures are implemented. Eventually, reclamation is expected to return the site to conditions potentially suitable for post-closure land uses such as livestock grazing. Irretrievable commitment of grazing resources would occur until reclamation has returned the site to conditions suitable for grazing. However, the subsidence area and tailings storage facility likely represent an irreversible loss of grazing area and resources.

3.17 Required Disclosures

This section addresses additional disclosures that are required under NEPA.

3.17.1 Short-Term Uses and Long-Term Productivity

NEPA requires consideration of the relationship between short-term uses of our environment and the maintenance and enhancement of long-term productivity. As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, create and maintain conditions under which humans and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The EIS recognizes that short-term uses and long-term productivity of the environment are linked and that opportunities that are acted upon have corollary opportunity costs in terms of forgone options and productivity that could have continuing effects well into the future. “Short term” is taken to mean the full life of the project (construction, operation, and post-closure phases). The relationship between short-term uses and long-term productivity is described in each individual resource section in this chapter.

3.17.2 Unavoidable Adverse Effects

This EIS describes the adverse or significant environmental effects that cannot be avoided from implementation of the proposed project or alternatives. In the resource sections of this chapter, the direct, indirect, and cumulative environmental effects of the project are discussed in detail. After taking into account required mitigation measures, significant and unavoidable impacts are disclosed in each individual resource section in this chapter.

3.17.3 Irreversible and Irretrievable Commitments of Resources

To comply with NEPA requirements, each resource section in this chapter describes any irreversible or irretrievable commitment of resources resulting from the implementation of any action alternative. Irreversible and irretrievable commitment of resources is defined as follows in FSH 1909.15 (U.S. Forest Service 2012a):

> Irretrievable. A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.
>
> Irreversible. A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals***Error! Bookmark not defined.*** or cultural resource***Error! Bookmark not defined.***s***Error! Bookmark not defined.***, or to those factors, such as soil***Error! Bookmark not defined.*** productivity that are renewable only over long periods of time.

3.17.4 Cumulative Effects

The cumulative effects analysis was conducted and is fully described in chapter 4. Each individual resource section in this chapter also addresses the results of the analysis.

3.17.5 Other Required Disclosures

The Forest Service consulted with the following agencies, as required by pertinent law and regulation.

3.17.5.1 Consultation under the Endangered Species Act

The Tonto National Forest consulted with the FWS regarding species protected under Section 7 of the ESA for the preferred alternative. All conservation measures brought forward under Section 7 consultation, as well as any reasonable and prudent measures and terms and conditions specified in the Biological Opinion (see appendix P of this FEIS), are nondiscretionary and would be included as components of the decision in the ROD.

3.17.5.2 Consultation under the National Historic Preservation Act

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties. Section 106 consultation involves multiple parties, including the SHPO, affected Tribes, and, in some cases, the direct participation of the ACHP. The ACHP began participating in the Resolution Copper Project and Land Exchange Section 106 consultation process in December 2017.

The ultimate outcome of consultation is often a Memorandum of Agreement or Programmatic Agreement (depending on the complexity of the project). The agreement outlines the roles and responsibilities of parties, the procedure for identification and evaluation of historic properties, the assessment of effects, and each party's responsibilities for resolving adverse effects from the project. The execution of the agreement evidences the agency official's compliance with Section 106. The agency official then must ensure that the undertaking is carried out in accordance with the agreement.

A PA was pursued and drafted during the Section 106 consultation process. Appendix O of the January 2021 Rescinded FEIS included that PA. All signatories, other than the ACHP, had signed the PA as of January 15, 2021. On February 11, 2021, the ACHP notified the Forest Service that "ACHP believes that further consultation in this case would be unproductive and therefore, we are hereby terminating consultation pursuant to 36 CFR § 800.7(a)(4)." In accordance with 36 CFR 800.7(c)(4), the Secretary of Agriculture delivered a written response to the ACHP on April 17, 2025, and that response concluded the Section 106 process for this undertaking.

Since ACHP did not sign the PA, the PA was never executed. Therefore, mitigation measures identified in the PA and any others identified subsequently will now be implemented through the final ROD and special use permit for use of NFS lands and through enforcement by other State and Federal agencies as well as third parties in separate agreements. Changes in enforcement of the measures described in the draft PA are further described in appendix J.

3.17.5.3 Conflicts with Regional, State, and Local Plans, Policies, and Controls

The Forest Service assessed possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian Tribe) land use plans, policies, and controls for the area concerned.

Plans reviewed for conflict are listed in the following section.

Federal Agencies

- Tonto National Forest land management plan (2023): The 2023 "Tonto National Forest Land Management Plan" provides long-term direction for managing forest resources. The plan directs the Tonto National Forest how to provide for multiple use and sustained yield of goods and services from the Tonto National Forest in a manner that maximized long-term public benefits in a way that is environmentally sound. The potential conflicts with this plan are explicitly evaluated in chapter 1 with respect to the need for a forest plan amendment. Note that the DEIS and January 2021 Rescinded FEIS both examined consistency of the project with the 1985 "Tonto National

Forest Land and Resource Management Plan." In December 2023, the Tonto National Forest implemented a new forest plan. The evaluation of the need for a forest plan amendment in the current FEIS is based on the 2023 forest plan.

- Tonto National Forest travel management plan (2021): The 2021 "Travel Management on the Tonto National Forest, Revised Final Environmental Impact Statement" serves to comply with the 2005 Travel Management Rule, which requires motor vehicles be restricted to designated roads, trails, and areas as shown in a Motor Vehicle Use Map. The proposed alternative in the 2019 "Travel Management on the Tonto National Forest, Final Supplemental Environmental Impact Statement" restricts off-road motor vehicle use. It designates approximately 3,700 miles of roads and motorized trails open to the public; eight off-highway vehicle (OHV) areas where travel off designated system roads and motorized trails is permitted; three additional permit zones; motor vehicle use solely for retrieving legally harvested elk and bear for all hunt up to 1 mile on both sides of all designated roads and motorized trails; motor vehicle use for dispersed camping on approximately 91 miles of full-sized motorized trails that access nearly 2,750 inventoried existing dispersed camping sites; and the use of motorized vehicles off of designated system roads and motorized trails to aid in the collection of permitted personal fuelwood within the designated fuelwood cutting areas. The Tonto National Forest travel management plan was evaluated at multiple points in the process, particularly when developing potential mitigation for motorized and non-motorized recreation. The resulting outcomes would be consistent with the plan, though the plan is not yet finalized.
- BLM Safford District resource management plan (1992, 1994): The "Safford District Resource Management Plan and Environmental Impact Statement" serves to resolve issues and management concerns about specific land management opportunities and problems.

  During the planning process, four issues and 10 management concerns were identified by BLM managers and specialists and the public. Issues included access, ACECs and other special management types, OHVs, and riparian areas. Identified management concerns included wildlife habitat, including threatened and endangered species; lands and realty; outdoor recreation and visual resource management, including socioeconomic factors; energy and minerals, including socioeconomic factors; cultural resources; soil erosion; vegetation; water resources; air quality; and paleontological resources. The resource management plan determines management objectives for each concern and identifies actions to implement the objectives. The evaluations of transportation, recreation, and scenic resources in chapter 3 identified conflicts with various plan objectives, specifically for Alternative 5.
- BLM Lower Sonoran and Sonoran Desert National Monument resource management plans (2012): The 2012 "Lower Sonoran Record of Decision and Approved Resource Management Plan" includes broad land use decisions that provide direction for managing resources and resource uses within the Lower Sonoran Decision Area through goals and objectives (desired outcomes), allowable uses, and management actions anticipated to achieve desired outcomes. The 2012 "Sonoran Desert National Monument Record of Decision and Approved Resource Management Plan" similarly provides management direction for BLM-administered lands in the Sonoran Desert National Monument in order to ensure protection of the spectacular diversity of biological resources and archaeological and historic sites. Direction is provided in the form of goals and objectives, allowable uses, and management actions to achieve desired outcomes. The evaluations of transportation, recreation, and scenic resources in chapter 3 identified conflicts with various plan objectives, specifically for Alternative 5.
- BLM Middle Gila Canyons travel management plan (2010): The 2010 "Middle Gila Canyons Transportation and Travel Management Plan" identifies the official BLM transportation system and travel management designations to appropriately allow for motorized and non-motorized

access to public lands in the planning area for administrative and public uses. The planned route system accommodates local travel needs, protects public safety, protects resources on the public lands, and prevents or minimizes conflict among users. Growing public demand for recreational and other uses, as well as growing impacts from public use, have resulted in the need for a plan in order to address the deteriorating physical conditions of existing routes and minimize impacts and conflicts from recreational use on other uses. The evaluations of transportation and recreation in chapter 3 identified conflicts with various plan objectives, specifically for Alternative 5.

State Government

- ADOT long-range transportation plan (2018): The ADOT long-range transportation plan is published every 5 years. Development of the plan included research on trends and issues affecting transportation in Arizona, refinement of Arizona's transportation vision and goals, an assessment of current state highway system conditions, quantification of 25-year investment needs to maintain and improve the state highway system and provide state support for non-highway modes, and a forecast of expected revenues over the planning horizon. The planning process also included an extensive engagement process that provided Arizona residents and transportation stakeholders across the state multiple opportunities to offer input into development of the plan. The plan provides a Recommended Investment Choice that defines how ADOT will strive to allocate its limited resources to different types of highway investments. The evaluation of the Resolution Copper project traffic volumes and the capacity of the regional transportation routes suggests there would be no conflicts with ADOT long-range planning.
- Arizona State workforce development plan (2016): The Arizona State workforce development plan seeks to align "workforce investment, education and economic development systems in support of a comprehensive, accessible, high-quality workforce development system in the United States." The plan provides an in-depth analysis for Arizona's workforce development systems and describes the various operational and planning elements that will be implemented over a 4-year period. In addition, the plan details how labor market information and feedback from workgroups and committee members were used to identify gaps within the workforce system as a whole. The addition of Resolution Copper project employment to the workforce does not conflict with this plan.
- Statewide comprehensive outdoor recreation plan (2018–2022): The Statewide Comprehensive Outdoor Recreation plan identifies outdoor recreation issues of statewide importance in order to guide outdoor recreation managers and decision-makers on policy and funding issues over a 5-year period. The priority issues for this plan included preservation and conservation; accessibility and inclusion; engagement; collaboration and partnerships; marketing, communication, and education opportunities; and funding. Key objectives for the 2018 plan were to establish outdoor recreation priorities for Arizona; set evaluation criteria to allocate the Federal Land and Water Conservation Fund grants; protect, conserve, and manage Arizona's public lands, recreation spaces, and unique places for current and future generations; encourage a highly integrated and connected outdoor recreation system throughout Arizona; ensure that Arizona's diverse and growing population has access to outdoor recreation spaces and opportunities to enjoy a range of recreation activities; communicate linkages between outdoor recreation, individual wellness benefits, community health, and a thriving economy; and elevate public participation and engagement in outdoor recreation planning initiatives and issues. The Resolution Copper project does represent a number of conflicts with recreational opportunities. Mitigation has been developed to reduce these conflicts and replace or enhance recreational opportunities for motorized access, non-motorized access, camping, birding, and other uses.
- Arizona state parks and trails 5-year strategic plan (2018–2022): Arizona State Parks and trails 5-year strategic plan provides goals and objectives for agency activities by using four strategic

pillars: optimizing system vitality; conservation; accessibility and inclusion; and thriving individuals and communities. The four pillars represent the agency's vision for tackling budget while improving visitor experience. The first pillar is consistent with the Arizona Governor's Arizona Management System initiative and acts as a springboard for decades of dynamic growth, while the remaining three pillars are consistent with the National Recreation and Parks Association's vision of community impact. The Resolution Copper Project does not represent any specific conflicts with this plan.

- State wildlife action plan (2012–2022): The state wildlife action plan for Arizona acts as a primary conservation tool for keeping fish and wildlife healthy and off the list of threatened and endangered species. The plan provides a 10-year vision for the entire state of Arizona and identifies wildlife and habitats in need of conservation, insight regarding stressors to those resources, and suggests actions that can be taken to alleviate those stressors. Congress identified eight elements required to be addressed in the plan: information on the distribution and abundance of wildlife; descriptions of locations and relative condition of key habitats; descriptions of problems that may adversely affect species; descriptions of conservation actions; proposed plans for monitoring species and their habitats; descriptions of procedures to review the strategy; plans for coordinating the development, implementation, review, and revision of the plan; and broad public participation. The Resolution Copper Project does represent a number of conflicts with wildlife and habitat. Mitigation has been developed in consultation with the AGFD to reduce these conflicts and replace or enhance wildlife habitat.
- ADWR Phoenix Active Management Area fifth management plan: The "Fifth Management Plan, Phoenix Active Management Area, 2020–2025," is a tool used by the ADWR to achieve groundwater goals for the Phoenix AMA. The statutory goal for the Phoenix AMA is a safe-yield, defined as "a groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area," by the year 2025. The plan uses management strategies from the 1980 Groundwater Management Act, such as conservation programs for all major water-using sectors, replacement of groundwater use with renewable water supplies, water-management assistance programs, enforcement provisions, and monitoring programs. As noted in Chapter 4, Cumulative Effects, Resolution Copper would ultimately be in compliance with the fifth management plan through acquisition of appropriate groundwater rights for the Desert Wellfield, even in light of competing uses of water in the region.
- ADWR Pinal Active Management Area fifth management plan: The "Fifth Management Plan, Pinal Active Management Area, 2020–2025," is a tool used by the ADWR to achieve groundwater goals for the Pinal AMA. The statutory goal for the Pinal AMA is to allow the development of non-irrigation uses and to preserve existing agricultural economies in the Pinal AMA for as long as feasible, consistent with the necessity to preserve future water supplies for non-irrigation uses. The plan uses management strategies from the 1980 Groundwater Management Act, such as conservation programs for all major water-using sectors, replacement of groundwater use with renewable water supplies, water-management assistance programs, enforcement provisions, and monitoring programs. Resolution Copper would not withdraw water from the Pinal AMA and would not be in conflict with this plan.

Pinal County

- Pinal County comprehensive plan 2009 (updated in 2015): The Pinal County comprehensive plan guides the county on managing growth, preserving quality of life, and promoting sustainability. It outlines where and how the county should grow and develop over time. The plan covers many areas, including long-term vision for employment centers, development, open space, and transportation. While some aspects of the Resolution Copper Project—such as habitat loss—would conflict with this plan's objectives, the Resolution Copper Project overall generally would develop in concert with this plan, once mitigation for project impacts is implemented.

- Pinal County strategic plan (2017–2020): The Pinal County strategic plan identifies long-term goals and objectives and determines the best approach for achieving those goals and objectives. The strategic plan requires County leadership to look into the future and influence it; defines the vision and mission of County government and focuses leadership on goals and objectives; provides better awareness of organizational direction, needs, and continuity; and helps bring all County employees into an integrated service delivery system providing standards of accountability for people, programs, and allocated resources. As with the comprehensive plan, the strategic plan covers many areas. While some aspects of the Resolution Copper Project would conflict with this plan's objectives, the Resolution Copper Project overall generally would develop in concert with this plan once mitigation for project impacts is implemented.
- Pinal County open space and trails master plan (2007): The Pinal County open space and trails master plan serves as the foundation of the Open Space and Recreation Element of the Pinal County comprehensive plan. The open space and trails master plan reflects the vision of county residents and identifies goals and objectives for the attainments of open space, trails, and regional parks. Included in the plan is 399,300 acres of existing or planned open space, 802,400 acres of proposed open space, 25,900 acres of restricted use open space, and 168,700 acres of regional parks. The Resolution Copper Project does represent a number of conflicts with recreational opportunities, including open space and trails. However, mitigation was developed to reduce these conflicts and replace or enhance recreational opportunities for motorized access, non-motorized access, camping, birding, and other uses. Overall, the mitigation as implemented would be consistent with the plan.
- Pinal County state implementation plans (SIPs) and applicable Maricopa Association of Governments regional air quality plans: The Pinal County SIP is a collection of regulations and documents used to reduce air pollution in areas that do not meet NAAQS. Demonstration of conformance with the SIP is disclosed in section 3.6.
- Pinal regional transportation plan (2017): The Pinal regional transportation plan is a comprehensive, multimodal plan which identifies a list of key roadway and public transportation projects to be developed between 2018 and 2037. The plan meets the transportation needs of the region as it grows rapidly, as well as the ongoing mobility need of Pinal County residents. The evaluation of Resolution Copper Project traffic volumes and the capacity of the regional transportation routes suggests there would be no conflicts with long-range transportation planning.
- Pinal County area drainage master plans: The Pinal County area drainage master plan identifies certain drainage and environmental hazards for watersheds in Pinal County. Included in the plan in an inventory of existing drainage-related facilities, an HEC-1 hydrologic skeleton model, and a GIS database. The Resolution Copper Project could impinge on 100-year floodplains, depending on the location of the tailings storage facility. These impacts would need to be reconciled with Pinal County through the appropriate regulatory process to be in compliance with the plan.
- Central Arizona Governments regional transportation plan (2015): The Central Arizona Governments (CAG) was incorporated in 1975 and is one of six regional planning districts established by Executive Order 70-2. At the time the CAG initiated the effort to develop a comprehensive long-range regional transportation plan for the CAG region, in 2011, the planning boundaries encompassed all of Gila and Pinal Counties. The CAG region has now been updated with a newly defined metropolitan planning area in western Pinal County and expansion of the boundaries of an existing metropolitan area into northern Pinal County. For this plan, the region

continued to encompass all of Gila and Pinal Counties. The regional transportation plan identifies future transportation facility needs, potential environmental mitigation actions associated with developing those facilities, established operational and capital investment strategies and priorities, and supports the implementation of regional transportation plan components. The plan provides funding framework for transportation improvements throughout the region to 2040.
The evaluation of Resolution Copper Project traffic volumes and the capacity of the regional transportation routes suggests that there would be no conflicts with long-range transportation planning.

Gila County

- Gila County comprehensive plan (2003, amended 2018): The Gila County comprehensive plan serves as a guide to address future growth and development within the unincorporated parts of Gila County. The comprehensive plan represents Gila County residents' preferences on how development should occur and is used by county decision-makers, staff, and citizens.
  The comprehensive plan also serves as a foundation for various other planning documents and ordinances, including the Gila County Zoning Ordinance, the Gila County Subdivision Ordinance, specific area plans, and others. Similar to the Pinal County comprehensive plan, the Gila County plan covers many areas, including long-term vision for employment centers, development, open space, and transportation. In the plan, the area near the Skunk Camp tailings storage facility is designated as residential use (including State Trust lands). The Resolution Copper Project would be in conflict with this use.
- Gila County land use and resource policy plan (2010): The Gila County land use and resource policy plan is specific to the use of Federal lands within Gila County. The only portion of the Resolution Copper Project that affects Federal lands within Gila County is a small portion of the Alternative 6 tailings pipeline/power line corridor, which encompasses about 38 acres, and would not conflict with the overall nature of the plan.
- Gila County small area transportation study (2006): The Gila County small area transportation study developed a 20-year transportation plan and implementation system to guide Gila County in meeting future transportation needs. Developments such as roadway and multimodal improvements were identified to address deficiencies and needs to improve mobility and safety in the county. The study determined how and when these improvements should be implemented and funded. Funding strategies and sources were included in the plan to guide the County in pursuing local, regional, State, and Federal funding, and transportation improvements were prioritized in order to maximize project benefits within budget limitations. The evaluation of Resolution Copper Project traffic volumes and the capacity of the regional transportation routes suggests there would be no conflicts with long-range transportation planning.
- Gila County transportation study (2014): The principal purpose of the Gila County transportation study is to identify the most critical transportation infrastructure needs within Gila County and recommend a program of improvement projects to address these needs. Transportation needs were grouped into the following elements: roadway, safety, pavement management, bicycle and pedestrian facilities, and transportation finance. The Resolution Copper Project has minimal impact on transportation networks within Gila County, and there would be no conflicts with these plans.

Indian Tribes

- No specific plans were identified, from scoping or public comments, or by the Tonto National Forest ID team.

Town of Superior

- Superior waters and trails. This plan identifies a long-term vision for trail opportunities along Queen Creek in the vicinity of the town of Superior. The Resolution Copper Project does represent a number of conflicts with recreational opportunities, including open space and trails; however, mitigation has been developed to reduce these conflicts and replace or enhance recreational opportunities for motorized access, non-motorized access, camping, birding, and other uses. Overall, the mitigation as implemented would be in line with the plan.

3.17.5.4 Energy Requirements and Conservation Potential

This section describes the consideration of energy requirements and conservation potential of the various alternatives.

Alternative 1 – No Action

The no action alternative uses the least amount of energy of any alternative, although power would still be required for legally permitted dewatering to preserve infrastructure. As no project would be built, there would be no overall energy conservation potential.

Alternative 2 – Near West – Proposed Action

All five action alternatives use the same amount of power for the mining at the East Plant Site, processing at the West Plant Site, delivery of concentrate to the filter plant and loadout facility, and dewatering. The only change in power usage by the alternatives is for the tailings storage facility. Out of five action alternatives, Alternative 2 uses the least power, primarily driven by energy needs of the cyclone/thickener. Alternative 2, however, requires the most energy for water pumping.

Given the nature of the mine, processing, water supply, and tailings storage, there is little potential for energy conservation without changing the fundamental aspects such as mining technique, tailings locations, or tailings disposal methods. Various mining techniques were evaluated during the alternative development process and not found to be reasonable and were not carried forward for detailed analysis. Variations in tailings disposal techniques are incorporated into the action alternatives and reflect the energy differences discussed here. The primary conservation potential is for the mine to generate or contract for renewable energy; this has been proposed as a mitigation measure (see mitigation measure RC-AQ-01 in appendix J).

Alternative 3 – Near West – Ultrathickened

Alternatives 2 and 3 use the same amount of power, which is the least of all action alternatives. Alternative 3 will require approximately 100,000 acre-feet less of total groundwater pumped from the Desert Wellfield; therefore, the total energy for water pumping is less than Alternative 2.

Alternative 4 – Silver King

Out of five action alternatives, Alternative 4 uses the most power, primarily driven by energy needs from filtering for the dry-stack tailings. Alternative 4 requires the least amount of energy for water pumping, however.

Alternative 5 – Peg Leg

Of the action alternatives, Alternative 5 falls in the center for total energy requirements, using the same amount of energy for water pumping from the Desert Wellfield, but less energy at the tailings storage facility itself than Alternative 4.

Alternative 6 – Skunk Camp

Alternative 6 uses the same amount of energy for water pumping from the Desert Wellfield as Alternative 5, about the same energy for concentrating/thickening, but less energy at the tailings storage facility itself.

3.17.5.5 Natural or Depletable Resource Requirements and Conservation Potential

This section describes the natural or depletable resource requirements and conservation potential of various alternatives.

Alternative 1 – No Action

WATER

The no action alternative would not require any water to be pumped from the Desert Wellfield.

HABITAT / LAND

Depletable resources include vegetation, soil, riparian areas, and overall habitat. These aspects are largely encompassed by the acreage of disturbance. The no action alternative would not result in any additional acreage of disturbance and would have the greatest conservation potential for these resources.

Alternative 2 – Near West – Proposed Action

WATER

Alternative 2 would require roughly 600,000 acre-feet of total groundwater to be pumped from the Desert Wellfield. This is the largest amount of water to be pumped from the Desert Wellfield and represents the alternative with the least conservation potential for water resources.

HABITAT / LAND

The acreage of disturbance of the East Plant Site, West Plant Site, and filter plant and loadout facility would remain the same between alternatives; no conservation potential is represented in these areas. The Alternative 2 tailings storage facility would have a footprint of roughly 4,900 acres within which natural resources could be lost; this represents the least acreage of disturbance of all alternatives and the greatest conservation potential.

Alternative 3 – Near West – Ultrathickened

WATER

Alternative 3 would require roughly 500,000 acre-feet of total groundwater to be pumped from the Desert Wellfield. This alternative offers some resource conservation potential over Alternative 2.

HABITAT / LAND

Alternative 3 impacts the same acreage as Alternative 2 and offers no conservation potential for those natural resources impacted by the disturbance footprint.

Alternative 4 – Silver King

WATER

Alternative 4 would require roughly 180,000 acre-feet of total groundwater to be pumped from the Desert Wellfield. This alternative offers the greatest resource conservation potential of all the alternatives with respect to water.

HABITAT / LAND

The Alternative 4 tailings storage facility would have a footprint of roughly 5,700 acres within which natural resources could be lost; this does not represent any natural resource conservation potential, compared with Alternative 2.

Alternative 5 – Peg Leg

WATER

Alternative 5 would require roughly 550,000 acre-feet of total groundwater to be pumped from the Desert Wellfield. This alternative offers minimal resource conservation potential, compared with Alternative 2.

HABITAT / LAND

The Alternative 5 tailings storage facility would have a footprint of roughly 10,800 acres within which natural resources could be lost. This is the largest footprint of any of the alternatives and represents the alternative with the least conservation potential for those natural resources impacted by the disturbance footprint.

Alternative 6 – Skunk Camp

WATER

Alternative 6 would require roughly 550,000 acre-feet of total groundwater to be pumped from the Desert Wellfield. This alternative offers minimal resource conservation potential, compared with Alternative 2.

HABITAT / LAND

The Alternative 6 tailings storage facility would have a footprint of roughly 9,200 acres within which natural resources could be lost. This is the second largest footprint of any of the alternatives and represents little conservation potential for those natural resources impacted by the disturbance footprint.

3.17.5.6 Means to Mitigate Adverse Environmental Impacts

The Forest Service process to identify the means to mitigate adverse environmental impacts is described in chapter 2. The full suite of mitigations developed to mitigate adverse environmental impacts is detailed in appendix J, and the effectiveness of those mitigation measures is evaluated in each individual resource section in chapter 3.

These measures include those required by the Forest Service under its authority or other regulatory authority (such as the Biological Opinion) and those mitigation measures developed that are solely voluntary by Resolution Copper.

The Forest Service has also identified additional mitigation measures that cannot yet be required (see (Garrett 2025)). These represent a means to mitigate adverse environmental impacts, even if they cannot yet be implemented. Future regulatory processes or conservation efforts could refer to these mitigation measures as a means to mitigate adverse environmental impacts.

As noted in the "Unavoidable Adverse Impacts" sections in the chapter, not all adverse impacts have the potential to be mitigated.

Chapter 4. Cumulative Effects

4.1 Introduction

A cumulative impact is one that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, which are those Federal or non-Federal activities not yet undertaken for which there are existing decisions, funding, or identified proposals (36 CFR 220.3). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts are the combination of impacts from

- the proposed action or alternatives
- other past or present actions
- reasonably foreseeable future actions

Past and present actions contribute to the existing condition of the affected environment in the project area, and any impacts related to those actions are included under the "Affected Environment" heading of each resource section in chapter 3. The additional effects of the proposed action or alternatives are discussed under the "Environmental Consequences" heading in each resource section of chapter 3. To assess cumulative impacts, those effects must then be considered in conjunction with the effects of "reasonably foreseeable" future actions, as long as they overlap in both space and time.

A reasonably foreseeable future action (RFFA) is one that is likely to occur in the future and does not include actions that are speculative. We compiled a list of future actions to form the basis for the cumulative effects analysis and applied specific criteria to determine whether they were reasonably foreseeable or speculative. We then conducted screening to determine which reasonably foreseeable future actions would overlap temporally with the Resolution Copper Project, which would have impacts on individual resources, and which would overlap spatially with project-related impacts. Those reasonably foreseeable future actions that are not speculative and overlap in space and time with project effects are then analyzed for cumulative effects using specific impact metrics.

The cumulative effects analysis process and results are described in this chapter. Summaries of the impacts specific to each resource are provided in each resource section in chapter 3.

4.1.1 Changes from the DEIS

Our cumulative effects analysis for the DEIS included these steps:

1. Compilation of potential reasonably foreseeable future actions and screening for temporal overlap was contained in Rigg and Morey (2018).
2. Screening of reasonably foreseeable future actions for spatial overlap and impacts to individual resources was contained in SWCA Environmental Consultants (2018a).
3. Analysis of cumulative effects was included in each resource section in chapter 3, primarily in a narrative and qualitative format.

We received public comments that generally criticized two aspects of this process: lack of documentation in the DEIS itself (though details were contained in the project record), and lack of quantitative analysis of cumulative effects.

To remedy these perceived shortcomings, we reworked the cumulative effects analysis for the FEIS in the following ways:

- First and foremost, chapter 4 was added to contain the bulk of the actual analysis of cumulative effects. The cumulative effects sections for each resource remain in chapter 3, but only as summaries of the full analysis presented in chapter 4.
- We updated the potential list of RFFAs, adding projects that have come to light since the DEIS, and reassessing projects that have occurred since the initial list was compiled for the DEIS analysis.
- Rather than narratively comparing the area of impact from reasonably foreseeable future actions to the cumulative effects analysis areas, we conducted the spatial overlap analysis solely in a GIS format, with the results of the spatial overlap for each resource contained in chapter 4.
- Finally, rather than a narrative, qualitative discussion of cumulative effects, quantitative metrics were selected and analyzed wherever possible. This does not preclude qualitative analysis where quantitative metrics cannot be supported by available data. In addition, there are other larger topics that warrant substantial narrative discussions in chapter 4. These include future meteorological trends and competing water uses.

Figure 4.1.1-1 shows the process steps for a cumulative effects analysis and how we documented this process in the DEIS and FEIS.

4.1.2 Changes from the January 2021 Rescinded FEIS

Several revisions have been made to chapter 4 since the January 2021 FEIS was rescinded.[130] With respect to the resource-by-resource cumulative effects analysis (section 4.3.3), since several years had passed, the list of potential RFFAs required updating. This update process is described in more detail in section 4.2.1. In addition to the resource-by-resource analysis, a number of key cumulative effects topics requiring a more holistic discussion were updated as well (section 4.3.4).

Section 4.3.4 contains two topics that lend themselves to a holistic discussion. The first topic addresses regional water supplies (section 4.3.4.1). This includes discussion of many topics of concern to the public that do not lend themselves to the strict definitions of reasonably foreseeable future actions that guide the resource-by-resource cumulative effects analysis in section 4.3.3. These topics include competing water uses, future growth, regional drought, and shortages on the Colorado River. This section has been updated to reflect new developments since January 2021, most of which can be characterized as worsening water resource conditions in Arizona.

The second topic addressed holistically in section 4.3.4 is future meteorological trends (section 4.3.4.2). These trends are addressed in each resource section in chapter 3 where pertinent, specifically sections 3.3 (Soils, Vegetation, and Reclamation), 3.6 (Air Quality), 3.7.1 (Groundwater Quantity and Groundwater-Dependent Ecosystems), 3.7.3 (Surface Water Quantity), and 3.10.2 (Fuels and Fire Management). A more holistic discussion of these trends is included in chapter 4, and we have expanded this discussion since the publication of the January 2021 Rescinded FEIS, including how future meteorological trends

[130] The DEIS for the Resolution Copper Project was published in August 2019. After compiling and reviewing all public comments on the DEIS and undertaking necessary changes, the Forest Service published an FEIS and draft ROD for the Resolution Copper Project on January 15, 2021. On March 1, 2021, the Secretary of Agriculture instructed the Forest Service to withdraw the Notice of Availability and rescind the FEIS and draft ROD. The Secretary indicated that this step was taken "to provide an opportunity for the agency to conduct a thorough review based on significant input received from collaborators, partners, and the public since these documents were released."

were assessed in the groundwater model and how extreme meteorological conditions have been incorporated into the tailings storage facility design.

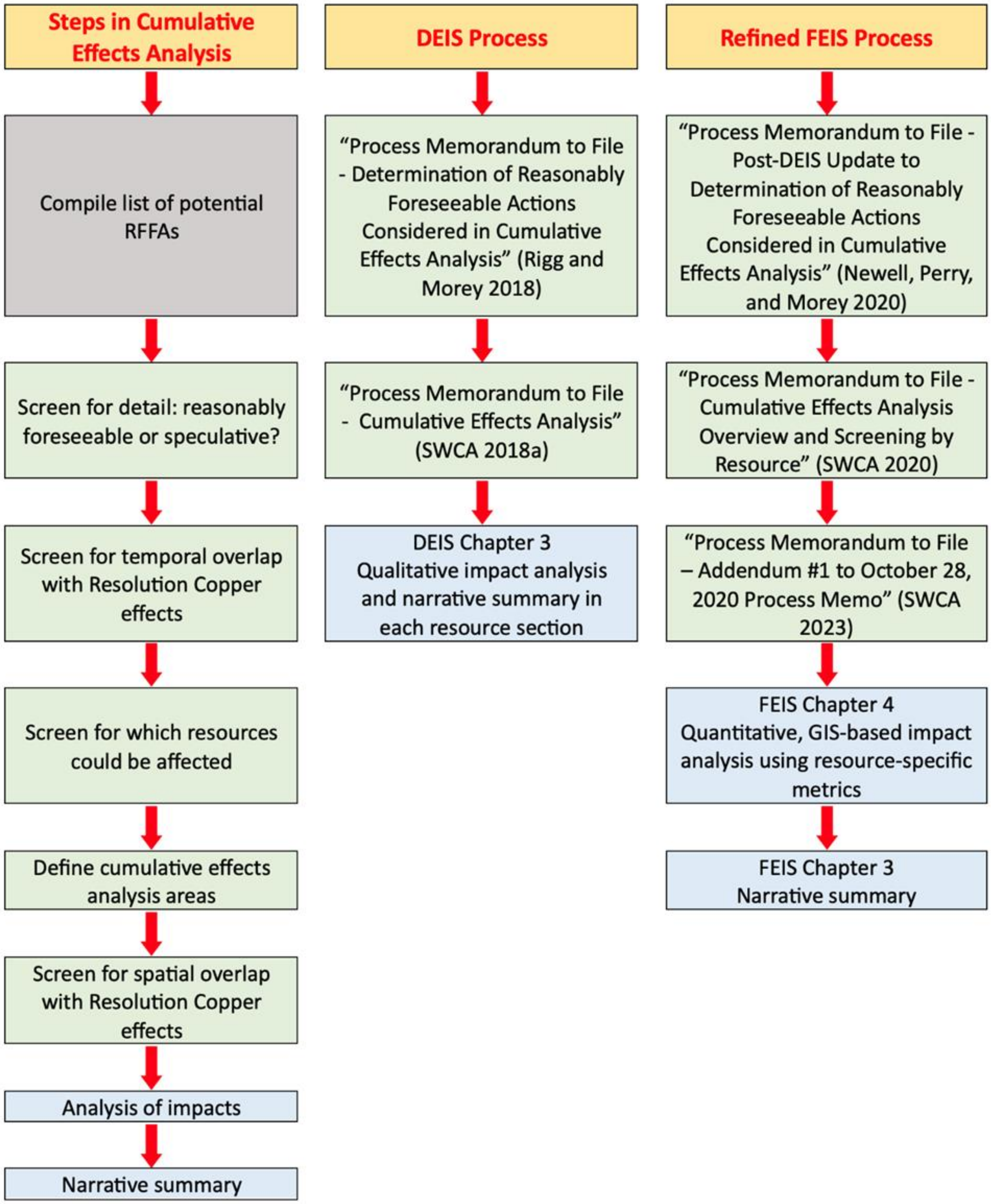

Figure 4.1.1-1. Comparison of cumulative effects analysis process for the DEIS and FEIS

4.2 Methodology and Screening

4.2.1 Screening of RFFA List

After publishing the DEIS (August 9, 2019), the status of each potential RFFA considered in the DEIS was reevaluated three times to determine whether the potential RFFAs would still overlap the Resolution Copper Project. Additionally, any newly identified RFFAs were considered. These updates occurred in October 2020, April 2023, and October 2024, as outlined below.

4.2.1.1 2020 RFFA Updates

As shown in the flowchart provided as figure 4.1.1-1, the RFFAs used in the DEIS were reevaluated before publishing the Rescinded FEIS in January 2021. As part of this screening, since several years had elapsed, the current schedule and status of each potential RFFA considered in the DEIS was reevaluated to determine whether the potential RFFAs would still overlap temporally with the Resolution Copper Project. The updated list of potential RFFAs and screening for temporal overlap is contained in the "Post-DEIS Update: Determination of Reasonably Foreseeable Actions Considered in Cumulative Effects Analysis Memorandum," dated October 28, 2020 (Newell et al. 2020).

The DEIS list of potential RFFAs was composed of 77 RFFAs. In 2020, the new temporal evaluation determined that 13 of these potential RFFAs had been completed or canceled. As a result, these potential RFFAs were determined to no longer overlap temporally with the Resolution Copper Project. This screening removed them from the FEIS cumulative effects analysis.

The addition of projects that came to light since the DEIS further updated the list of potential RFFAs. Potentially new RFFAs were identified through public comments received on the DEIS, through a new review of Federal sources that included the Forest Service, BLM, Bureau of Indian Affairs, and Federal Register listings for the Interior and Energy Departments. Potential RFFAs also were identified through a search for actions occurring on Tribal lands and projects that may be occurring along the Arizona National Scenic Trail. An additional 74 potential RFFAs were identified during the 2020 reevaluation, and with some consolidation we assessed a total of 145 potential RFFAs for the FEIS. However, 75 of these RFFAs are not considered foreseeable or had no temporal overlap with the project. A preliminary list of 70 RFFAs was thus carried forward for detailed consideration and screening to identify which projects potentially would have effects on each individual resource (SWCA Environmental Consultants 2020b).

4.2.1.2 2023 RFFA Updates

The RFFAs were again reevaluated in April 2023 using the following screening process:

- Evaluate the status of all previous RFFAs evaluated in the EIS, primarily to determine their continued applicability for inclusion within the EIS cumulative impact analysis.
- Identify any new projects that have been introduced after October 28, 2020, and evaluate their validity as RFFAs for cumulative analysis in the republished EIS.

As a result of this updated screening analysis, five previous RFFAs analyzed in 2021 have been removed as valid RFFAs for cumulative effects analysis due to no longer having temporal overlap with the Resolution Copper Project. Additionally, four newly identified cumulative projects qualified as valid RFFAs for analysis within the republished FEIS. The updated list of potential RFFAs and screening for temporal overlap is contained in the "Process Memorandum to File – Addendum #1 to October 28, 2020 Process Memo" (Debauche 2023).

4.2.1.3 2024 RFFA Updates

Similar to April 2023, in October 2024 the RFFAs were again reevaluated using the following screening process:

- Evaluate the status of all previous RFFAs being evaluated as of April 2023, primarily to determine their continued applicability for inclusion within the EIS cumulative impact analysis.
- Identify any new projects that have been introduced since April 2023 and evaluate their validity as RFFAs for cumulative analysis in the republished EIS.

As a result of this updated screening analysis, one RFFA analyzed in April 2023 has been removed as a valid RFFA for cumulative effects analysis because it no longer has a temporal overlap with the Resolution Copper Project. No newly identified projects qualified as valid RFFAs for analysis within the republished FEIS. The updated list of potential RFFAs and screening for temporal overlap is contained in the "Process Memorandum to File – Addendum #2 to October 28, 2020 Process Memo" (SWCA Environmental Consultants 2024).

4.2.2 Cumulative Effects Analysis

Chapter 4 contains the analysis of the resource effects from these RFFAs combined with the project effects. This analysis consists of three steps:

1. A cumulative effects analysis area is defined for each resource, primarily based on consideration of the area over which effects might occur. The rationale is clearly documented for each analysis area.
2. Each RFFA was assigned a geographic area or footprint. For each resource, GIS technology was used to overlay the RFFA footprint with the resource cumulative effects analysis area. Only those RFFAs with spatial overlap of the cumulative effects analysis area are carried forward for analysis of effects.
3. Specific impact metrics are selected for each resource, with a strong preference for metrics that allow for quantitative analysis of cumulative effects. In cases where the preferred metric simply is not known for many of the RFFAs, proxy metrics are used. In many cases, acreage of project disturbance serves as a useful proxy.

The acreage calculations in chapter 4 are based on the footprint for the preferred alternative (Alternative 6 – Skunk Camp). This alternative has the greatest acreage impact of all the alternatives and therefore represents a maximum anticipated cumulative impact when combined with other RFFAs.

4.3 Cumulative Effects Analysis

4.3.1 Cumulative Effects Analysis Areas and Impact Metrics

The cumulative effects analysis area and impact metrics used are summarized in table 4.3.1-1 for each resource.

Table 4.3.1-1. Cumulative effects spatial analysis areas for cumulative effects, and preferred and proxy impact metrics

Resource	Spatial Analysis Area for Cumulative Effects Analysis	Impact Metrics and Rationale
Geology, Minerals, and Subsidence	The potential for activation of faults extends beyond the project footprint to the general region, as do the geological changes (subsidence) that affect regional hydrology. The cumulative effects analysis area for mineral resources extends throughout the Copper Triangle area. Because the offered lands also remove areas from mineral development (as per PL 113-291), they are also included in the spatial analysis area.	Metric: Physical footprint of RFFAs (acres) Rationale: The footprint of each RFFA represents that area where physical disturbance, extraction of minerals, or loss of access to subsurface minerals would occur that would prevent any mineral resources—if present—from being accessed by future generations.
Soils, Vegetation, and Reclamation	The loss of soil and vegetation in the project footprint contributes to the characteristics of the greater watershed, as do the changes in landscape-scale habitat blocks. The cumulative effects analysis area for soils and vegetation includes all watersheds[131] impacted by ground disturbance.	Metric: (1) type and amount of vegetation communities physically disturbed (acres); (2) type and amount of soils physically disturbed (acres); (3) type and amount of any critical or special habitats disturbed (acres) Rationale: The overall cumulative loss of vegetation has impacts on habitat for wildlife population health and extent, and large-scale changes in the nature and characteristics of the overall landscape. The overall cumulative impact to soils has impacts on a watershed scale for erosion and sedimentation and impacts to downstream drainages. Combined impacts on critical or special habitats can have cumulative effects on specific populations of species that have special protections, such as threatened or endangered species.
Noise and Vibration	The direct and indirect effects of noise and vibration were determined to be limited to 1 mile from the project area. The cumulative effects analysis area for noise and vibration extends an additional mile from the project footprint (2 miles total), to allow for overlap of the direct/indirect effects from any RFFAs.	Metric: Combined areas in which combined noise levels exceed 55 dBA (acres) Rationale: There are numerous ways to characterize noise impacts and thresholds of concern. The most stringent threshold used in the FEIS is 55 dBA, which is an impact threshold specifically appropriate to residential areas.
Transportation and Access	The direct and indirect effects of transportation changes are analyzed for the roads adjacent to the project-related facilities and the regional transportation routes. The cumulative effects analysis area for transportation is identical, as traffic from other projects would potentially travel these same routes.	Metric: Combined additional volume of traffic on road segments (number) Rationale: Increased traffic impacts would be felt by residents, travelers, and users either on road segments or at intersections, and increased volume over existing levels is associated with reductions in level of service, increased travel times, and potential for increased accidents.
Air Quality	The modeling analysis area used to assess direct and indirect impacts to air quality encompassed an area up to 100 kilometers from the project. This area is much greater than the area where impacts were modeled to occur (all air quality standards were met at the project fence line), and is sufficiently large to encompass other emission sources that could combine with the project emissions to impact air quality. The cumulative effects analysis area for air quality is identical to the model analysis area.	Metric: Increase in regional emissions, focusing on particulate matter, compared with the entire state and to the three-county area of Gila, Maricopa, and Pinal Counties (tons/year) Rationale: Project modeling indicates the ability to meet National Ambient Air Quality Standards at the fence line, but the project still contributes to regional emissions. There are substantial emissions and development within the airshed. The percent increase in these amounts describes the overall level of additional development the project and RFFAs represent regionally.

[131] As noted in chapter 1, the term "watershed" refers to the area encompassing the 10-digit Hydrologic Unit Code (HUC).

Resource	Spatial Analysis Area for Cumulative Effects Analysis	Impact Metrics and Rationale
Water: Groundwater Quantity and Groundwater-Dependent Ecosystems	Two separate modeling areas were used to assess direct and indirect impacts to groundwater resources and groundwater-dependent ecosystems: a large model area centered on the block-cave zone and encompassing much of the Upper Queen Creek watershed, the Superior basin, and Oak Flat (where dewatering would occur), and the East Salt River valley (from where the mine water supply would be pumped). Both model areas are sufficiently large to encompass other water users that could combine with the project effects and impact groundwater resources. The cumulative effects analysis area for groundwater quantity is identical to the two groundwater model analysis areas.	Metric: Amount of water pumped within the same groundwater basin or aquifer (acre-feet); drawdown caused by pumping within the same groundwater basin or aquifer (feet); drawdown in the East Salt River valley around the Desert Wellfield will be based on cumulative modeling results (model results); modeled GDEs lost or impacted (number) Rationale: Drawdown in the aquifer from different projects is cumulative and multiple projects can impact the same water supplies, whether community supplies or private wells. Even where drawdown cannot be reasonably assessed, the use of the same basins or aquifers affects water supply on a regional scale, by reducing the amount of water available for future development or generations. The cumulative number of GDEs lost due to specific groundwater removal from the same aquifer has impacts on habitat for wildlife population health and extent, and large-scale changes in the nature and characteristics of the overall landscape.
Water: Groundwater and Surface Water Quality	The effects on surface water quality generally would be confined to the watersheds within which the project is located. In most cases, the point at which groundwater quality impacts would merge with impacts from other projects is where groundwater is expressed at the surface, specifically Queen Creek (Alternatives 2, 3, and 4) and the Gila River (Alternatives 5 and 6). The cumulative effects analysis area for groundwater and surface water quality consists of the contributing areas for Upper Queen Creek (headwaters to Whitlow Ranch Dam), Dripping Spring Wash, Donnelly Wash, and the Gila River between Dripping Spring Wash to the Ashurst-Hayden Diversion Dam near Florence.	Metric: Addition of pollutants to the same groundwater basin, aquifer, or surface water (concentration or tonnage for specific pollutants) Rationale: Pollutants from multiple sources accumulate on a watershed scale and affect the ability for downstream waters to meet beneficial uses and surface water quality standards. Similarly, pollutants from multiple sources accumulate in an aquifer and affect the ability to meet beneficial uses and aquifer water quality standards. In both cases, accumulated pollutant loads can affect water supplies, wildlife, livestock, and the availability of water supplies for future development or generations.
Water: Surface Water Quantity	The effects on surface water quantity are confined to the watersheds within which the project is located, where surface water reductions could occur due to mine stormwater controls or the subsidence area. The cumulative effects analysis area for surface water quantity is the same as that used for groundwater and surface water quality.	Metric: Reductions in streamflow, preferably in annual volume, within the same watershed (acre-feet or percent reduction from baseline conditions); in lieu of flow estimates, acreage of contributing area from which stormwater would no longer flow downstream (acres) Rationale: Flow reductions across a watershed accumulate and affect the overall amount of water available to downstream users, aquatic habitat, and riparian areas.
Wildlife	As with vegetation effects, the loss of habitat in the project footprint contributes to changes in landscape-scale habitat blocks. The cumulative effects analysis area for wildlife consists of the larger landscape of the Arizona transition zone (an ecoregion that roughly extends from the Mogollon Rim/Colorado Plateau to the desert valleys).	Metric: (1) type and amount of vegetation communities physically disturbed (acres); (2) type and amount of any critical or special habitats disturbed (acres); (3) GDEs lost or impacted by groundwater removal (number) Rationale: The cumulative loss of vegetation has impacts on habitat for wildlife population health and extent. Combined impacts on critical or special habitats can have cumulative effects on specific populations of species that have special protections, such as threatened or endangered species. Loss of area across the wider landscape can affect wildlife movement and migration. The cumulative number of GDEs lost due to specific groundwater removal from the same aquifer has impacts on habitat for wildlife population health and extent.

Resource	Spatial Analysis Area for Cumulative Effects Analysis	Impact Metrics and Rationale
Recreation	The direct and indirect analysis area for recreation includes the project footprint and the Globe Ranger District of the Tonto National Forest; Passages 15, 16, and 17 of the Arizona National Scenic Trail (Arizona National Scenic Trail); and Game Management Units (GMUs) 24A, 24B, and 37B. This area also encompasses the Apache Leap Special Management Area. The cumulative effects analysis area for recreation consists of these same areas, as changes in recreation caused by other projects would affect users of these same general areas.	Metric: Physical footprint of RFFAs that occur on lands open to recreation, either ASLD land or Federal land (acres); loss of recreational backroads or trails (number); impact to experience on the Arizona National Scenic Trail (segments affected) Rationale: Recreation is impacted when users have less public land—either state or Federal—within which to recreate, whether camping, hiking, nature viewing, climbing, or biking. Motorized users and hikers would be impacted by increasing loss of miles of trail or roads available for recreation, including OHV riding. Arizona National Scenic Trail users would have a change in experience as more miles are exposed to industrial development instead of natural areas.
Public Health & Safety: Tailings and Pipeline Safety	The direct and indirect analysis area for tailings and pipeline safety includes all downstream areas that could be affected in the event of a partial or complete failure of the tailings embankment. The cumulative effects analysis area for tailings and pipeline safety would match that of surface water quantity, as the risks of other large tailings facilities generally would follow similar flow patterns.	Metric: Tailings facilities located within the same watersheds (number) Rationale: Multiple tailings storage facilities within the same watershed do not affect the safety of any individual tailings storage facility, or probability of failure of any given facility. However, the more tailings storage facilities are located upstream of a given person, residence, or community, the greater the risk that an incident or failure could impact that location in the future.
Public Health & Safety: Fuels and Fire Management	The direct and indirect analysis area for fuels and fire management includes all lands where mine-related activities would increase fuel accumulations due to subsidence or increase the risk of inadvertent, human-caused fire ignitions. The cumulative effects analysis area for fuels and fire management encompasses the larger forested area around the mine, as it is these areas where additional risks could occur.	Metric: Physical footprint of RFFAs (acres) Rationale: Risk of wildfire increases with industrial activity on the landscape. This can involve a variety of actual activities, including maintenance, traffic, visitation, industrial processes, or storage/use of explosives or flammable materials. Physical footprint serves as a proxy for the overall level of activity occurring on the landscape that contributes to fire risk.
Public Health & Safety: Hazardous Materials	The direct and indirect analysis area for hazardous materials includes the project footprint and transportation routes to these areas. The cumulative effects analysis area is identical, as the potential for impacts from hazardous materials from other projects would largely follow the same transportation routes.	Metric: Use of hazardous materials and location of hazardous materials traveling on roads Rationale: Hazardous materials stored or handled at individual RFFA locations would not tend to result in cumulative risk to the community or risk of accident. The primary cumulative impact to the public would be increased risk of accident caused by the transportation of hazardous materials from multiple projects along the same roads.
Scenic Resources	The direct and indirect analysis area for scenic resources consists of buffers of varying distance around project components, with a maximum of 6 miles for the tailings storage facilities. The 6-mile visual resource analysis buffer was chosen based upon the location of sensitive viewing locations, regional topography, and the potential for viewing the proposed tailings facilities in the regional landscape. Based upon Forest Service and BLM methodologies, background viewing distance ranges from 4 to 15 miles. Using a viewshed analysis technique, 6 miles was determined to represent potential background views of the proposed tailings facilities from sensitive viewing locations. The cumulative effects analysis area for scenic resources is identical, as it would be these same areas from which other projects would be visible.	Metric: Physical footprint of RFFAs (acres) Rationale: The impact to scenic resources is specific to individual facility designs, locations, and nearby landscapes. In general, however, multiple facilities within sight would have cumulative impacts on a given resident, traveler, or recreational user. Physical footprint serves as a proxy for the overall level of disturbance of the landscape that contributes to degradation of scenic resources. Similarly, impacts to dark skies are specific to individual facility lighting plans and locations, but physical footprint serves as a proxy for the overall level of lighting and development in the area.

Resource	Spatial Analysis Area for Cumulative Effects Analysis	Impact Metrics and Rationale
Cultural Resources	The direct and indirect analysis areas for cultural resources is identical to the area of potential effects (APE) which has been determined through Section 106 consultation. The cumulative effects analysis area for cultural resources is identical, as it would be these same areas in which cultural resources would be present that could be affected by other projects.	Metric: Historic properties impacts (number); in lieu of this, physical footprint can be used as a proxy for disturbance of sites (acres) Rationale: Smaller projects, like exploration projects, generally can identify and avoid cultural sites. Projects covering a large area generally result in disturbance of cultural sites, in many cases only after data recovery and mitigation activities. However, even if recorded and documented, loss of these cultural sites contributes to the overall impact to the cultural heritage of the areas. Impacts to cultural sites are known if surveys were conducted, which is not necessarily required on private land. Physical footprint can serve as a proxy for the overall disturbance to cultural sites where no site-specific data exist.
Socioeconomics	The direct and indirect analysis area for socioeconomic effects is the area encompassing Maricopa, Pinal, Gila, and Pima Counties. The cumulative effects analysis area for socioeconomic effects is identical, as the economic changes caused by other projects would affect these same towns, economies, and public services.	Metric: Overall change in labor workforce from baseline levels (percent); overall effect on local housing and local community services, including emergency services. Where these metrics do not exist, a qualitative discussion of the cumulative impacts would be used. Rationale: Industrial, commercial, and residential development has positive and negative impacts. These become cumulative mostly where residents see impacts from multiple projects on their communities, such as housing stock, housing prices, or services such as schools, ambulance, fire department, or police services.
Tribal Values and Concerns	The direct and indirect analysis area for Tribal values and concerns is identical to the cultural resource analysis area. However, the effects on Tribes can extend over much larger areas, and projects can impact Tribal values independent of proximity. The cumulative effects analysis area for Tribal concerns and values is considered to be the ancestral homelands of the affected Tribes, which is assumed to be the southwestern United States.	Metric: Physical footprint of RFFAs (acres) Rationale: Given the long time period in which Tribal members have occupied these lands, and their religious and community connections to the landscape, there are many areas on the natural landscape that represent sacred sites for Tribal members, or for which general disturbance of the natural landscape represents an impact to their Tribal values. These types of impacts are difficult to quantify. Physical footprint is used as a proxy for the level of disturbance occurring to the natural landscape, assuming that effects on Tribal values would stem from these disturbances.
Environmental Justice	This section has been removed in compliance with Executive Orders 14148 and 14173.	This section has been removed in compliance with Executive Orders 14148 and 14173.
Land Use: Livestock and Grazing	The cumulative effects analysis area for livestock and grazing encompasses the same grazing allotments as those used for the direct and indirect analysis area, as any effects on livestock from other projects would be felt within these same allotments.	Metric: Area of individual grazing allotments lost or disturbed by RFFA footprints (acres); loss of water supplies within allotments (number) Rationale: The FEIS analysis uses reduction in animal unit months (AUMs) as a measure of impact, but the estimate of reduction in AUMs is based on the area lost from individual allotments either by physical disturbance or loss of access. Physical disturbance is a direct proxy for the loss of supporting capacity of the allotments, and the resulting reduction in AUMs. Loss of water supplies (tanks, springs, streams) within allotments also reduces the supporting capacity of those allotments.

4.3.2 Descriptions of RFFAs

Of the entire suite of RFFAs reviewed, only the 21 RFFAs shown in table 4.3.2-1 were determined to be reasonably foreseeable, temporally overlap the Resolution Copper Project, and spatially overlap the cumulative effects analysis area of at least one resource. Maps depicting the cumulative effects analysis area and the spatial overlap of RFFAs are included in the resource sections of this chapter. Descriptions of other RFFAs can be found in the resource screening memorandum (Debauche 2023; SWCA Environmental Consultants 2020b, 2024).

Table 4.3.2-1. Descriptions of RFFAs carried forward into cumulative effects analysis

RFFA	Description
ADOT Pinal County North-South Corridor	The project would include construction of a new freeway. While an exact route is being developed, the North-South Corridor spans 55 miles between U.S. 60 in Apache Junction (northern terminus) and Interstate 10 in Eloy (southern terminus), passing through the city of Coolidge, town of Florence, and portions of unincorporated Pinal County along the way. The study also incorporates the proposed extension of SR 24 from Ironwood Drive to the North-South Corridor.
ADOT Vegetation Treatment	ADOT plans to conduct annual treatment programs using EPA-approved herbicides to contain, control, or eradicate noxious, invasive, and native plant species that pose safety hazards or threaten native plant communities on road easements and NFS lands up to 200 feet beyond road easement on the Tonto National Forest.
AGFD Wildlife Water Catchment Improvement Projects	Longer-term cooperative effort between the Tonto National Forest and AGFD to improve wildlife habitat throughout the Tonto National Forest. The project includes the installation of up to four water catchment arrays (including water storage tanks, a large “apron” to gather and direct precipitation to the storage tanks, drinking trough, and fencing) that would disturb no more than 0.5 acre. The project specifically benefits mule deer populations (although access to water provided by the catchments would also benefit elk, javelina, Gambel’s quail, and other species).
Apache-Sitgreaves National Forests Public Motorized Travel Management Plan	A proposal to designate motorized travel routes (roads and trails) in areas on Federal lands administered by the Forest Service within the Apache-Sitgreaves National Forests in order to comply with the Travel Management Rule (36 CFR 212).
APS Herbicide Use within Authorized Power Line ROWs on NFS lands	APS has proposed to include Forest Service–approved herbicides as a method of vegetation management, in addition to existing vegetation treatment methods, on existing APS transmission rights-of-way. The existing transmission rights-of-way are within five National Forests: Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests. The Forest Service must decide whether to allow this herbicide use. If approved, the use of herbicides as well as currently authorized treatments would become part of the APS Integrated Vegetation Management approach.
ASARCO Mine, including the Hayden Concentrator and Smelter, and Superfund Site	The Ray Mine operations consist of a 250,000-ton/day open-pit mine with a 30,000-ton/day concentrator, a 103-million-pound/year solvent extraction-electrowinning operation, associated maintenance, warehouse, and administrative facilities. Cathode copper produced in the solvent extraction and electrowinning operation is shipped to outside customers and to the ASARCO Amarillo Copper Refinery. A local railroad, Copper Basin Railway, transports ore from the mine to the Hayden concentrator, concentrate from the Ray concentrator to the smelter, and sulfuric acid from the smelter to the leaching facilities. The ASARCO Hayden Plant Superfund site is located 100 miles southeast of Phoenix and consists of the towns of Hayden and Winkelman and nearby industrial areas, including the ASARCO smelter, concentrator, former Kennecott smelter and all associated tailings facilities in the area surrounding the confluence of the Gila and San Pedro Rivers. Site investigation and sampling work are ongoing and will be used to develop the cleanup approach for the area. The site is not listed on the National Priorities List, but is considered to be a National Priorities List–caliber site and is being addressed through the Superfund Alternatives Approach.
Drake Limestone Quarry Expansion	The Prescott National Forest is proposing to approve an amendment to the Drake Cement LLC existing plan of operations to allow Drake Cement LLC to expand its existing quarry operations on an additional 287 acres of NFS lands.
Florence Copper In-Situ Mining Project	The Florence Copper in situ copper recovery facility near the town of Florence produces copper through underground injection and recovery. The production test facility was constructed in 2017 and is currently in operation. ADEQ issued a draft APP on August 6, 2020, which is one of two key permits required to advance to commercial production.
Grazing Allotment Permit Renewals (Various)	In total, 16 grazing allotments were identified on NFS, BLM, or Arizona State Trust lands, for which allotment analysis would be conducted to determine whether to reissue term grazing permits.
LEN Range Improvements	Re-drill 11 existing wells and equip them with solar pumps, storage tanks, and water troughs. Some may have water lines going to troughs at locations away from the storage tank. The roads on the allotment are in disrepair and are not passable in anything but high-clearance 4-wheel drive vehicles. The roads will need to be maintained to allow drilling equipment into the project sites to re-drill the existing wells.

RFFA	Description
LG Energy Solution Battery Production Facility Project	The developer has purchased a 650-acre site at Germann Road and Ironwood Drive in the town of Queen Creek from an ASLD auction to build a 1.4-million-square-foot advanced cylindrical battery manufacturing facility.
Merrill Ranch Master Planned Community Project	The developer has purchased two parcels in Florence, Arizona, totaling 4,150 acres to develop a master-planned community with 12,000 homes and industrial, commercial, and retail components.
Oak Wells Wind Project	While currently in the exploration phase, the developer is proposing a 300-MW wind farm with up to 83 wind turbines. The developer has been evaluating a roughly 44,000-acre “area of interest” in Pinal County about 30 miles north of Tucson.
Pine Creek Mining River Bend Placer Project	This project would include gold mining operations on approximately 48 acres (10 acres in the Red Hill #2 placer mining claim and 38 acres in the Riverbend placer mining claim), with an additional 4 acres for processing facilities, settling ponds, and roads.
Pinto Valley Mine Expansion	The Pinto Valley Mine is an existing open-pit copper and molybdenum mine located approximately 8 miles west of Miami, Arizona, in Gila County. Pinto Valley Mining Corp. has an approved mine plan of operations to expand mining activities onto the Tonto National Forest, extend the mine life to 2039, and to consolidate previous and ongoing authorizations for the mine. The project would result in an estimated 1,316 acres of new disturbance (229 acres on Tonto National Forest land and 1,087 acres on private land owned by Pinto Valley Mining Corp.).
Ray Land Exchange and Proposed Plan Amendment*	As originally proposed in 1994 to BLM by ASARCO, a land exchange between the two parties would include conveyance of approximately 10,976 acres of public lands and federally owned mineral estate located near ASARCO’s Ray Mine Complex in east-central Arizona to ASARCO. In exchange for these Federal lands, the BLM would acquire approximately 7,304 acres of private lands, primarily in northwestern Arizona, that possess resource qualities considered to be of significant value to the public.
Ripsey Wash Tailings Project	ASARCO is proposing to construct a new tailings storage facility to support its Ray Mine operation. The tailings facility would include two starter dams, new pipelines to transport tailings and reclaimed water, a pumping booster station, a containment pond, a pipeline bridge across the Gila River, and other supporting infrastructure. A segment of the Arizona National Scenic Trail would be relocated east of the tailings storage facility. A section of Florence-Kelvin Highway and a power line would be rerouted. The proposed tailings storage facility, situated within the Ripsey Wash subwatershed (12-digit HUC 150501000303), would be located on 2,627 acres of private lands and 9 acres of BLM lands.
Silver Bar Mining Regional Landfill and Cottonwood Canyon Road	AK Mineral Mountain, LLC, NL Mineral Mountain, LLC, POG Mineral Mountain, LLC, SMT Mineral Mountain, LLC, and Welch Mineral Mountain, LLC, proposed to build a municipal solid waste landfill on private property surrounded by BLM land in an area known as the Middle Gila Canyons area.
Superior to Silver King 115-kV Relocation Project	This project involves the relocation of a segment of the existing Superior-Silver King 115-kV transmission line on Resolution Copper private property near Superior.
Tonto National Forest Travel Management Plan	The Tonto National Forest travel management plan establishes the system of roads, trails, and areas designated for motorized vehicle use and determines suitable locations for dispersed camping.
Wild and Scenic River Eligibility Study	The Tonto National Forest has identified the linked segments of Arnett Creek and Telegraph Canyon as eligible for inclusion in the National Wild and Scenic Rivers System (U.S. Forest Service 2017j). The river segments offer unique and outstandingly remarkable scenery and fisheries values.

* The BLM approved a land exchange with ASARCO near the Ray Mine in May 2020. ASARCO has not provided a mine plan of operations for these areas for us to consider. In lieu of being able to review a proposed plan of operations, it is assumed for this analysis that the existing mining impacts at the Ray Mine would continue for the private property ASARCO owns and is able to mine.

4.3.3 Cumulative Effects Analysis by Resource

4.3.3.1 Geology, Minerals, and Subsidence

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to geology and mineral resources (figure 4.3.3-1):

- Pinto Valley Mine Expansion

- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

Four other RFFAs identified in the screening as pertinent to geology and mineral resources fell outside the cumulative effects analysis area: Drake limestone quarry expansion, Florence Copper in situ mining project, Jack’s project, and Pine Creek Mining River Bend Placer Project.

The metric used to quantify cumulative impacts to geology and mineral resources is the acreage of physical disturbance, mineral extraction, or loss of access that would prevent any mineral resources—if present—from being accessed by future generations.

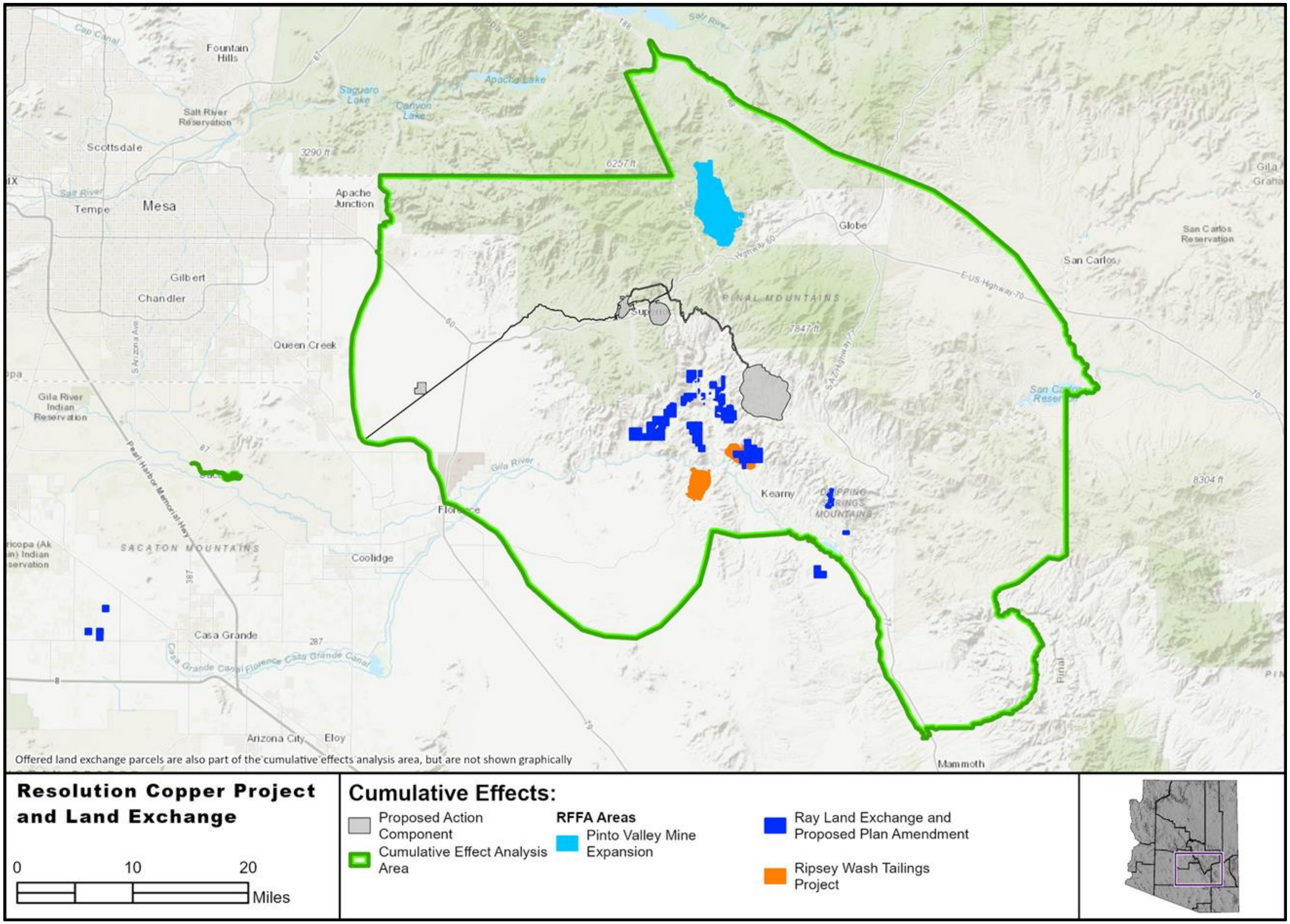

Figure 4.3.3-1. Geology, minerals, and subsidence cumulative effects analysis area and RFFAs

The cumulative effects analysis area for geology and mineral resources is approximately 1,421,408 acres, the Resolution Copper Project preferred alternative footprint within the cumulative effects analysis area is approximately 21,316 acres, and the combined physical disturbance area of the RFFAs within the cumulative effects analysis area is approximately 12,972 acres. The cumulative effect of the Resolution Copper Project and the three RFFAs listed above would result in approximately 34,288 acres of physical disturbance within the cumulative effects analysis area, or 2.4 percent of the total area. This represents the combined potential for loss of access to mineral resources to future generations.

4.3.3.2 Soils, Vegetation, and Reclamation

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to soils and vegetation resources (figure 4.3.3-2):

- ADOT Pinal County North-South Corridor
- ADOT Vegetation Treatment
- AGFD Wildlife Water Catchment Improvement Projects
- APS Herbicide Use within Authorized Power Line ROWs on NFS lands
- Oak Wells Wind Project
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project
- Superior to Silver King 115-kV Relocation Project
- Tonto National Forest Travel Management Plan

Eleven other RFFAs identified in the screening as pertinent to soil and vegetation resources fell outside the cumulative effects analysis area: Apache-Sitgreaves National Forests public motorized travel management plan, Drake limestone quarry expansion, Jack's project, Mount Baldy shooting sports sites, Peralta regional park, Pine Creek Mining River Bend Placer Project, Pinto Valley Mine Expansion, Silver Bar Regional Landfill and Cottonwood Canyon Road, Southline Transmission Project, and SunZia Southwest Transmission Project.

The metrics used to quantify cumulative impacts to soils and vegetation resources are (1) the acreage of physical disturbance in each vegetation community, (2) soil type, and (3) any critical habitat within the cumulative effects area. The cumulative loss of vegetation has impacts on habitat for wildlife population health and extent, and large-scale changes in the nature and characteristics of the overall landscape. The cumulative impact to soils has impacts on a watershed scale for erosion and sedimentation and impacts to downstream drainages. Combined impacts on critical or special habitats can have cumulative effects on specific populations of species that have special protections, such as threatened or endangered species.

The cumulative effects analysis area for soils and vegetation resources is approximately 591,143 acres, the Resolution Copper Project footprint within the cumulative effects analysis area is approximately 12,419 acres, and the combined physical disturbance area of the RFFAs is approximately 145,266 acres. The cumulative effect of the Resolution Copper Project and the nine RFFAs listed above would result in approximately 157,685 acres of disturbance within the cumulative effects analysis area, which is 26.7 percent of the total area.

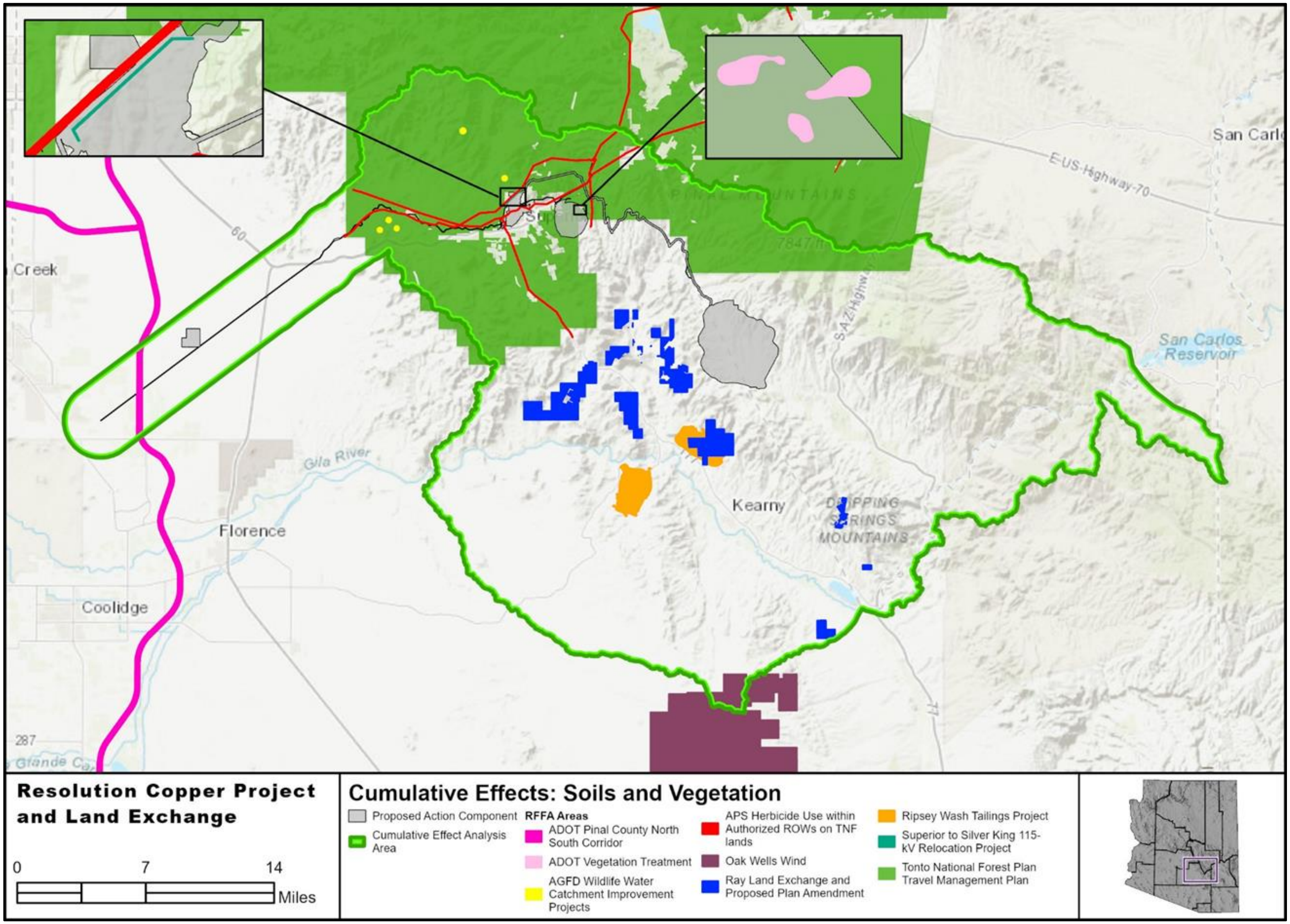

Figure 4.3.3-2. Soils and vegetation cumulative effects analysis area and RFFAs

The physical disturbance of each vegetation type within the soils and vegetation cumulative effects analysis area is provided in table 4.3.3-1. The cumulative effect of the Resolution Copper Project and the nine RFFAs listed above would have the greatest impact on the Upland Sonoran Desertscrub vegetation type, with a total of approximately 64,725 acres of disturbance. The second greatest impact would be to the Interior Chaparral vegetation type, with a total of approximately 31,417 acres of disturbance.

Table 4.3.3-1. Physical disturbance by vegetation community within the soils and vegetation cumulative effects analysis area

Vegetation Community	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)
Chihuahuan Desertscrub	1,341	6	1,347
Human Dominated	489	373	862
Interior Chaparral	30,805	612	31,417
Madrean Evergreen	90	0	90
Mesquite	8	12	20
Mohave Desertscrub	15,080	788	15,868
Open Pit Mine	401	0	401
Petran Montane Conifer Forest	622	0	622
Pine-Oak	8,919	39	8,958
Pinyon-Juniper	2,879	62	2,941
Riparian	1,592	17	1,609
Rock	247	0	247
Semidesert Grassland	17,787	7,559	25,346
Sonoran/Mohave Desertscrub	570	574	1,144
Upland Sonoran Desertscrub	63,021	1,704	64,725
Wash	1	0	1
Xeric Riparian	1,414	673	2,087
Total acres of disturbance	145,266	12,419	157,685

Note: Totals may not sum exactly due to rounding.

The physical disturbance within each soil type in the soils and vegetation cumulative effects analysis area is provided in table 4.3.3-2. The cumulative effect of the Resolution Copper Project and the nine RFFAs listed above would have the greatest impact on the White House-Stronghold complex soil type, with a total of approximately 7,130 acres of disturbance. The cumulative effect of the Resolution Copper Project and the nine RFFAs listed above would result in approximately 157,791 acres of disturbance of soils (26.7 percent of the analysis area), with roughly 10.8 percent of this acreage known as being highly susceptible to erosion (16,976 acres, or 2.9 percent of the analysis area).

Table 4.3.3-2. Physical disturbance by soil type within the soils and vegetation cumulative effects analysis area

Soil Type	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)	Highly Susceptible to Erosion
Agustin-Kokan-Queencreek complex	254.5	0.0	254.5	No

Soil Type	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)	Highly Susceptible to Erosion
Andrada extremely gravelly sandy loam	22.7	132.3	155.0	Yes
Antho sandy loam	1.6	0.0	1.6	No
Beardsley-Suncity complex	0.0	64.8	64.8	Yes
Bodecker soils and Riverwash	4.8	0.0	4.8	Yes
Bodecker soils and Riverwash complex	96.8	795.2	892.0	Yes
Brunkcow-Chiricahua complex	202.1	0.0	202.1	No
Bucklebar-Hayhook complex	343.4	0.0	343.4	No
Caralampi extremely gravelly sandy loam	32.9	149.2	182.1	No
Carrizo family-Brios-Riverwash complex	0.6	20.5	21.1	Yes
Cellar-Anklam-Rock outcrop complex	400.8	0.5	401.3	Yes
Cellar-Rock outcrop complex	3.2	0.0	3.2	Yes
Chiricahua-deloro-leyte soils	721.1	1,226.4	1,947.5	Yes
Chiricahua-Mallet complex	3.3	0.0	3.3	Yes
Contine clay loam	387.0	50.7	437.7	No
Contine loam	116.9	0.0	116.9	No
Dateland-Denure-Mohall complex	0.0	552.5	552.5	Yes
Delnorte-Nahda complex	373.0	5.7	378.7	Yes
Deloro-Andrada-Sasabe, deep complex	287.2	7.2	294.4	Yes
Denied access	1,390.6	0.0	1,390.6	Unknown
Denure sandy loam	0.3	0.0	0.3	No
Fig family-Topock complex	2,312.4	0.0	2,312.4	Unknown
Gran-Rock outcrop-Pantano complex	2,292.1	0.0	2,292.1	No
Hayhook-Riverwash complex	1.6	0.0	1.6	No
Holguin-Rock outcrop complex	1,999.8	147.0	2,146.8	No
Lanque sandy loam and Urban land	25.2	0.0	25.2	No
Laveen loam	0.8	0.0	0.8	Yes
Laveen loam, 0 to 1 percent slopes	60.3	0.0	60.3	No
Mabray-Rock outcrop complex	9.2	0	9.2	Yes
Mined land	64.0	557.6	621.6	No
Mohall clay loam	123.7	240.6	364.3	Yes
Mohall loam	136.7	0.0	136.7	Yes
Mohall sandy loam	168.0	0.0	168.0	Yes
Other/Not Mapped	127,268.8	102.7	127,371.5	Unknown
Oracle-Romero-Combate complex	41.6	0.0	41.6	No
Oxyaquic Torrifluvents and Typic Fluvaquents soils and Riverwash	0.1	0.6	0.7	Unknown
Oxyaquic Torrifluvents-Riverwash complex	0.1	5.9	6.0	Yes
Oxyaquic Torrifluvents-Riverwash-Water complex	13.8	0.0	13.8	Yes

Soil Type	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)	Highly Susceptible to Erosion
Pantak-Cammerman-Rock outcrop complex	26.5	61.2	87.7	No
Queencreek soils and riverwash	353.3	130.1	483.4	No
Rock outcrop-various	3,904.7	523.3	4,428.0	Yes
Schrap-Rock outcrop complex	999.8	0.0	999.8	No
Stagecoach-Delnorte complex	218.7	0.0	218.7	No
Tenneco-Bodecker complex	10.3	0.0	10.3	No
Topawa very gravelly sandy loam	413.1	0.0	413.1	Unknown
Tubac-Rillino complex	221.0	505.9	726.9	No
Urban land and Haplic Torriarents soils	42.5	7.4	49.9	No
Vortex family-Silverstrike complex	18.3	0.0	18.3	Unknown
White House-Stronghold complex	0.7	7,129.5	7,130.2	Yes
Wikieup family very channery sandy loam	4.2	0.0	4.2	Unknown
Total acres of disturbance	**145,374.1**	**12,416.8**	**157,790.9**	

The physical disturbance within critical and special habitats in the soils and vegetation cumulative effects analysis area is provided in table 4.3.3-3. The cumulative effect of the Resolution Copper Project and the nine RFFAs listed above would result in approximately 229 acres of disturbance to critical habitat within the cumulative effects analysis area. Most of this is related to Gila chub and consists of impacts from the RFFAs; the biological opinion found that the Resolution Copper Project may affect, but is unlikely to adversely affect, Gila chub (see appendix P of this FEIS).

Table 4.3.3-3. Physical disturbance within critical habitats within the soils and vegetation cumulative effects analysis area

Critical Habitat Type	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)
Gila chub	211	14	225
Southwestern willow flycatcher	4	0	4
Total acres of disturbance	215	14	229

4.3.3.3 Noise and Vibration

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with noise and vibration project impacts (figure 4.3.3-3):

- ADOT Pinal County North-South Corridor
- Ray Land Exchange and Proposed Plan Amendment

Five other RFFAs identified in the screening as pertinent to noise and vibration fell outside the cumulative effects analysis area: Mount Baldy shooting sports sites, Pine Creek Mining River Bend Placer Project, Pinto Valley Mine Expansion, and the Silver Bar Regional Landfill and Cottonwood Canyon Road project.

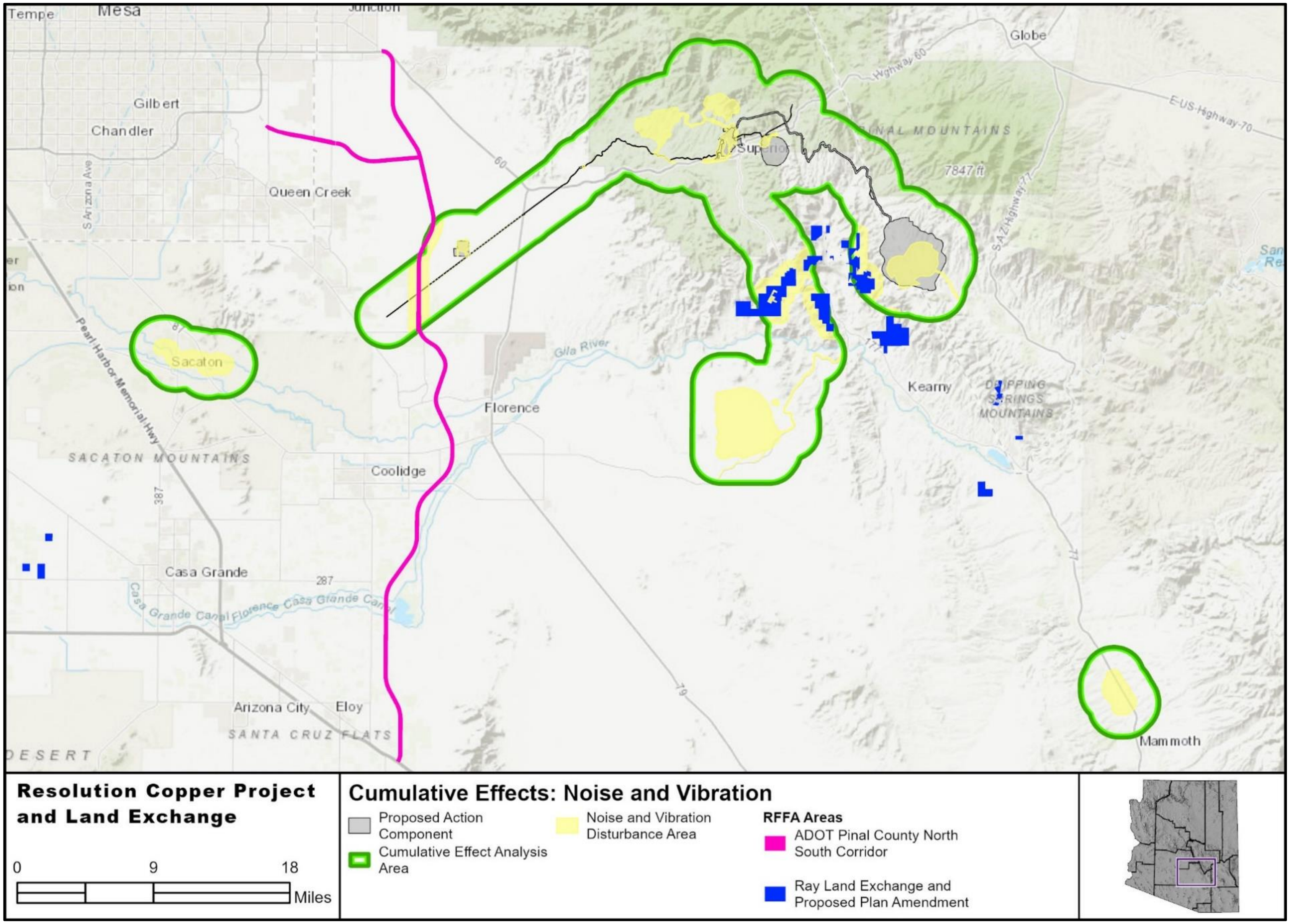

Figure 4.3.3-3. Noise and vibration cumulative effects analysis area and RFFAs

The metrics used to quantify noise and vibration cumulative impacts is the acreage of area within the cumulative effects analysis area where combined noise levels exceed 55 dBA. The threshold of 55 dBA is the most stringent threshold used in the FEIS and is specifically applicable to residential areas. For the preferred alternative, the 55-dBA noise contours from site-specific noise modeling were used. To determine where noise levels could exceed 55 dBA for the RFFAs, a 0.5-mile radius was used around the project footprints. The 0.5-mile radius was used based on noise level estimates from construction in section 3.4 of the FEIS, which determined construction noise levels would be 63 dBA at 1,000 feet. Therefore, 0.5 mile (2,640 feet) was used as a conservative threshold where noise levels could exceed 55 dBA for the RFFAs.

The noise and vibration cumulative effects analysis area is approximately 295,562 acres, the area where noise levels are expected to exceed 55 dBA for the Resolution Copper Project is approximately 29,018 acres, and the combined area of the RFFAs where noise levels are expected to exceed 55 dBA within the cumulative effects analysis area is approximately 19,774 acres. The cumulative effects of the Resolution Copper Project and the two RFFAs listed above would result in approximately 63,099 acres where noise levels are expected to exceed 55 dBA within the cumulative effects analysis area, or 21.3 percent of the total area.

4.3.3.4 Transportation and Access

The following RFFAs were determined through the cumulative effects analysis process to be reasonably foreseeable and overlap in time with project transportation and access impacts. An RFFA is considered to overlap in space with project transportation impacts when it is anticipated to influence traffic volumes on road segments included within the traffic and access cumulative effects analysis area.

Unlike other resources, the screening for transportation routes is not conducive to GIS analysis. The spatial analysis and justifications are summarized in table 4.3.3-4 for each RFFA.

Table 4.3.3-4. Rationale for overlap of transportation from RFFAs with Resolution Copper Project transportation routes for those RFFAs affecting transportation or access

RFFA	Spatial Overlap (yes/no)	Justification
ADOT Pinal County North-South Corridor	Yes	Traffic generated by a new freeway within the RFFA corridor would alter the overall annual daily traffic on surrounding and connecting roads, including introducing new trips to the cumulative effects analysis area. Greater safety risk may occur on connecting roads due to the increase in traffic volumes. Surrounding roads are likely to be impacted by temporary closures and disruption of access during construction of the project.
ADOT Vegetation Treatment	No	Herbicidal vegetation treatment will take place along U.S. 60 on the Tonto National Forest, within the cumulative effects analysis area. However, herbicidal vegetation treatment is not expected to measurably impact traffic levels in the cumulative effects analysis area. Any traffic impacts are expected to be substantially limited in duration.
Apache-Sitgreaves National Forests Public Motorized Travel Management Plan	No	The Apache-Sitgreaves National Forests is approximately 60 miles east/northeast of the cumulative effects analysis area. Travel management changes within the Apache-Sitgreaves National Forests are not anticipated to measurably impact traffic within the cumulative effects analysis area.
LEN Range Improvements	No	The project would renew the grazing permit, re-drill eight existing wells, and drill three new wells within the allotment area. The proposed project will include minimal road maintenance and repair to roads within the grazing allotment to allow drilling equipment into the project sites. However, there would be no impact to roadways included in the cumulative effects analysis area and the project is not anticipated to have a measurable impact on traffic within the cumulative effects analysis area.

RFFA	Spatial Overlap (yes/no)	Justification
Pine Creek Mining River Bend Placer Project	No	The project is located approximately 90 miles northwest of the cumulative effects analysis area. Therefore, project traffic would not have a measurable impact on traffic within the cumulative effects analysis area.
Pinto Valley Mine Expansion	No	The Pinto Valley Mine is an existing open-pit copper and molybdenum mine. A mine plan of operations, approved in 2021, authorized expansion of mining activities onto the Tonto National Forest, extension of the mine life to 2039, and consolidation of previous and ongoing authorizations for the mine. The mine is located to the northeast of the Resolution Copper Project and employees use some of the roadways within the cumulative effects analysis area, such as U.S. 60. The FEIS completed for the proposed action found that the continuation of mining operations and net expansion of mining facilities would not result in an increase in annual employee and contractor traffic. Therefore, these impacts as already are reflected in the “Affected Environment” section (3.5.3).
Ray Land Exchange and Proposed Plan Amendment	Yes	The project would result in a land exchange between the BLM and ASARCO LLC. The land exchange would allow ASARCO to consolidate its land holdings within and adjacent to areas of ongoing mineral development at the Ray Mine. ASARCO intends to use a portion of the selected land to support and expand current and future mining-related operations. The expansion of Ray Mine is anticipated to increase the number of employees and contractors using roadways outside of the cumulative effects analysis area, and U.S. 60 within the cumulative effects analysis area. The anticipated amount of traffic is unknown, and it would be speculative to quantify it.
Ripsey Wash Tailings Project	Yes	ASARCO LLC is proposing to construct a new tailings storage facility to support its Ray Mine operations. The proposed tailings storage facility is located approximately 5 miles west-northwest of Kearny, Arizona. The FEIS completed for the project concluded that the project would result in a minor increase of approximately 115 vehicles per day along SR 177 during the 3-year construction phase, and only a negligible increase in project-associated vehicular traffic during operations.
Silver Bar Mining Regional Landfill and Cottonwood Canyon Road	Yes	The project would result in the construction of a municipal solid waste landfill southwest of the Resolution Copper Project. Under the proposed action, approximately 6 miles of Cottonwood Canyon Road and approximately 0.6 mile of Sandman Road would be improved. However, these roads are not roads included in the cumulative effects analysis area. It is anticipated that construction of the municipal solid waste landfill would result in increased traffic along U.S. 60, within the cumulative effects analysis area. The anticipated amount of traffic is unknown and would be speculative to quantify.
Tonto National Forest Travel Management Plan	No	While a portion of the Tonto National Forest is within the cumulative effects analysis area, the proposed action would impact forest roads that are not being used for Resolution Copper Project traffic. Changes in the Tonto National Forest road network within the forest but outside the cumulative effects analysis area are not anticipated to have a measurable impact on traffic within the analysis area.

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and overlap in space and time with transportation project impacts (figure 4.3.3-4):

- ADOT Pinal County North-South Corridor
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project
- Silver Bar Mining Regional Landfill and Cottonwood Canyon Road

The metrics used to quantify traffic and access cumulative impacts is the combined additional volume of traffic on road segments. Increased traffic impacts would be felt by residents, travelers, and users either on road segments or at intersections, and increased volume over existing levels is associated with reductions in level of service, increased travel times, and potential for increased accidents.

The transportation and access cumulative effects analysis area includes approximately 150 miles of major roadways and approximately 38 miles of minor roadways (see figure 4.3.3-4). The Resolution Copper Project tailings storage facility (for the preferred alternative) is expected to increase peak-hour traffic from employees and material/equipment from 46 (operations) to 66 (construction) vehicles during peak hours, at least a portion of which would be on SR 177 (see table 3.5.4-7). The larger impact is from employee and material/equipment traffic to the West Plant Site and East Plant Site, which would add 344 (operations) to 739 (construction) vehicles during peak hours (see table 3.5.4-2). A portion of the Ripsey Wash Tailings Project traffic (155 vehicles per day) could also be on SR 177. It is anticipated that the Ray Land Exchange and Proposed Plan Amendment action (primarily SR 177) and the Silver Bar Mining Regional Landfill and Cottonwood Canyon Road (primarily U.S. 60) RFFAs would increase traffic volumes within the cumulative effects analysis area. However, the anticipated amount of traffic is unknown and would be speculative to quantify. For the Ray Land Exchange project, it can be anticipated that at least a portion of any expansion traffic would replace existing traffic.

Based on the analysis in section 3.5 of chapter 3, the current traffic load on SR 177 is 2,067 vehicles per day, with an anticipated 1,618 vehicles per day added by the Resolution Copper Project. The analysis further estimates that SR 177 could accept an additional 4,415 vehicles before reaching unacceptable levels of service (see figure 3.5.4-2). Given the minimal number of vehicles from the Ripsey Wash project, and the assumption that a portion of the Ray Land Exchange traffic would replace existing Ray Mine traffic on SR 177, the cumulative effect on SR 177 would be unlikely to reach unacceptable levels due to the combination of Resolution Copper Project traffic with traffic from these RFFAs.

The current traffic load on U.S. 60 is 15,077 vehicles per day, with an anticipated 1,618 vehicles per day added by the Resolution Copper Project. The analysis further estimates that U.S. 60 could accept an additional 39,605 vehicles per day before reaching unacceptable levels of service (see figure 3.5.4-2). The amount of traffic from Silver Bar landfill is unknown. However, it appears the cumulative effect on SR 177 would be negligible, and the route would be unlikely to reach unacceptable levels as a result of the combination of Resolution Copper Project traffic with traffic from these RFFAs.

The proposed ADOT Pinal County North-South Corridor could reduce current traffic volumes on SR 177 and U.S. 60 by providing an additional freeway serving the area. A new freeway built within the North-South Corridor is expected to provide an alternative to Interstate 10 between the Phoenix and Tucson areas and is not being planned to serve the cumulative effects analysis area (although it would also serve that function). This could increase capacity of both SR 177 and U.S. 60 by shifting trips on these freeways to the new freeway. Furthermore, the anticipated trips associated with the Resolution Copper Project could also use this new freeway. The proposed North-South Corridor freeway would increase trip distribution on all freeways serving the area, thus reducing the likelihood of any freeway's reaching unacceptable levels of service as a result of the combination of Resolution Copper Project traffic with traffic from these RFFAs.

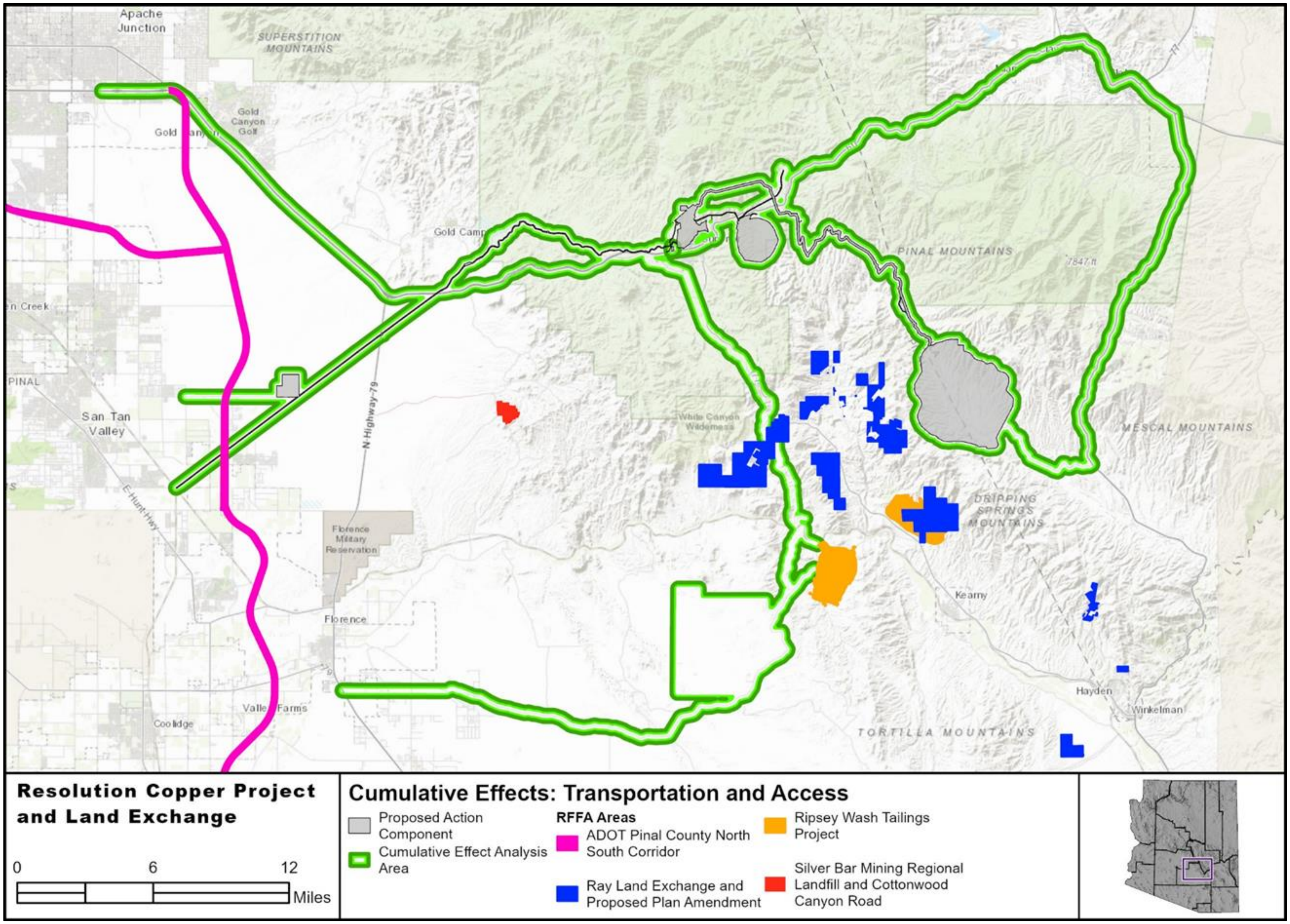

Figure 4.3.3-4. Transportation and access cumulative effects analysis area and RFFAs

4.3.3.5 Air Quality

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to air quality (figure 4.3.3-5):

- ADOT Pinal County North-South Corridor
- LG Energy Solution Battery Production
- Merrill Ranch Master Planned Community Project (Merrill Ranch)
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

One other RFFA identified in the screening as pertinent to air quality fell outside the cumulative effects analysis area: Drake limestone quarry expansion project.

Originally, the cumulative effects analysis was anticipated to make use of an air quality model, similar to that used for the project impacts analysis, but incorporating concentrations from other RFFAs. That modeling included only the Pinto Valley Mine expansion and was not able to quantify emissions for the other RFFAs considered. As the modeling effort used different sources than those listed above, it was not an appropriate tool to estimate impacts.

In lieu of modeling, the metrics used to quantify the cumulative impacts to air quality is tons of emissions within the general airshed. The primary source of emissions from most mines is particulate matter; this analysis focuses on PM_{10} and $PM_{2.5}$ as the metrics of interest. The Resolution Copper Project is estimated to annually produce 329 tons of PM_{10} particulates and 78 tons of $PM_{2.5}$ particulates.

The ADOT Pinal County North-South Corridor, LG Energy Solution Battery Production, and Merrill Ranch RFFAs are deemed reasonably foreseeable, but have not advanced to project design or any level of environmental review. Therefore, at this time, no emission estimates (construction or operations) for these projects have been completed. All three projects would generate emissions during construction from use of construction equipment and fugitive dust from ground disturbance. Furthermore, these three projects would generate long-term emissions from associated vehicle trips, with the LG Energy Solution Battery Production facility potentially also generating direct and indirect emissions from manufacturing processes. Given the current lack of detail on these projects, estimating their cumulative contribution to air quality impacts is not feasible. However, all three projects are expected to cumulatively contribute both localized and regional emissions.

With respect to cumulative projects that have estimated emissions, the Pinto Valley Mine project is anticipated to result in an annual increase from existing operations of 238 tons of PM_{10} particulates and 45 tons of $PM_{2.5}$ particulates. The Ripsey Wash project is anticipated to emit a maximum annual 90 tons of PM_{10} particulates and 7 tons of $PM_{2.5}$ particulates. Both estimates were made during preparation of EIS documents.

Potential emissions from the Ray Land Exchange are difficult to assess, as they have not been estimated as part of any Federal process, because actual mine plans are not known. However, a reasonable assumption is that no change in activity rates (ore removal, blasting, crushing, waste rock placement) would occur, only a shift from the existing mining area to the exchange lands.

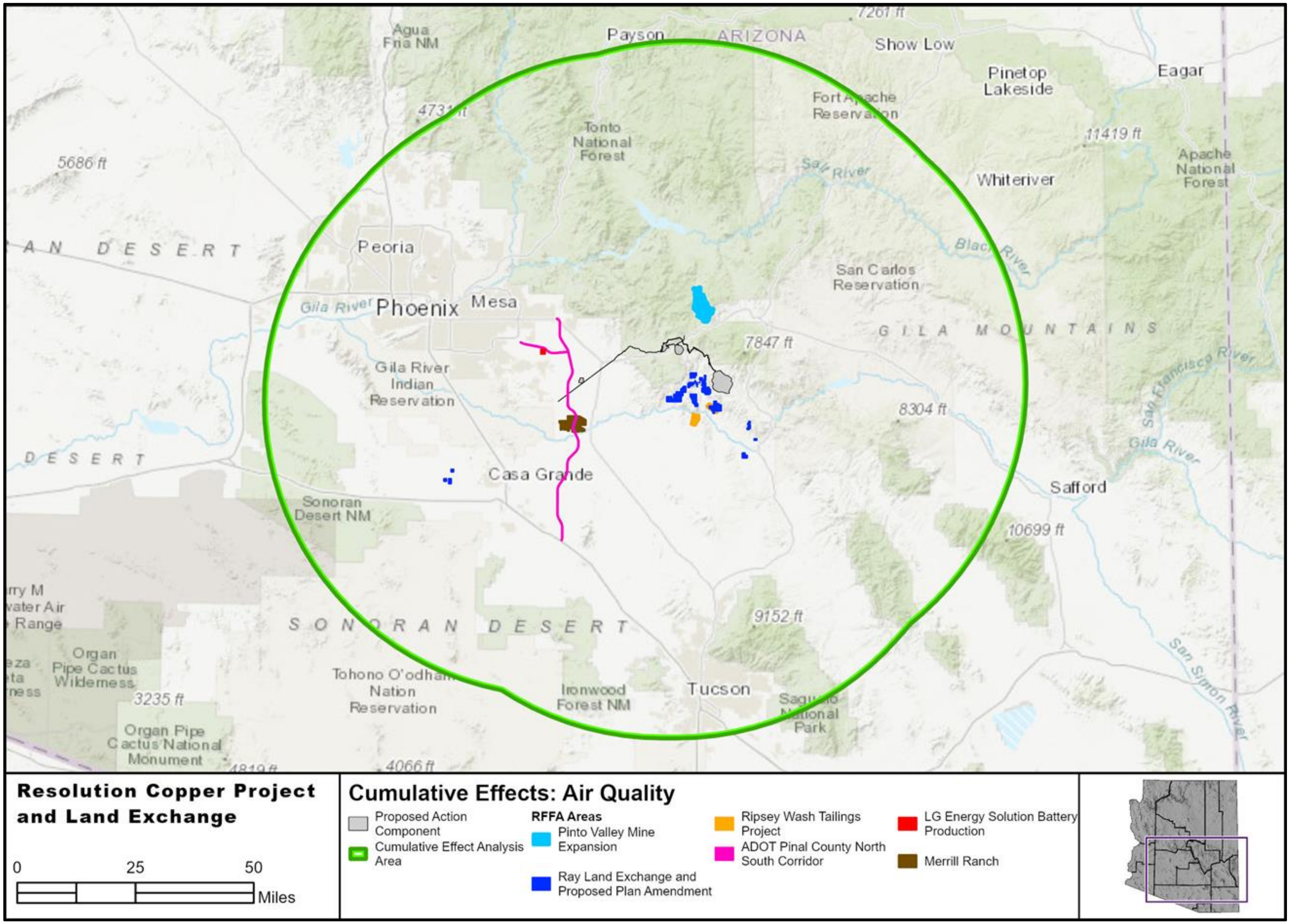

Figure 4.3.3-5. Air quality cumulative effects analysis area and RFFAs

Table 4.3.3-5 shows the combined cumulative impact to regional emissions.

Table 4.3.3-5. Increase in annual regional emissions of particulate matter from Resolution Copper Project and RFFAs

Region	Emissions of PM_{10} (tons/year)	Emissions of $PM_{2.5}$ (tons/year)
Gila County	10,926	3,414
Maricopa County	98,106	20,052
Pinal County	25,942	4,376
Statewide	320,245	81,992
Cumulative Effects		
Resolution Copper Project	329	78
Pinto Valley Mine Expansion	238	45
Ripsey Wash Tailings Project	90	7
Ray Land Exchange	No increase	No increase
Percent increase over three-county area	*0.5%*	*0.5%*

4.3.3.6 Water: Groundwater Quantity and Groundwater-Dependent Ecosystems

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to groundwater quantity and GDEs (figure 4.3.3-6):

- Merrill Ranch Master Planned Community Project
- Ray Land Exchange and Proposed Plan Amendment

Three other RFFAs identified in the screening as pertinent to groundwater quantity fell outside the cumulative effects analysis area: LEN Range Improvements, Pinto Valley Mine Expansion, and the Ripsey Wash Tailings Project.

The metrics used to quantify the cumulative impacts to groundwater quantity and GDEs are (1) the amount of water pumped within the same groundwater basin or aquifer (acre-feet); (2) drawdown caused by pumping within the same groundwater basin or aquifer (feet); (3) drawdown in the East Salt River Valley around the Desert Wellfield will be based on cumulative modeling results (model results); and (4) GDEs lost or impacted (number). Drawdown in the aquifer from different projects is cumulative and multiple projects can impact the same water supplies, whether community supplies or private wells. Even where drawdown cannot be reasonably assessed, the use of the same basins or aquifers effects water supply on a regional scale, by reducing the amount of water available for future development or generations. The cumulative number of GDEs lost due to specific groundwater removal from the same aquifer has impacts on habitat for wildlife population health and extent and large-scale changes in the nature and characteristics of the overall landscape.

The Merrill Ranch project is a proposed master planned community. As such, the residential component of this project is expected to be the largest water user. This RFFA would be required to show 100 years of water supply prior to authorization. This demonstration is not yet made and the exact water supplies for the project are not yet known. Most of the development is not within the Phoenix AMA and the groundwater cumulative effects analysis area, and any future groundwater pumping to supply the development may or may not be located within the groundwater cumulative effects analysis area. However, see section 4.3.4 for a holistic discussion of cumulative effects on overall regional water supplies, including developments like Merrill Ranch and the portion of Superstition Vistas that was auctioned off for development in 2020.

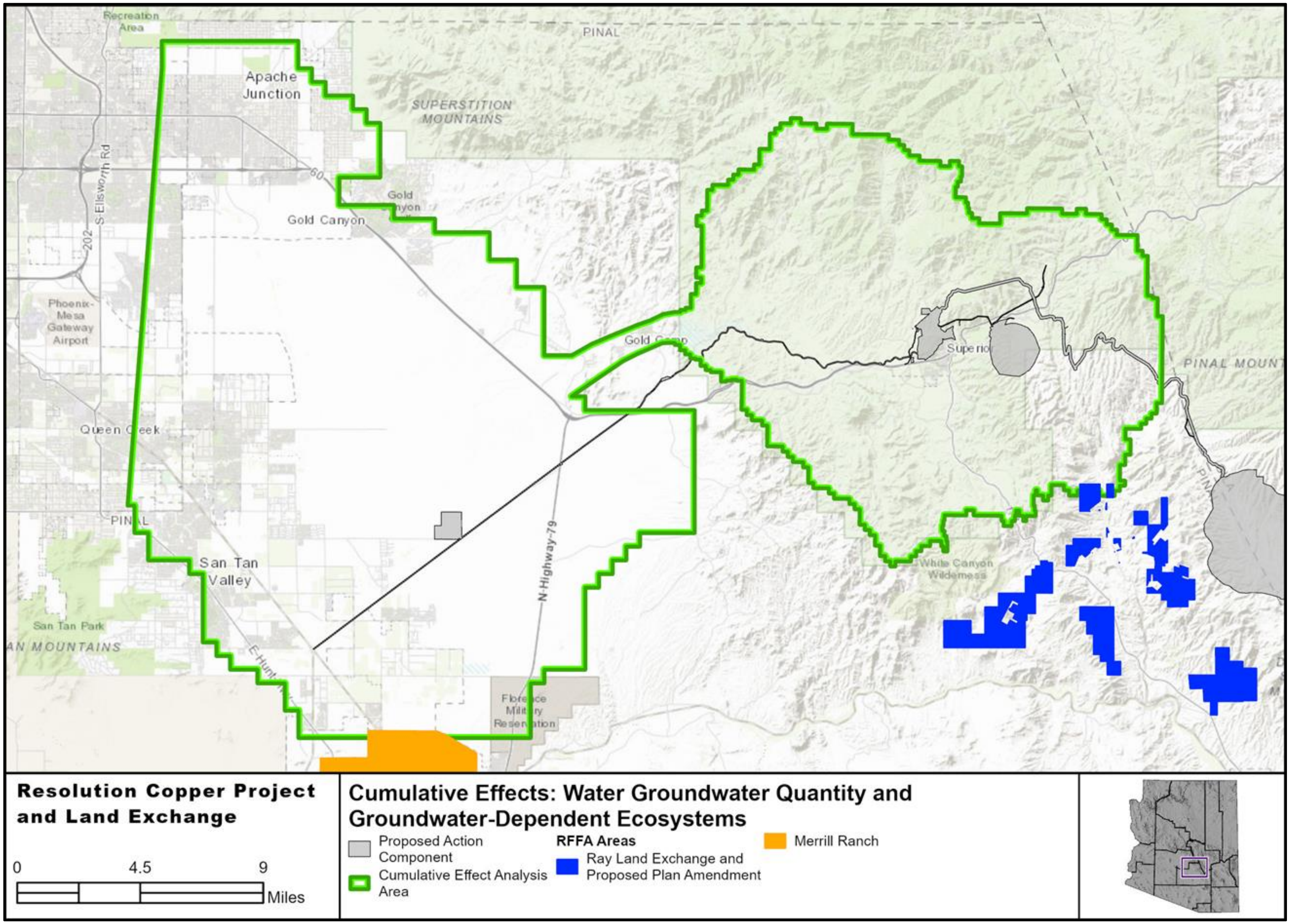

Figure 4.3.3-6. Groundwater quantity and groundwater-dependent ecosystems cumulative effects analysis area and RFFAs

As no mine plans have been prepared to date, it is unknown how much water future activities associated with the Ray Land Exchange might use. If groundwater is extracted and used on-site, there could be impacts to some of the same regional aquifers impacted by the Resolution Copper Project, though the distance suggests that overlap of drawdown is unlikely to occur or if it does, it is unlikely to be substantial. In general, Ray Mine obtains much of its water supply from sources to the south, including the Hayden well field. Continued reliance on these sources is not anticipated to have any cumulative effect with drawdown or groundwater use associated with Resolution Copper. Note that while there are not specific RFFAs listed above that would directly overlap with the Desert Wellfield, a number of RFFAs were identified that contribute to overall impacts to regional water supplies. These RFFAs, as well as ongoing climatic trends and drought, are discussed in detail as cumulative effects in the "Cumulative Effects on Regional Water Supplies" section later in chapter 4.

Some commenters have stated that the southern boundary of the groundwater cumulative effects analysis area is inappropriate, because drawdown impacts from the Desert Wellfield (see figure 3.7.1-2) could extend farther than this. As defined above, the focus of the groundwater cumulative effects analysis area are those actions within the same groundwater basin or aquifer. There is a valid hydrogeologic divide between the Phoenix AMA and the Pinal AMA, and this divide defines the cumulative effects analysis area (see figure 3.7.1-5). It is recognized that this divide is not absolute, however, and groundwater flow passes between the two basins. For this reason, some actions in the adjacent Pinal AMA are further analyzed in section 4.3.4.1, along with a holistic discussion of cumulative effects on regional water supplies.

4.3.3.7 Water: Groundwater and Surface Water Quality

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to groundwater and surface water quality (figure 4.3.3-7):

- ADOT Pinal County North-South Corridor
- LEN Range Improvements
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

One other RFFAs identified in the screening as pertinent to groundwater and surface water quality—Pinto Valley Mine Expansion—fell outside the cumulative effects analysis area.

The metrics used to quantify the cumulative impacts to groundwater and surface water quality is the addition of pollutants to the same groundwater basin, aquifer, or surface water (concentration or tonnage for specific pollutants). Pollutants from multiple sources accumulate on a watershed scale and affect the ability for downstream waters to meet beneficial uses and surface water quality standards. Similarly, pollutants from multiple sources accumulate in an aquifer and affect the ability to meet beneficial uses and aquifer water quality standards. In both cases, accumulated pollutant loads can affect water supplies, wildlife, livestock, and the availability of water supplies for future development or generations.

During construction of a new freeway built under the ADOT Pinal County North-South Corridor project, potential water quality impacts would be minimized and mitigated through the project-specific SWPPP and best management practices. Impacts are predicted to be minor and temporary. Development of a new freeway, while linear, would create a substantial amount of new impermeable surface, which would alter drainage patterns and likely result in small amounts of oils, fuels, and other vehicle debris in the roadway to be washed onto adjacent permeable surfaces during storm events.

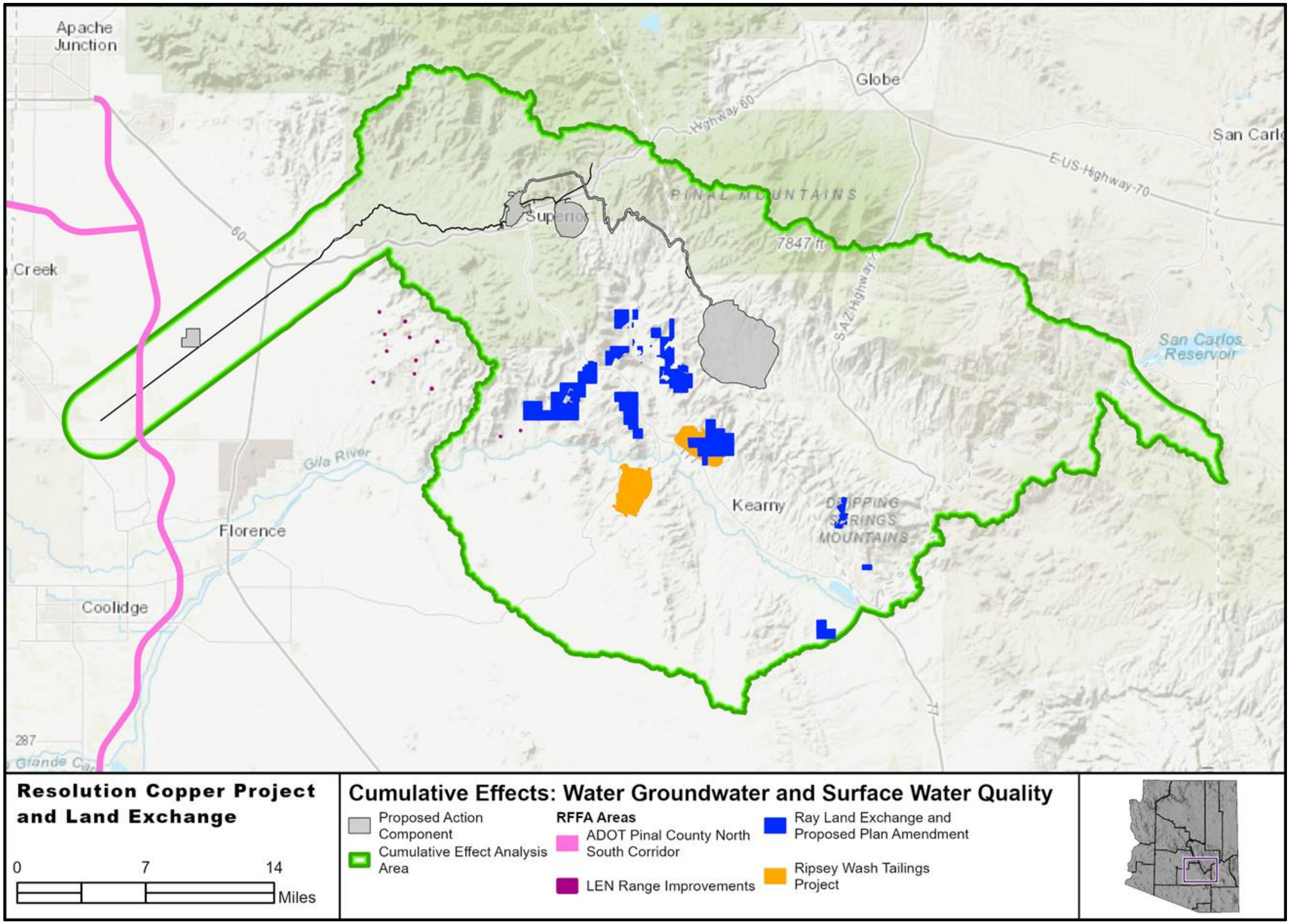

Figure 4.3.3-7. Groundwater and surface water quality cumulative effects analysis area and RFFAs

The LEN Range Improvements RFFA would renew the existing grazing permit, upgrade eight existing wells and drill three new wells, and perform maintenance of roads and access to the range improvements. These new activities are not expected to have effects on groundwater quality, as the three new wells would be permitted to ensure no impacts to the source occur. Access road improvements under this RFFA are expected to slightly reduce the amount of pollutant runoff during storm events by bettering function and drainage of existing roads.

As with groundwater quantity, since no mine plans have been prepared to date, it is unknown whether there would be pollutant discharges from the activities associated with the Ray Land Exchange. The distance suggests that overlap of discharges into the same groundwater systems that could be impacted by the Resolution Copper Project is unlikely to occur, or if it does, it is unlikely to be substantial. The watershed boundaries suggest that surface water quality impacts, including those from stormwater runoff, could eventually enter the Gila River. If this is the case, they would be cumulative with increased pollutant loads associated with either Alternative 5 – Peg Leg, which would enter the Gila River via tailings seepage downstream from the Ray Mine Exchange parcels, or with Alternative 6 – Skunk Camp, which is upstream from the Ray Land Exchange parcels.[132]

The Ripsey Wash tailings storage facility would generate tailings seepage that would likely enter the Gila River as well (upstream from Alternative 5 and downstream from Alternative 6). Based on disclosures from the permitting process, anticipated tailings seepage water quality appears to meet numeric Arizona aquifer water quality standards; however, the seepage still has substantially high concentrations of sulfate (greater than 2,000 mg/L) and dissolved solids (greater than 3,200 mg/L). These would contribute to pollutant loads in the Gila River. The overall pollutant load (tons per year) cannot be estimated without better information on anticipated flow rates. The potential for cumulative impacts is greatest after closure, as during operations a pumpback system would be employed to control seepage impacts.

4.3.3.8 Water: Surface Water Quantity

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to surface water quantity (figure 4.3.3-8):

- ADOT Pinal County North-South Corridor
- LEN Range Improvements
- Oak Wells Wind Project
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

Two other RFFAs identified in the screening as pertinent to surface water quantity fell outside the cumulative effects analysis area: Pinto Valley Mine Expansion, and Silver Bar Regional Landfill and Cottonwood Canyon Road.

The metrics used to quantify the cumulative impacts to surface water quantity is the reduction in streamflow, preferably in annual volume, within the same watershed (acre-feet or percent reduction from baseline conditions); in lieu of flow estimates, acreage of watershed from which stormwater would no longer flow downstream (acres). Flow reductions across a watershed accumulate and affect the overall amount of water available to downstream users, aquatic habitat, and riparian areas.

[132] The Ray Land Exchange is located within the Box O Wash-Gila River watershed (10-digit HUC 1505010003) and Mineral Creek-Gila River watershed (10-digit HUC 1505010002). The Alternative 5 tailings storage facility also is within the Box O Wash-Gila River watershed. The Alternative 6 tailings storage facility is within the Dripping Spring Wash-Gila River watershed. All of these are tributary watersheds to the Gila River.

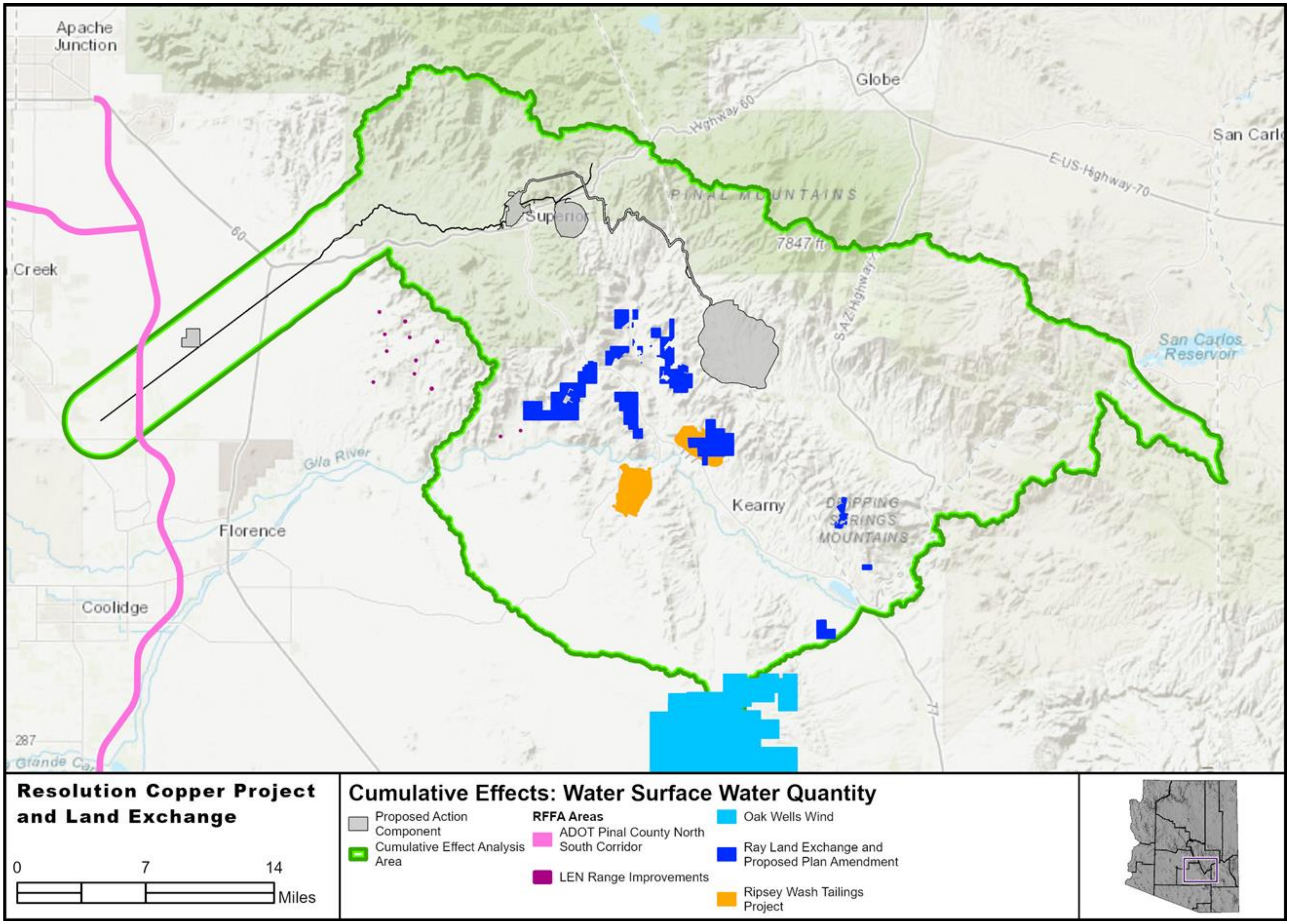

Figure 4.3.3-8. Surface water quantity cumulative effects analysis area and RFFAs

The most consistent metric to estimate surface water quantity loss is total acreage, given that several of the five RFFAs analyzed have no detailed estimates of how stormwater might be controlled during operations. The total acreage of the watersheds that make up the cumulative effects analysis area for surface water quantity is 591,143 acres. Within this area, the Resolution Copper Project footprint has 15,117 acres of disturbance. A good portion of this would result in reductions in surface water flow because of capture of precipitation by the subsidence area or the tailings storage facility; these reductions are analyzed in detail in chapter 3.

The five RFFAs would impact an additional 16,802 acres of these watersheds, representing a combined total of 31,919 acres, or 5.4 percent of the cumulative effects analysis area. Much of the combined disturbed area drains to the Gila River, and cumulative reductions in surface flow would be most noticeable in that water body.

4.3.3.9 Wildlife

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to wildlife resources (figure 4.3.3-9):

- ADOT Pinal County North-South Corridor
- ADOT Vegetation Treatment
- Apache-Sitgreaves National Forests Public Motorized Travel Management Plan
- APS Herbicide Use within Authorized Power Line ROWs on NFS lands
- Drake Limestone Quarry Expansion
- LEN Range Improvements
- LG Energy Solution Battery Production
- Merrill Ranch Master Planned Community Project
- Pine Creek Mining River Bend Placer Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project
- Silver Bar Mining Regional Landfill and Cottonwood Canyon Road
- Tonto National Forest Travel Management Plan
- Wild and Scenic River Eligibility Study

Three other RFFAs identified in the screening as pertinent to wildlife fell outside the cumulative effects analysis area: Mount Baldy shooting sports sites, Southline Transmission Line Project, and SunZia Southwest Transmission Project.

The metrics used to quantify cumulative impacts to wildlife resources are (1) the acreage of physical disturbance in each vegetation community, (2) any critical or special habitat within the cumulative effects area, and (3) loss of GDEs. The overall cumulative loss of vegetation has impacts on habitat for wildlife population health and extent. Combined impacts on critical habitats can have cumulative effects on specific populations of species that have special protections, such as threatened or endangered species. Loss of area across the wider landscape can affect wildlife movement and migration. The cumulative number of GDEs lost due to specific groundwater removal from the same aquifer has impacts on habitat for wildlife population health and extent.

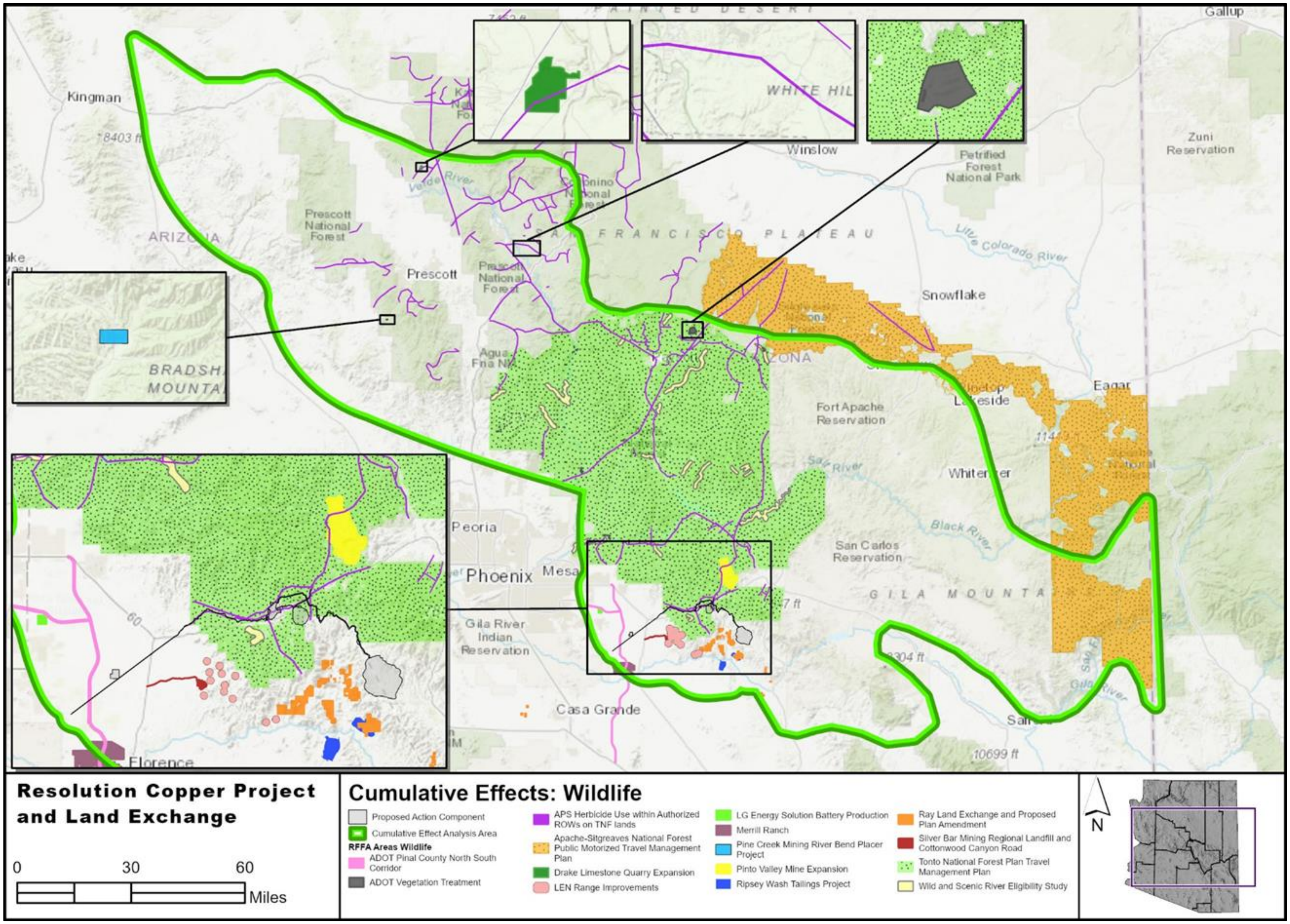

Figure 4.3.3-9. Wildlife cumulative effects analysis area and RFFAs

With respect to GDEs, out of the 15 RFFAs listed above, only the Ray Land Exchange and Proposed Plan Amendment action is potentially located within the same aquifer as the Resolution Copper Project. As described for the groundwater quantity cumulative effects analysis, any overlap in groundwater drawdown is unlikely to occur, or if it does, is unlikely to be substantial. No cumulative effects on GDEs are anticipated.

The cumulative effects analysis area for wildlife resources is approximately 11,799,007 acres; this represents one of the largest cumulative effects analysis areas, due to the range over which wildlife species can occur and the continuity of habitat types. The Resolution Copper Project disturbance within the cumulative effects analysis area is approximately 15,117 acres, and the combined physical disturbance area of the RFFAs is approximately 3,227,279 acres. The cumulative effect of the Resolution Copper Project and the 15 RFFAs listed above would result in approximately 3,242,397 acres of disturbance within the cumulative effects analysis area, which is 27.5 percent of the total area.

The physical disturbance of each vegetation type within the wildlife cumulative effects analysis area is provided in table 4.3.3-6. The cumulative effect of the Resolution Copper Project and the 15 RFFAs listed above would have the greatest impact on the Upland Sonoran Desertscrub vegetation type, with a total of approximately 732,956 acres of disturbance. The next greatest impact would be to the Semidesert Grassland and Pinyon-Juniper vegetation types, with a total of approximately 661,763 and 622,221 acres of disturbance, respectively.

Table 4.3.3-6. Physical disturbance by vegetation community within the wildlife cumulative effects analysis area

Vegetation Community	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)
Aspen	171.3	0.0	171.3
Burn (i.e., wildfires)	5,281.6	0.0	5,281.6
Chihuahuan Desertscrub	4,437.4	5.8	4,443.2
Human Dominated	3,125.6	437.7	3,563.3
Interior Chaparral	554,812.1	1,889.7	556,701.8
Madrean Evergreen	1,209.9	0.0	1,209.9
Mesquite	8.0	12.7	20.7
Mohave Desertscrub	28,606.8	1,554.0	30,160.8
Open Pit Mine	5,352.1	0.0	5,352.1
Petran Montane Conifer Forest	197,169.4	0.0	197,169.4
Petran Subalpine Conifer Forest	3,134.5	0.0	3,134.5
Pine-Oak	352,303.8	41.7	352,345.5
Pinyon-Juniper	622,108.1	113.0	622,221.1
Plains, Great Basin Grassland	431.4	0.0	431.4
Riparian	26,115.0	46.8	26,161.8
Rock	13,385.8	0.0	13,385.8
Semidesert Grassland	654,134.7	7,628.2	661,762.9
Sonoran/Mohave Desertscrub	4,311.9	574.2	4,886.1
Upland Sonoran Desertscrub	730,922.6	2,033.7	732,956.3
Wash	1,227.6	3.3	1,230.9

Vegetation Community	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)
Water	17,453.0	14.7	17,467.7
Xeric Riparian	1,576.7	761.9	2,338.6
Total acres of disturbance	3,227,279.3	15,117.4	3,242,396.7

The physical disturbance within critical and special habitats in the wildlife cumulative effects analysis area is provided in table 4.3.3-7. The cumulative effect of the Resolution Copper Project and the 15 RFFAs listed above would result in approximately 879,527 acres of disturbance to critical habitat within the wildlife cumulative effects analysis area. The greatest impact would be to Mexican spotted owl critical habitat, with a total of approximately 835,478 acres of disturbance. The second greatest impact would be to southwestern willow flycatcher critical habitat, with a total of approximately 17,281 acres of disturbance. As shown in table 4.3.3-7, this impacted acreage comes from the RFFAs.

Note that these acreages represent any disturbance within the cumulative effects analysis area, not just where project footprints and RFFA footprints overlap. This is because wildlife is mobile and can be impacted by multiple disturbed areas. However, this assumption does not hold true for critical habitat. Critical habitat is specific to a single species, and it is necessary to note that the Resolution Copper Project solely impacts Gila chub critical habitat. Impacts to other critical habitats—such as for Mexican spotted owl, Chiricahua leopard frog, and razorback sucker—occur within the cumulative effects analysis area. The Resolution Copper Project would not impact these species, however, and these do not represent cumulative effects.

Table 4.3.3-7. Physical disturbance to critical habitats within the wildlife cumulative effects analysis area

Critical Habitat Type	RFFA Disturbance (acres)	Resolution Copper Project Disturbance (acres)	Total Disturbance (acres)
Chiricahua leopard frog	3.8	0.0	3.8
Gila chub	2,282.1	19.8	2,301.9
Mexican spotted owl	835,477.5	0.0	835,477.5
Narrow-headed gartersnake	3,740.7	0.0	3,740.7
Northern Mexican gartersnake	3,730.0	0.0	3,730.0
Razorback sucker	4,309.2	0.0	4,309.2
Southwestern willow flycatcher	17,281.4	0.0	17,281.4
Yellow-billed cuckoo	12,682.3	0.0	12,682.3
Total acres of disturbance	879,507.0	19.8	879,526.8

4.3.3.10 Recreation

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts for recreation resources (figure 4.3.3-10):

- ADOT Pinal County North-South Corridor
- Oak Wells Wind Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment

- Ripsey Wash Tailings Project
- Silver Bar Mining Regional Landfill and Cottonwood Canyon Road
- Wild and Scenic River Eligibility Study

One other RFFA identified in the screening as pertinent to recreation fell outside the cumulative effects analysis area: the Mount Baldy shooting sports sites project.

The metrics used to quantify cumulative impacts to recreation resources are (1) the physical footprint of RFFAs that occurs on lands open to recreation, either ASLD land or Federal lands (acres); (2) loss of recreational backroads or trails (number); and (3) impact to experience on the Arizona National Scenic Trail (segments affected). Recreation is impacted when users have less public land—either State or Federal—within which to recreate, whether camping, hiking, nature viewing, climbing, or biking. Motorized users and hikers would be impacted by increasing loss of miles of trail or roads available for recreation, including OHV riding. Arizona National Scenic Trail users would have a change in experience as more miles are exposed to industrial development instead of natural areas.

It should be noted that the Wild and Scenic River Eligibility Study overall represents a beneficial effect on recreation. For the purposes of the cumulative effects analysis it has been analyzed in the same way as those RFFAs that would have adverse effects. This approach was chosen to avoid trying to qualitatively estimate whether beneficial and adverse effects from different RFFAs would offset each other.
The resulting cumulative effects analysis should overestimate overall cumulative impacts to recreation resources.

The cumulative effects analysis area for recreation resources is approximately 1,826,174 acres and includes approximately 1,585,625 acres of ASLD land and Federal lands. The Resolution Copper Project will physically disturb approximately 10,813 acres of ASLD and Federal land and the combined physical disturbance area of the seven RFFAs above will impact approximately 80,640 acres of ASLD land and Federal land within the cumulative effects analysis area. The cumulative effect of the Resolution Copper Project and the RFFAs listed above would result in approximately 91,453 acres of physical disturbance to ASLD land and Federal lands within the cumulative effects analysis area, or 5.8 percent of the lands open to recreation within the cumulative effects analysis area.

Both the Ray Land Exchange and the Ripsey Wash projects would impact a number of back roads, as would the Resolution Copper Project. The Ray Land Exchange parcels include nine roads that could be impacted (Cochran Road, Price Box Canyon Road, Diversion Dam Road, Whitlow Ranch Road, Knisely Ranch Road, Tomlin Road, McCracken Mine Road, Sacramento Valley Road, and Battle Axe Road). Ripsey Wash includes a number of unnamed and undefined roads within the footprint. In both cases, these back roads form a network of recreational routes throughout the region. Losses of these back roads would be cumulative with losses of Forest Service roads associated with the Resolution Copper Project, limiting recreational opportunities within the area. The ADOT Pinal County North-South Corridor and Oak Wells Wind projects have not yet progressed to detailed design or environmental analysis under NEPA or local land use reviews. When those occur, both projects will be evaluated for impacts to any identified recreational uses. The ADOT Pinal County North-South Corridor project would alter the circulation pattern of the area and could make the area more accessible for use by recreational visitors. Cursory desktop reviews of both RFFA footprints (both of which are conceptual at this time) did not identify any authorized recreational uses within the potentially affected areas, but they could include unauthorized recreational uses.

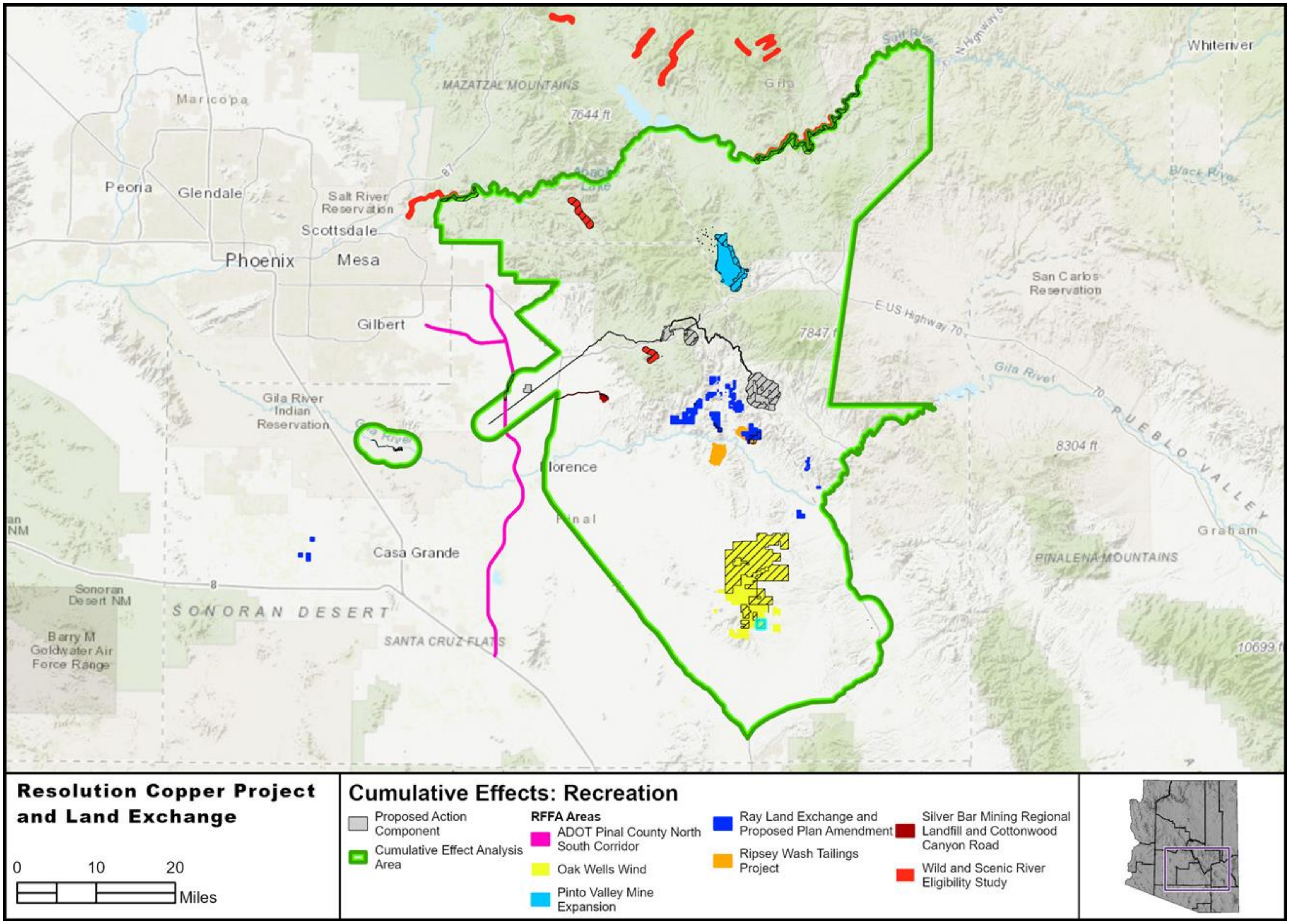

Figure 4.3.3-10. Recreation cumulative effects analysis area and RFFAs

The Arizona National Scenic Trail is also impacted by these same projects. For the Ray Land Exchange parcels, the potential impact would be to Passage #16; though the type of impact is unknown, in general the land exchange would contribute to industrialization of areas that are not now disturbed. The Ripsey Wash project would impact Passage #15 and would require a reroute of this portion of the trail. The Resolution Copper Project would potentially impact Passage #18 of the Arizona National Scenic Trail by slurry pipeline crossings. While the same segments of the Arizona National Scenic Trail are not being impacted, the overall experience could be cumulatively impacted as multiple projects change the experience of users covering long distances of the trail. While the actual Oak Wells Wind Project boundary is not yet fully defined, the preliminary potential area of this RFFA would potentially impact Passages #14f and #15a of the Arizona National Scenic Trail.

4.3.3.11 Public Health and Safety: Tailings and Pipeline Safety

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts for public health and safety: tailings and pipeline safety (figure 4.3.3-11):

- ASARCO Mine, including the Hayden Concentrator and Smelter, and Superfund Site
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

One other RFFA identified in the screening as pertinent to tailings safety—Pinto Valley Mine Expansion—fell outside the cumulative effects analysis area.

The metric used to quantify cumulative impacts to tailings and pipeline safety is the number of tailings facilities located within the same watershed. Multiple tailings storage facilities within the same watershed do not affect the safety of any individual tailings storage facility, or probability of failure of any given facility. However, the more tailings storage facilities in one watershed are located upstream of a given person, residence, or community, the greater the risk that an incident or failure could impact that location in the future.

It is unknown whether a tailings storage facility would be built on part of the Ray Land Exchange parcels, but the possibility exists; if a tailings storage facility were built it would drain to the Gila River . The other two RFFAs represent existing or future tailings storage facilities along the main stem of the Gila River. Within the cumulative effects analysis area, the three RFFAs listed could include tailings storage facilities located potentially within the same drainage (Gila River) as the Resolution Copper Project tailings. If either Alternative 5 – Peg Leg or Alternative 6 – Skunk Camp is selected as the Resolution Copper Project tailings location, the downstream communities on the Gila River would experience an overall greater risk of being impacted in the event of a partial or complete failure of a tailings storage facility.

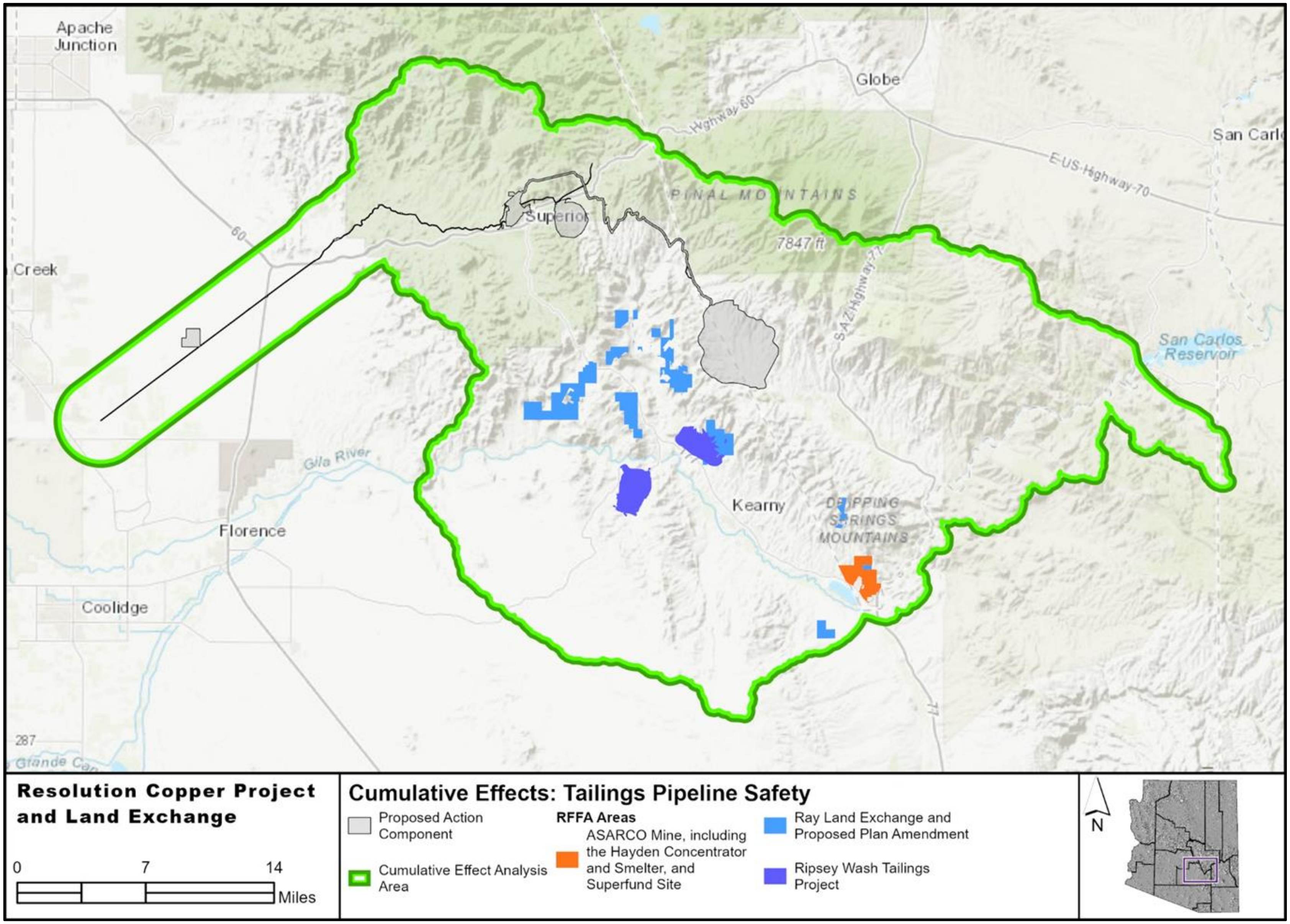

Figure 4.3.3-11. Tailings and pipeline safety cumulative effects analysis area and RFFAs

4.3.3.12 Public Health and Safety: Fuels and Fire Management

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to public health and safety: fuels and fire management (figure 4.3.3-12):

- APS Herbicide Use within Authorized Power Line ROWs on NFS lands
- Oak Wells Wind Project
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

One other RFFA identified in the screening as pertinent to fuels and fire management—Peralta regional park—fell outside the cumulative effects analysis area.

The metric used to quantify cumulative impacts to fuels and fire management is the physical footprint of the RFFAs. Risk of wildfire increases with industrial activity on the landscape, which can include a wide variety of actual activities including maintenance, traffic, visitors, industrial processes, or storage/use of explosives or flammable materials. Physical footprint serves as a proxy for the overall level of activity occurring on the landscape that contributes to fire risk.

It should be noted that the APS herbicide use overall represents a beneficial effect on fuels management, as it reduces fire risk below power lines. For the purposes of the cumulative effects analysis, it has been analyzed in the same way as those RFFAs that would have adverse effects. This approach was chosen to avoid trying to qualitatively estimate whether beneficial and adverse effects from different RFFAs would offset each other. The resulting cumulative effects analysis should overestimate overall cumulative impacts to fuels and fire management.

The cumulative effects analysis area for fuels and fire management is approximately 699,943 acres. The Resolution Copper Project footprint within the cumulative effects analysis area is approximately 14,121 acres, and the combined physical disturbance area of the four RFFAs within the cumulative effects analysis area is approximately 14,035 acres. The cumulative effect of the Resolution Copper Project and the four RFFAs listed above would result in approximately 28,156 acres of physical disturbance within the cumulative effects analysis area, or 4.0 percent of the total area. This increase in general disturbance or activity overall increases the potential for fire risk in the area.

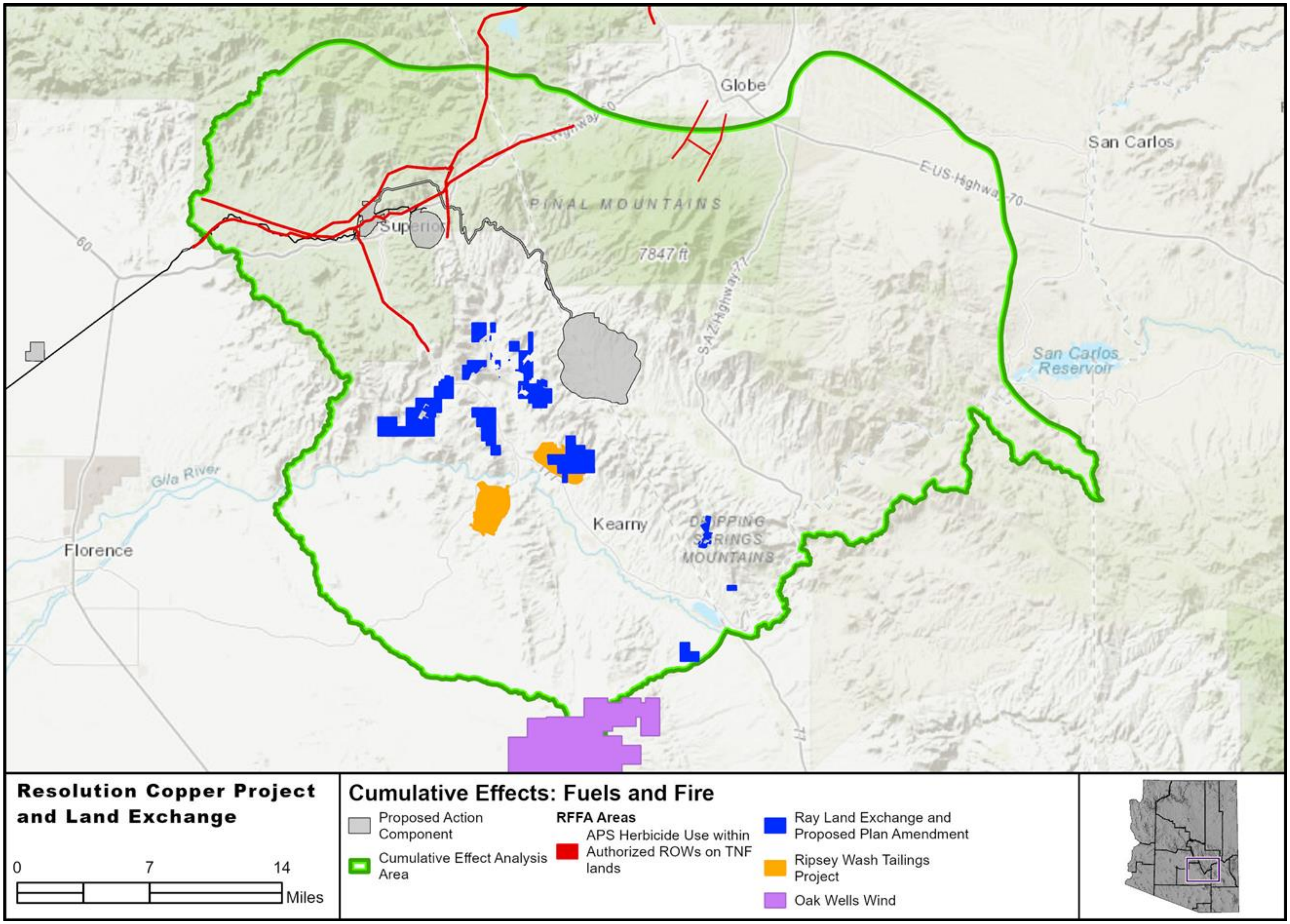

Figure 4.3.3-12. Fuels and fire management cumulative effects analysis area and RFFAs

4.3.3.13 Public Health and Safety: Hazardous Materials

The following RFFAs were determined through the cumulative effects analysis process to be reasonably foreseeable and overlap in time with project transportation, use, or storage of hazardous materials (figure 4.3.3-13). An RFFA is primarily considered to overlap in space with project hazardous materials impacts when it is anticipated to use the same road segments within the hazardous materials cumulative effects analysis area.

Unlike other resources, the screening for hazardous materials routes is not conducive to GIS analysis. The spatial analysis and justifications are summarized in table 4.3.3-8 for each RFFA.

Table 4.3.3-8. Rationale for overlap of hazardous materials from RFFAs with Resolution Copper Project hazardous materials transportation routes

RFFA	Spatial Overlap (yes/no)	Anticipated Hazardous Material Transport
ADOT Pinal County North-South Corridor	Yes	It is possible there may be spills of fuel, lubricants, and/or antifreeze during construction that would require clean-up and proper disposal. In addition, operation of the freeway would likely introduce trips involving the transport of hazardous materials, which would increase the likelihood of a spill from a motor vehicle accident.
Pinto Valley Mine Expansion	Yes	The Pinto Valley Mine is an existing open pit copper and molybdenum mine. A mine plan of operations, approved in 2021, authorized expansion of mining activities onto the Tonto National Forest, extension of the mine life to 2039, and consolidation of previous and ongoing authorizations for the mine. The mine is located to the northeast of the Resolution Copper Project and uses some of the roadways within the cumulative effects analysis area, such as U.S. 60. The FEIS completed for the proposed action identified the extension of the time frame for hazardous materials transportation along U.S. 60.
Ray Land Exchange and Proposed Plan Amendment	Yes	The project would result in a land exchange between the BLM and ASARCO LLC. The land exchange would allow ASARCO to consolidate its land holdings within and adjacent to areas of ongoing mineral development at the Ray Mine. ASARCO intends to use a portion of the selected land to support and expand current and future mining-related operations. No mine plans have been submitted, but it is reasonable to assume that hazardous materials would be transported for use at any mine development on the exchange lands. This likely would be similar to current shipments to existing operations, though perhaps over an extended time frame. Transportation of hazardous materials would likely take place along U.S. 60 and SR 177.
Ripsey Wash Tailings Project	Yes	ASARCO LLC is proposing to construct a new tailings storage facility to support its Ray Mine operations. The proposed tailings storage facility is located approximately 5 miles west-northwest of Kearny, Arizona. No major use of hazardous materials was noted for the tailings storage facility, and the likely transport routes may not use the same roads as the Resolution Copper Project.

Overall, hazardous material transportation could increase along U.S. 60 and SR 177, as well as along a new freeway built within the ADOT North-South Corridor. The types and amounts of hazardous materials transported is not known at this time, but in the case of both Pinto Valley Mine and the Ray Land Exchange parcels these would probably be similar to those occurring now, though they would continue over an extended time frame. Along with Resolution Copper Project transportation of hazardous materials on these roads, the overall risk of accidents or release would increase.

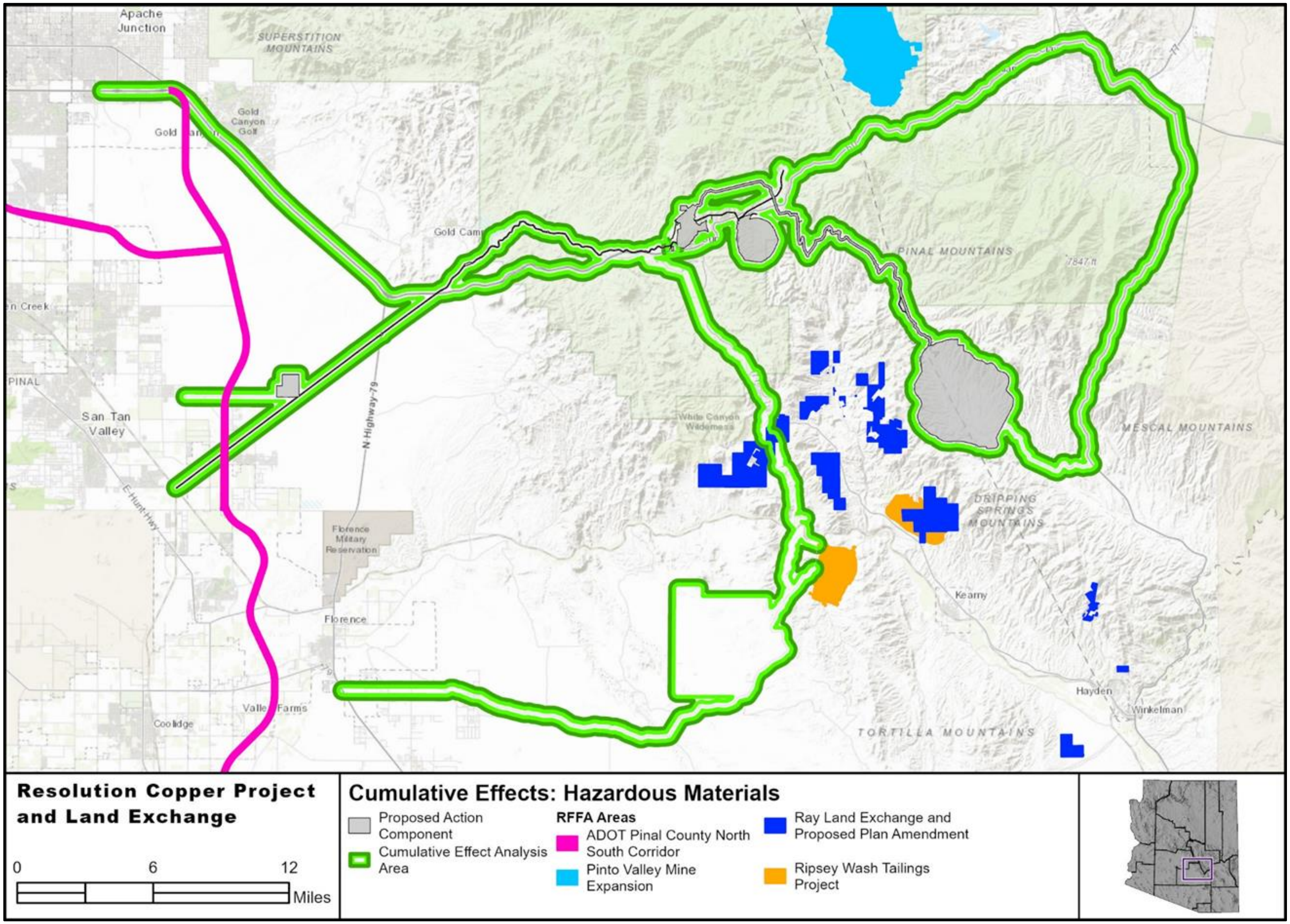

Figure 4.3.3-13. Hazardous materials management cumulative effects analysis area and RFFAs

4.3.3.14 Scenic Resources

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to scenic resources (figure 4.3.3-14):

- ADOT Pinal County North-South Corridor
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

Five other RFFAs identified in the screening as pertinent to fuels and fire management fell outside the cumulative effects analysis area: Drake limestone quarry expansion, Mount Baldy shooting sports site, Silver Bar Mining Regional Landfill and Cottonwood Canyon Road, Southline Transmission Project, and SunZia Southwest Transmission Project.

The metric used to quantify cumulative impacts to scenic resources is the physical footprint of the RFFAs. The impact to scenic resources is specific to individual facility designs, locations, and nearby landscapes. In general, however, multiple facilities within sight would have cumulative impacts on a given resident, traveler, or recreational user. Physical footprint serves as a proxy for the overall level of disturbance of the landscape that contributes to degradation of scenic resources. Similarly, impacts to dark skies are specific to individual facility lighting plans and locations, but physical footprint serves as a proxy for the overall level of lighting and development in the area.

The cumulative effects analysis area for scenic resources is approximately 375,458 acres, the Resolution Copper Project preferred alternative footprint within the cumulative effects analysis area is approximately 15,851 acres, and the combined physical disturbance area of the three RFFAs within the cumulative effects analysis area is approximately 13,505 acres. The cumulative effect of the Resolution Copper Project and the RFFAs listed above would result in approximately 29,356 acres of physical disturbance within the cumulative effects analysis area, or 7.8 percent of the total area.

This combined level of disturbance contributes to the overall industrialization and change in scenic integrity of the area. Physical footprint is only a proxy for visual resource impacts. In reality, these types of developments can be seen for much longer distances, though the effect is sensitive to the specific terrain.

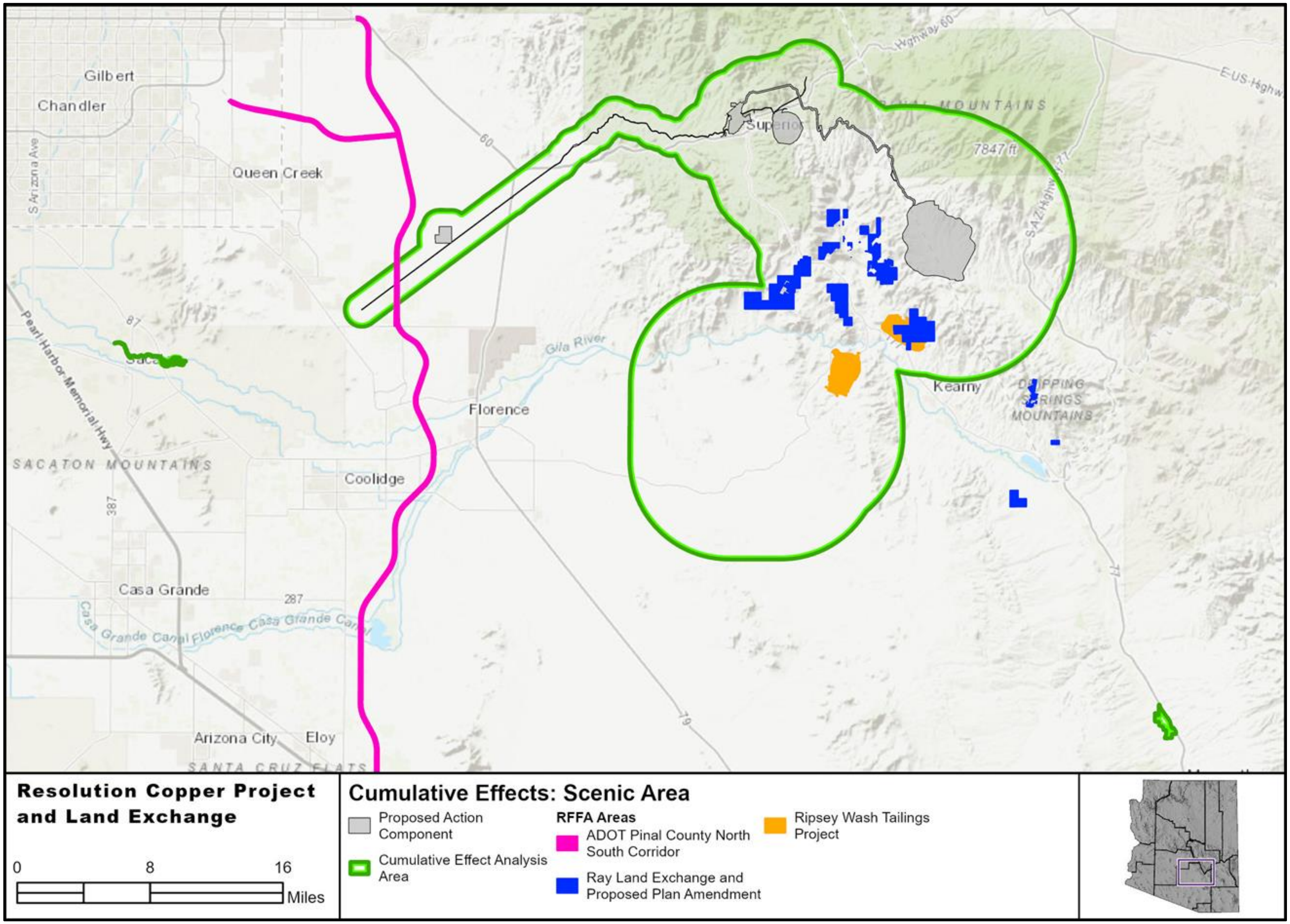

Figure 4.3.3-14. Scenic resources cumulative effects analysis area and RFFAs

4.3.3.15 Cultural Resources

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to cultural resources (figure 4.3.3-15):

- ADOT Pinal County North-South Corridor
- LEN Range Improvements
- Merrill Ranch Master Planned Community Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project
- Silver Bar Mining Regional Landfill and Cottonwood Canyon Road
- Superior to Silver King 115-kV Relocation Project

Two other RFFAs identified in the screening as pertinent to cultural resources fell outside the cumulative effects analysis area: Southline Transmission Project and SunZia Southwest Transmission Project.

The metric used to quantify cumulative impacts to cultural resources is the physical footprint of the RFFAs. Almost all projects result in disturbance of cultural sites, in many cases only after data recovery and mitigation activities. However, even if recorded and documented, loss of these cultural sites contributes to the overall impact to the cultural heritage of the areas. Often cultural sites are only known to be impacted if surveys have been conducted, which is not necessarily required on private land; physical footprint can serve as a proxy for the overall disturbance to cultural sites where no site-specific data exist.

The cumulative effects analysis area for cultural resources is approximately 729,680 acres, the Resolution Copper Project preferred alternative footprint within the cumulative effects analysis area is approximately 15,117 acres, and the combined physical disturbance area of the eight RFFAs within the cumulative effects analysis area is approximately 21,826 acres. The cumulative effect of the Resolution Copper Project and the RFFAs listed above would result in approximately 36,943 acres of physical disturbance within the cumulative effects analysis area, or 5.1 percent of the total area.

While the footprint of these projects is used as a proxy for impacts to cultural resources, effects on cultural resources extend beyond destruction by physical disturbance. The nearby presence of activities also can change the character of prehistoric and historic cultural sites.

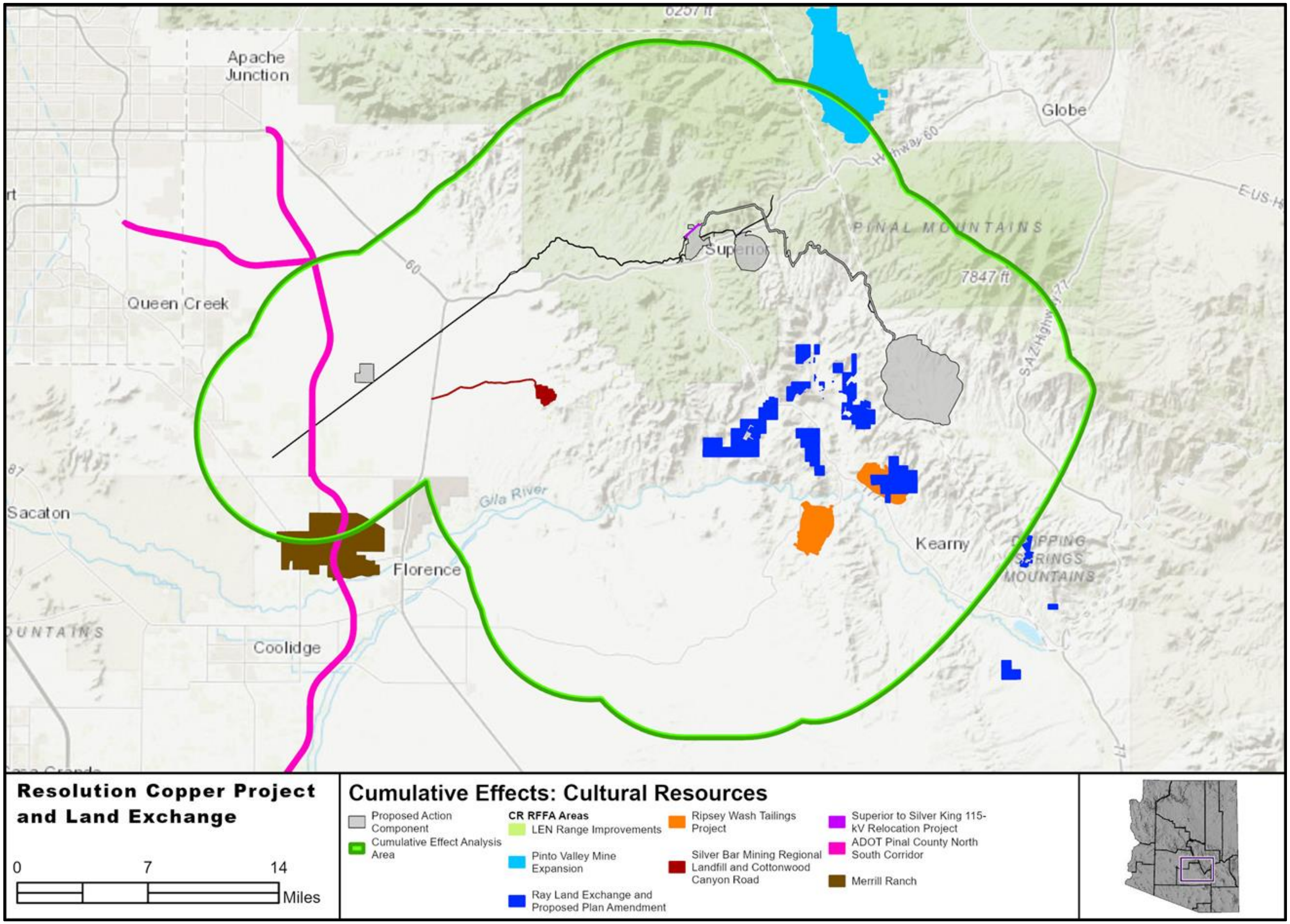

Figure 4.3.3-15. Cultural resources cumulative effects analysis area and RFFAs

4.3.3.16 Socioeconomics

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to socioeconomics (figure 4.3.3-16):

- ADOT Pinal County North-South Corridor
- Florence Copper In-Situ Mining Project
- LG Energy Solution Battery Production
- Merrill Ranch Master Planned Community Project
- Oak Wells Wind Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment
- Tonto National Forest Travel Management Plan

Two other RFFAs identified in the screening as pertinent to socioeconomic resources fell outside the cumulative effects analysis area: Apache-Sitgreaves travel management plan and the Pine Creek River Bend Placer Project.

The metrics used to quantify socioeconomic cumulative impacts are (1) the overall change in labor workforce from baseline levels (percent); and (2) the overall effect on local housing and local community services, including emergency services. Industrial, commercial, and residential development has positive and negative impacts. These become cumulative mostly where residents see impacts from multiple projects on their communities, such as housing stock, housing prices, or services they rely upon such as schools, ambulance, fire department, or police services.

The ADOT Pinal County North-South Corridor, LG Energy Solution Battery Production, Merrill Ranch, and Oak Wells Wind RFFAs are deemed reasonably foreseeable, but have not advanced to design or any level of environmental or jurisdictional review that may include socioeconomic analysis. Therefore, at this time, no workforce or population estimates (construction or operations) for these projects have been completed. All four projects would generate jobs and economic stimulus during construction and could result in temporary worker in-migration. Furthermore, these projects would generate long-term workforce demands, economic stimulus, and permanent population to the area. Given the current lack of detail on these projects, estimating their cumulative contribution to socioeconomic impacts, both beneficial and adverse, would be speculative. However, all four projects are expected to cumulatively contribute both localized and regional population changes, as well as both beneficial and adverse social change and economic effects. Of note is the ADOT Pinal County North-South Corridor, which will introduce a new transient population through the area and likely result in indirect population and economic growth due to providing a new regional transportation link.

With respect to cumulative projects that have estimated socioeconomic effects, the Pinto Valley Mine Expansion estimates a labor force of about 1,030 people, though the expansion would not change the overall labor force but would extend it for a longer time period. Florence Copper estimates a labor force of about 796 direct and indirect jobs. These would largely be drawing from the same labor pool as the Resolution Copper Project, which anticipates over 3,700 direct and indirect/induced jobs during operations. There are about 60,000 jobs in Pinal County and Gila County combined (U.S. Census Bureau 2018b); these projects together could represent as much as a 9 percent increase in the workforce in these two counties. It is speculative to assign workforce numbers to the Ray Land Exchange, as no mine plans have been developed. Like Pinto Valley Mine Expansion, the labor force likely would remain similar to current levels, but would shift from existing operations to new mining operations on the exchange lands.

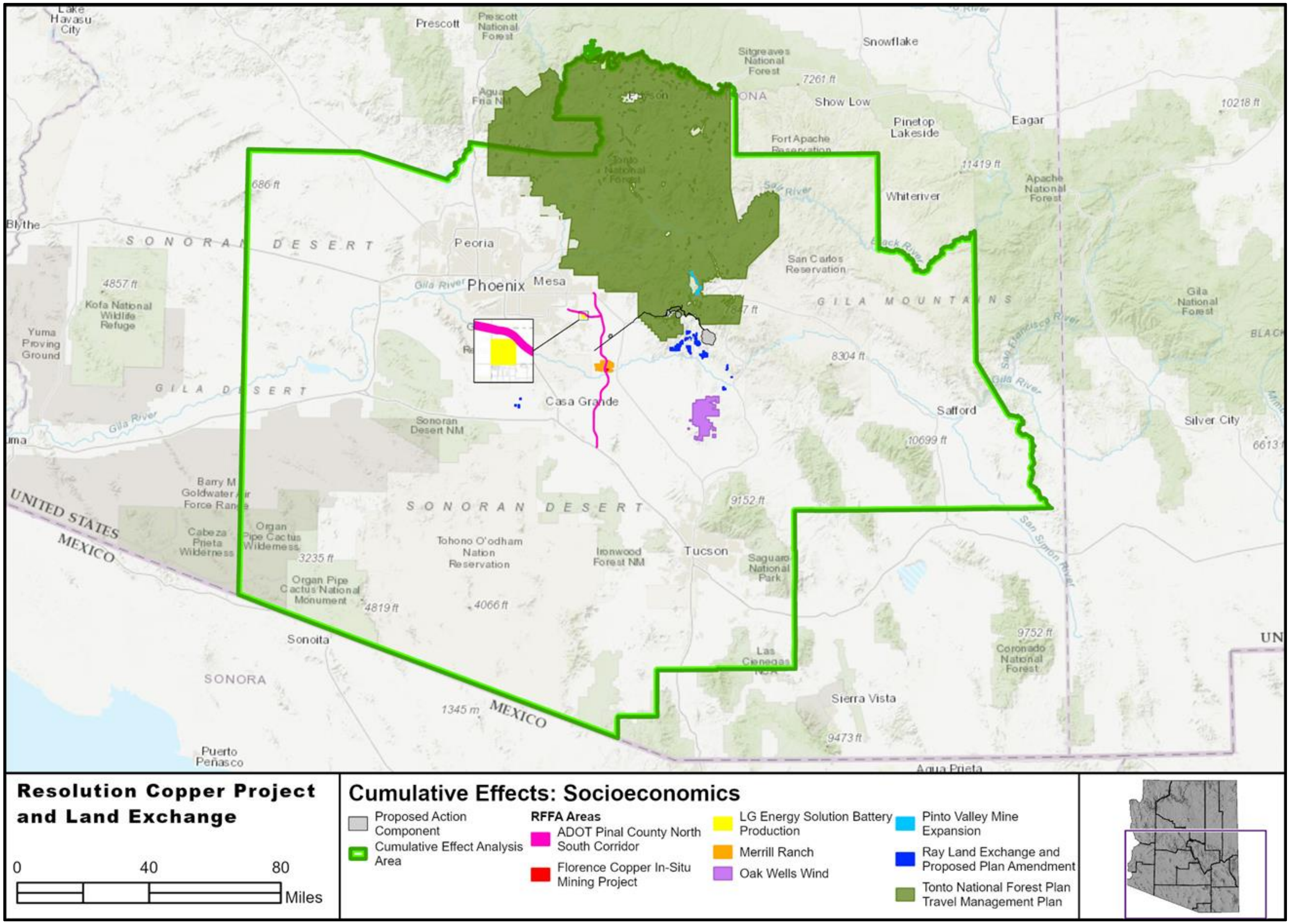

Figure 4.3.3-16. Socioeconomic cumulative effects analysis area and RFFAs

Note that the Tonto National Forest travel management plan was included as an RFFA after screening because there may be some impact on road maintenance costs. Ultimately, however, the metrics used to assess socioeconomics showed this would be negligible for this RFFA.

In terms of use of impacts on local housing and local community services, Pinto Valley Mine Expansion and the Resolution Copper Project are in the closest vicinity to each other and would likely overlap in their use of services, both for the mines themselves as well as services used by employees in communities like the town of Superior and city of Globe.

4.3.3.17 Tribal Values and Concerns

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to Tribal values and concerns (figure 4.3.3-17):

- ADOT Pinal County North-South Corridor
- Merrill Ranch Master Planned Community Project
- Pinto Valley Mine Expansion
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project
- Silver Bar Mining Regional Landfill and Cottonwood Canyon Road

Two other RFFAs identified in the screening as pertinent to Tribal values and concerns fell outside the cumulative effects analysis area: Southline Transmission Line Project and SunZia Southwest Transmission Project.

The metric used to quantify cumulative impacts to Tribal values and concerns is the physical footprint of the RFFAs. Given the long time period in which Tribal members have occupied these lands, and their religious and community connections to the landscape, there are many areas on the natural landscape that represent sacred sites for Tribal members, or for which general disturbance of the natural landscape represents an impact to their Tribal values. These types of impacts are difficult to quantify. Physical footprint is used as a proxy for the level of disturbance occurring to the natural landscape, assuming that effects on Tribal values would stem from these disturbances.

The cumulative effects analysis area for Tribal values and concerns is approximately 729,680 acres, the Resolution Copper Project preferred alternative footprint within the cumulative effects analysis area is approximately 15,117 acres, and the combined physical disturbance area of the six RFFAs within the cumulative effects analysis area is approximately 21,814 acres. The cumulative effect of the Resolution Copper Project and the RFFAs listed above would result in approximately 36,931 acres of physical disturbance within the cumulative effects analysis area, or 5.1 percent of the total area.

As described in section 3.14 in chapter 3, impacts to Tribal values and concerns are inadequately expressed through percentages and numbers. As disclosed in that section, the impacts of the Resolution Copper Project alone are substantial and irreversible due to the changes that would occur at Oak Flat. The other projects listed have not been identified as exhibiting the same level of Tribal concern; however, the combined disturbance across a wide region contributes to an overall disruption of the landscape and erosion of traditional places important to Tribes.

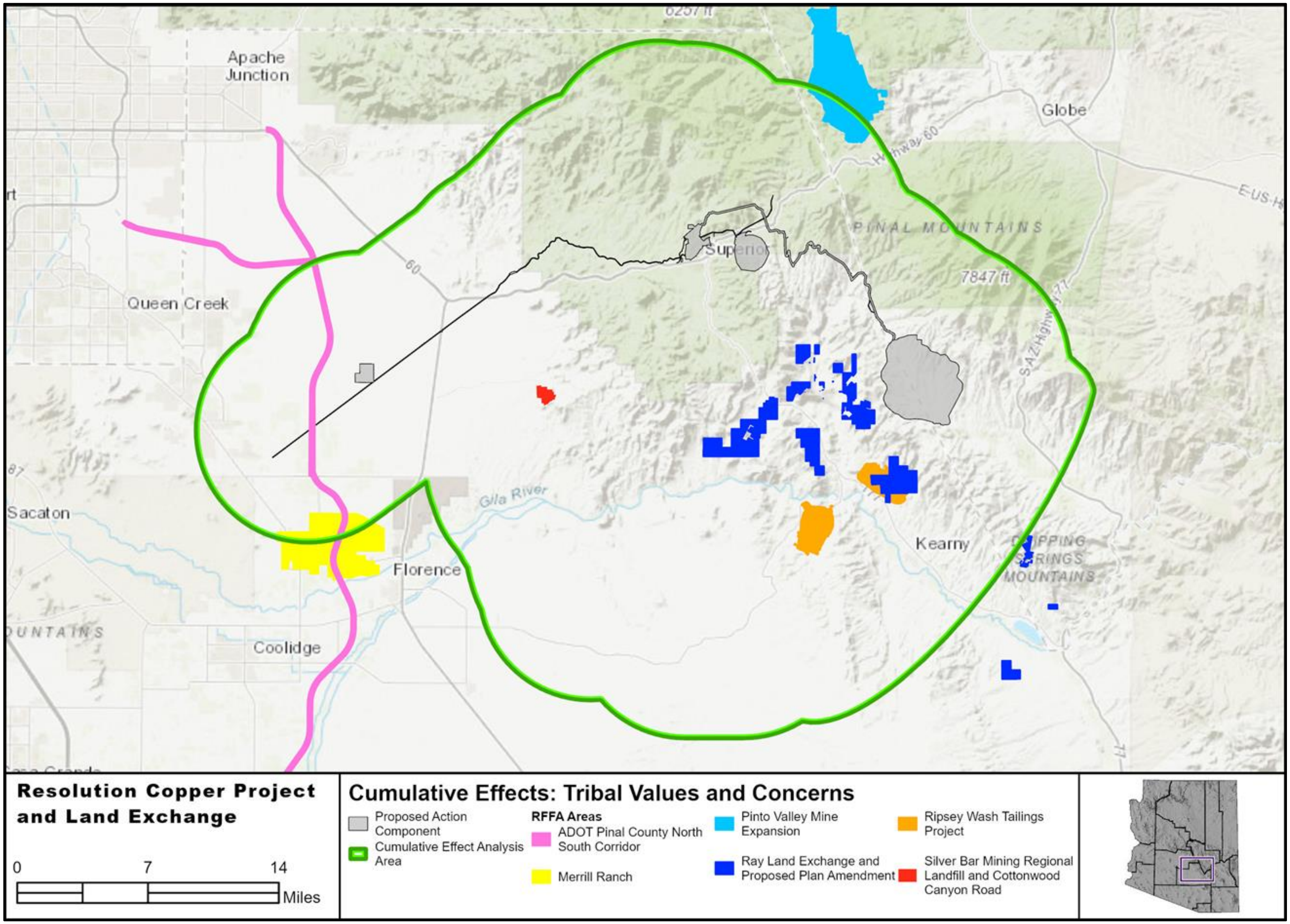

Figure 4.3.3-17. Tribal values and concerns cumulative effects analysis area and RFFAs

4.3.3.18 Environmental Justice

This section has been removed in compliance with Executive Orders 14148 and 14173.

4.3.3.19 Livestock Grazing

The following actions were determined through the cumulative effects analysis process to be reasonably foreseeable and to overlap in space and time with project impacts to livestock and grazing (figure 4.3.3-18):

- ADOT Pinal County North-South Corridor
- APS Herbicide Use within Authorized Power Line ROWs on NFS Lands
- Grazing Allotment Permit Renewals (Various)[133]
- LEN Range Improvements
- Ray Land Exchange and Proposed Plan Amendment
- Ripsey Wash Tailings Project

Two other RFFAs identified in the screening as pertinent to livestock and grazing and concerns fell outside the cumulative effects analysis area: Drake limestone quarry expansion and Peralta regional park project.

The metric used to quantify cumulative impacts to livestock and grazing are (1) the area of individual grazing allotments lost or disturbed by RFFA footprints, and (2) loss of water supplies within allotments. The FEIS analysis uses AUMs as a measure of impact, but the estimate of reduction in AUMs is based on the area lost from individual allotments either by physical disturbance or loss of access. Physical disturbance is a direct proxy for the loss of supporting capacity of the allotments, and the resulting reduction in AUMs. Loss of water supplies (tanks, springs, streams) within allotments also reduces the supporting capacity of those allotments.

The cumulative effects analysis area for livestock and grazing is approximately 462,062 acres and consists of the following grazing allotments:

- A-Diamond
- Battle Axe
- Devil's Canyon
- Ellsworth Desert
- Government Springs
- Heber
- Helmwheel
- Hicks-Pikes Peak
- Horsetrack
- Meyers
- Nichols Ranch
- Ruiz
- Slash S
- Superior
- Teacup Ranch
- Victory Cross
- Whitlow

The Resolution Copper Project preferred alternative footprint within the cumulative effects analysis area is approximately 13,697 acres, and the combined physical disturbance area of the six identified RFFAs within the cumulative effects analysis area is approximately 7,963 acres. The cumulative effect of the Resolution Copper Project and the RFFAs listed above would result in approximately 21,660 acres of physical disturbance within the cumulative effects analysis area, or 4.7 percent of the total area.

[133] While not an identified RFFA, these have been included because the cumulative analysis assumes existing grazing allotment permits would be renewed.

The above calculations exclude the grazing allotment permit renewals, which account for over 99 percent of the cumulative effects analysis area. Fundamentally, these renewals would not result in a material change in the use of the lands, reduction in AUMs, or loss of livestock grazing areas.

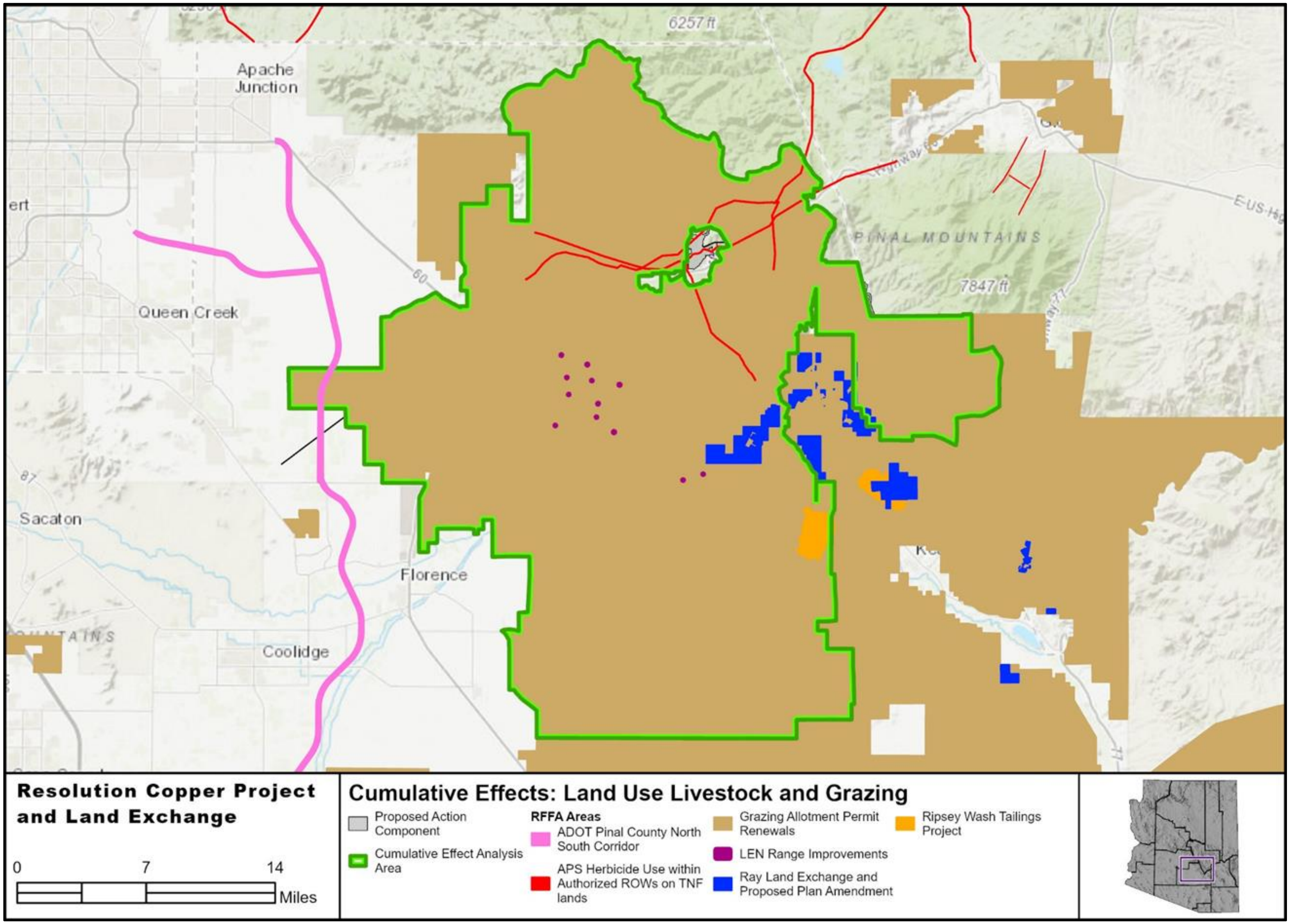

Figure 4.3.3-18. Livestock and grazing cumulative effects analysis area and RFFAs

A specific loss of water sources for specific grazing allotments is not known for any of the RFFAs.

4.3.4 Further Discussion of Key Topics

The following discussions concern several topics that have cumulative impacts that are not adequately captured in the cumulative effects analysis undertaken in sections 4.3.1 through 4.3.3. In some cases this is because many of the reasonably foreseeable actions have been screened out for lack of sufficient detail, but are still likely to happen in some unspecified fashion, such as increasing competition for water supplies. In other cases, such as future meteorological trends, the effects are not tied to a single reasonably foreseeable future action but have ramifications on many aspects of the analysis.

4.3.4.1 Cumulative Effects on Regional Water Supplies

We received many comments expressing concern with regional water supplies, current and future stresses on water supplies from drought and future meteorological trends, and the ramifications of Resolution Copper's use of water in the face of competing water uses.

We considered a number of specific projects or actions related to water supplies during the cumulative effects analysis process, including the following:

- Arizona's Drought Contingency Plan
- Resolution Copper's Potential Allocation of CAP Water
- Town of Florence Development Projects
- Population Change
- Recent Modeling Reports Projecting Water Shortages in Pinal County
- Assured Water Supplies in the East Salt River Valley
- Future Superstition Vistas Development Area on Arizona State Trust Land

Some of these normally would not be analyzed as cumulative effects because they do not meet the appropriate screening criteria to be considered reasonably foreseeable future actions (Debauche 2023; Newell et al. 2020; SWCA Environmental Consultants 2020b). For example, the provisions of the drought contingency plan expire in 2026 and would not overlap in time with the Resolution Copper Project's operational pumping. Similarly, water shortages in Pinal County are outside the spatial area impacted by Resolution Copper Project's pumping, and the effects of groundwater drawdown would not overlap. The Superstition Vistas development area would likely overlap in both space and time with the Resolution Copper Project's operational pumping. However, the development plans are conceptual and lack adequate detail to allow substantial analysis of resource effects and thus normally would be considered speculative, not reasonably foreseeable.

Regardless of the screening outcomes, due to the great interest expressed by the public and cooperating agencies in water-related issues, we have added this section to the cumulative effects analysis to discuss these regional water supply issues in the context of the Resolution Copper Project's use of water.

Regulatory Framework and Appropriateness of Resolution Copper's Water Use

Many comments express a value judgment that use of water for the Resolution Copper Project is an inappropriate use of Arizona's limited water resources, especially in the context of current drought and future meteorological trends.

The use of water in Arizona—from whatever source—takes place under a complex regulatory framework designed to prioritize and manage limited water resources. There is no single author of this framework; rather, it represents the combined outcome of four decades of intensive water management in Arizona and in the Colorado River basin. Two major components of this framework that are pertinent to the Resolution Copper Project are the following:

- The authorities and restrictions put in place by the State of Arizona with the 1980 Groundwater Management Act and furthered by subsequent legislation. These laws are administered by the ADWR and govern the use of groundwater within AMAs.
- The body of laws, treaties, and agreements known generally as the Law of the River. This governs the contracting and use of Colorado River water delivered through CAP, which is administered by the Central Arizona Water Conservation District and the Bureau of Reclamation.

These laws and regulations were enacted to codify the value and priorities that the State of Arizona, the Colorado River basin states, the U.S. Government (via Congress), and society in general place on the use of a limited water supply. While many individuals expressed their personal value judgments about the appropriateness of Resolution Copper using groundwater for mining, these laws and regulations reflect the overall value that society places on competing uses for water.

Every aspect of the water supply used by the Resolution Copper Project must adhere to this legal and regulatory framework, whether direct use of CAP water, dewatering at the mine site (which lies within the Phoenix AMA), pumping from the Desert Wellfield (also within the Phoenix AMA), or acquisition and use of long-term storage credits. By definition, the legally permitted use of water by Resolution Copper adheres to the norms and values placed on water by the State of Arizona.

Drought Contingency Plan and Central Arizona Project Resources

With respect to water supplies from the Colorado River, the State of Arizona is currently operating under a drought contingency plan. The drought contingency plan was signed in May 2019 by of all seven Colorado River basin states, the U.S. Department of the Interior, and the Bureau of Reclamation. The provisions of the plan expire in 2026. This plan imposes additional restrictions on the delivery of Colorado River water; these restrictions are in addition to interim guidelines previously agreed to by the seven Colorado River upper and lower basin states.

The Colorado River Compact of 1922 is the foundation of the "Law of the River," which governs Colorado River water management. State apportionments were established in agreements approved subsequent to the Colorado River Compact, and other laws and court decisions have further added to the Law of the River. The drought contingency plan is designed to reduce the risks of Lake Mead declining to critical elevations by requiring Arizona, California, and Nevada to contribute additional water to Lake Mead storage at predetermined elevations and creating additional flexibility to incentivize additional voluntary conservation of water to be stored in the lake. These new contributions of water by each lower basin state are an overlay and are in addition to the shortage volumes outlined in the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (known as the 2007 Guidelines, which were further supplemented in May 2024) (Bureau of Reclamation 2007, 2024b). Like the shortage elements of the 2007 guidelines, new contributions would increase as Lake Mead's elevation declines, providing protection against Lake Mead's declining to critically low elevations. The drought contingency plan also provides for the potential recovery of contributions later, should Lake Mead conditions improve significantly.

Every year in August, the Bureau of Reclamation makes a 24-month projection of anticipated reservoir levels, which in turn determines the level of restrictions that will be in place for the coming year. In 2020 and 2021, projections indicated that Lake Mead reservoir water levels would remain between 1,075 and

1,090 feet amsl; at these levels, the reservoir is operated under “Intentional Created Surplus” conditions (also known as “Tier 0”). At Tier 0 conditions, Arizona already forgoes 192,000 acre-feet of allocated Colorado River water. But in August 2021, the Bureau of Reclamation projections showed Tier 1 conditions expected for 2022 (corresponding to Lake Mead reservoir levels between 1,050 and 1,075 feet amsl), and beginning on January 1, 2022, Arizona has forgone 512,000 acre-feet of allocated Colorado River water, with the new reductions primarily affecting agricultural users (Ramirez 2021).

In August 2022, the Bureau of Reclamation’s projections indicated that Lake Mead’s water level would be below 1,050 feet amsl in January 2023, corresponding to a Tier 2a shortage. This means, beginning January 1, 2023, Arizona has forgone an additional 80,000 acre-feet to achieve the total 592,000 acre-foot Tier 2a reduction in water consumption. These cuts will primarily come from the CAP allocations to the Gila River Indian Community, Tohono O’odham Nation, and some cities, including Phoenix (Duda 2022; Nilsen and Ramirez 2022; U.S. Department of the Interior 2022).

In August 2023 and August 2024, the Bureau of Reclamation’s projections indicated that Lake Mead’s water level would be between 1,050 and 1,075 feet amsl. This recovery in water levels moved the reservoir back to Tier 1 conditions from Tier 2A conditions, as of January 2023.

The Bureau of Reclamation also makes probability projections about likely outcomes under various hydrologic conditions (including “stress test” conditions). As of August 2024, these projections suggest that for Lake Mead:

- In 2025, there is a 100 percent probability that shortage conditions will persist (Tier 1 or Tier 2).
- In 2026, there is a 0 percent probability of surplus conditions, a 7 percent probability that Tier 0 (normal year) conditions could return, and a 93 percent probability of remaining in a Tier 1 condition.
- In 2027, there is a 0 percent probability of return to surplus conditions, a 17 percent probability that Tier 0 (normal year) conditions could return, and an 83 percent probability of remaining in a Tier 1 condition (Bureau of Reclamation 2024a).

Upstream, Lake Powell projections indicate that water level conditions may improve. Water levels in Lake Powell as of August 2024 were in the Mid-Elevation Release Tier (> 3,525 feet amsl) and have a 57 percent probability of improving to a higher elevation tier in 2026 and a 70 percent probability of improving to a higher elevation tier in 2027 (Bureau of Reclamation 2024a). The drought contingency plan guidelines extend only to 2026; it was not considered for analysis as an RFFA because it will expire before Resolution Copper begins pumping groundwater from the Desert Wellfield. Given long-term climate conditions, presumably the drought contingency plan will be replaced with a different framework. ADWR and CAP have convened the Arizona Reconsultation Committee. This committee will develop an Arizona perspective on the reconsultation of the 2007 Guidelines. Regardless of the specifics, it is reasonable to anticipate that some level of similar restrictions would be in place on the Colorado River, and the projections suggest that such restrictions are likely to worsen over time rather than improve.

However, these restrictions do not mean a complete absence of Colorado River water for Arizona. Arizona’s allocation from the Colorado River is 2.8 million acre-feet, of which one-half is allocated to main-stem users, and the other one-half is accessed by users via the CAP aqueduct. Most of the 192,000 acre-feet of forbearance under Tier 0 shortages has come from the excess CAP water pool, which reduces water available for groundwater replenishment activities but avoids drastic effects on contracted users. In 2022, under Tier 1 shortages and the drought contingency plan provisions, the reductions have spread more widely, primarily impacting agricultural users with allocations from the Agriculture Excess pool (Ag pool). In 2023, under Tier 2 shortages and the drought contingency plan provisions, reductions expanded to include reductions in CAP water availability, primary affecting cities in the Phoenix area and

Tribes that receive water from the Non-Indian Agricultural (NIA) pool (Person 2021; Whitehill 2019). Though internal to Arizona, the drought contingency plan also provides for mitigation measures (including wet water replacement and financial compensation) that are meant to reduce impacts on end users.

One provision of the drought contingency plan is to allow irrigation districts in central Arizona to pump an additional 70,000 acre-feet of groundwater per year, which would only replace part of the Colorado River water that Pinal County farmers will have to relinquish under Tier 2 restrictions (James 2020). Some amount of CAP water has also been banked annually for future use as groundwater since 1996, but between 1996 and 2016, only 9 million total acre-feet of water was banked. This is the equivalent of about 1 year of total water usage for the state, or 9 years of total water usage for the Phoenix and Tucson AMAs (Hirt et al. 2017). With Tier 2 restrictions (as occurred in 2023), banking of CAP water for future use is likely to be further reduced, increasing the net reduction in available groundwater. There already is a demand/supply gap with respect to groundwater in Arizona, resulting in long-term depletion of aquifers (Eden et al. 2015). If water use restrictions continue or increase and the amount of groundwater recharge continues to decrease, this would only increase the rate at which groundwater supplies are depleting.

Ramifications of Future Colorado River Shortages on the Resolution Copper Project

In June 2020, the U.S. Department of the Interior published a proposed decision for the reallocation of NIA priority CAP water (U.S. Department of the Interior 2020). The reallocation decision originated with the 2004 Arizona Water Settlements Act, which led to an ADWR recommendation in January 2014 to reallocate a pool of CAP water to a number of entities, including Resolution Copper. ADWR recommended that Resolution Copper receive 2,238 acre-feet of CAP water annually. The Bureau of Reclamation undertook a NEPA analysis for the potential reallocation, which culminated in the completion of a Final Environmental Assessment and Finding of No Significant Impact in November 2019. On September 20, 2021, Resolution Copper entered into a subcontract with the United States and the Central Arizona Water Conservation District for the approved annual allocation of 2,238 acre-feet of NIA CAP water (Antone 2022b). In 2022, Resolution's NIA CAP allocation was delivered to New Magma Irrigation and Drainage District's Groundwater Savings Facility. Availability of the Resolution Copper NIA CAP water in future years will be subject to both physical availability and the terms of the drought contingency plan.

The DEIS disclosed the potential for Resolution Copper to use CAP water directly as one possible water source, along with pumping groundwater from the Desert Wellfield. However, because Resolution Copper did not have an approved CAP allotment, for the purposes of impact analysis, all makeup water for the mine was assumed to be physically pumped from the Desert Wellfield. This choice was made to ensure that impacts caused by groundwater drawdown in the East Salt River valley are not underestimated. The FEIS continues to assume that all makeup water for the mine is physically pumped from the Desert Wellfield.

Now that Resolution Copper has received the CAP allocation, it could potentially be used to offset about 100,000 acre-feet of groundwater pumping over the operational life of the mine. This could be accomplished by direct use of CAP water but more likely would be accomplished by using the allotment to acquire additional long-term storage credits, as was done in 2022. If this occurs, the impacts to regional groundwater would be less than those disclosed in section 3.7.1 of the January 2021 Rescinded FEIS.

Under Tier 1 and 2 shortages on the Colorado River, or similar shortages required by future iterations of management plans once the drought contingency plan expires, Resolution Copper's CAP allocation may not be fully available. In this case, the disclosures of impacts to regional groundwater in the FEIS would remain appropriate.

There are other ramifications to shortages on the Colorado River. To date, Resolution Copper has obtained long-term storage credits to offset pumping from the Desert Wellfield. In some cases, these long-term storage credits were generated by recharging or using excess CAP water. The current shortages reduce the available pool of excess CAP water significantly, rendering future acquisition of long-term storage credits more difficult. However, these long-term storage credits have no bearing on the impact analysis conducted for the EIS; the entire amount of makeup water needed for the mine was assumed to be physically pumped from the Desert Wellfield. Again, this choice was made to ensure that impacts caused by groundwater drawdown in the East Salt River valley are not underestimated.

Assured Water Supplies, Future Development, and Competing Uses for Groundwater

With the passage of the 1980 Groundwater Management Act, Arizona enacted one of the most progressive and expansive regulatory systems in the western United States governing the use of groundwater. Over the past 40 years, this regulatory system has helped transition water users in Arizona's most populous areas away from the use of groundwater and toward the use of renewable sources.

The Groundwater Management Act established special management areas called Active Management Areas (AMAs) and Irrigation Non-expansion Areas (INAs). Within AMAs, which encompass much of the urban population of the state and several agricultural centers, groundwater use is subject to a system of groundwater rights. By contrast, many rural parts of the state, outside any AMAs, have no restrictions on groundwater pumping except for the legal requirement that it be put to beneficial use.

MANAGEMENT OF THE PHOENIX ACTIVE MANAGEMENT AREA

Both the Desert Wellfield and the dewatering pumping at the mine site take place within the boundaries of the Phoenix AMA. The management strategy of water resources within the AMA is laid out in the AMA management plan. The most recent (and by statute, the final) management plan for the Phoenix AMA is the fifth management plan (2020–2025) (Arizona Department of Water Resources 2022). The Director of the Arizona Department of Water Resources entered an order adopting the fifth management plan on September 9, 2022, with conservation measures to go into effect January 1, 2025. As the fifth management plan is the final plan envisioned in the original Arizona Groundwater Management Act, the conservation measures will remain in effect "until the legislature determines otherwise" (ARS 45-568(C)).

The management plans for each AMA serve as a tool to assist ADWR in achieving the groundwater goals of each AMA. The statutory management goal of the Phoenix AMA is safe-yield by the year 2025 (ARS 45-562(A)). Safe-yield is defined as "a groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area" (ARS 45-561(2)). Groundwater withdrawals in excess of natural and artificial recharge lead to groundwater overdraft.

The fifth management plan summarizes the water management challenges facing the Phoenix AMA. This includes groundwater pumping by industrial users like Resolution Copper:

> The risks associated with the overuse of groundwater have been long recognized in Arizona. There were multiple efforts prior to the GMA [Groundwater Management Act] to regulate groundwater, and the risks of overdraft were well-accepted enough that they were written into the "Declaration of Policy" in the Groundwater Code: "(overdraft) is threatening to do substantial injury to the general economy and welfare of this state and its citizens. . . " (A.R.S. § 45-401(A)). To address this threat, the [Groundwater Management Act] set forth what was then seen as a comprehensive and proactive set of regulations with the goal to shift water users to alternate supplies and preserve groundwater.

> The regulations and goals laid out in the [Groundwater Management Act] have proven to be insufficient though: despite significant conservation efforts and imported water supplies added to the [Phoenix AMA] since 1980, the AMA has not reached, and is not expected to reach, its goal of safe-yield by 2025. Continued overdraft has resulted in growing pressure on groundwater supplies: physical availability challenges in the AWS [Assured Water Supply] program which have already been observed in the Pinal AMA are expected eventually to also occur in the [Phoenix AMA], and there are additional concerns about the physical impacts (subsidence, fissures, water quality degradation, etc.) associated with continued groundwater mining. (Arizona Department of Water Resources 2022:8-11)

PINAL ACTIVE MANAGEMENT AREA MODELING

ADWR has a long history of assessing groundwater conditions in the Pinal AMA and projecting groundwater use into the future, starting in 1989 with the first Pinal AMA groundwater flow model (Wickham and Corkhill 1989). The results of ADWR's most recent modeling effort for the Pinal AMA was published in 2019, generally raising concerns about future groundwater supplies in the Pinal AMA (Arizona Department of Water Resources 2019). This modeling effort projected groundwater conditions through the year 2115, and incorporated all known groundwater demands including groundwater supplies already committed and approved for Assured Water Supplies and the recovery of long-term storage credits. Municipal and industrial demands were maintained at 2015 levels, and agricultural demands were projected based on a number of factors. Overall, the combined projections show that annual rates of groundwater pumping decrease somewhat over the next century, but not substantially so.

The modeling report focused on whether committed or projected water supplies could physically be obtained from the aquifer. The modeling found that of the roughly 80 million acre-feet projected to be required by the year 2115, only 72 million acre-feet were physically available, suggesting the Pinal AMA may experience a long-term shortfall of 8.1 million acre-feet, or about 10 percent of cumulative total projected 100-year demand (Arizona Department of Water Resources 2019).

The modeled shortfalls noted are for the Pinal AMA as a whole, and it is important to recognize that because the model is based on physical availability, the specific location of the pumping determines whether a shortfall is anticipated. Most of the critical shortfalls are predicted to occur south of Eloy, roughly 30 to 40 miles from the Desert Wellfield. Based on the modeling, groundwater supplies are likely to remain physically available in the northern part of the Pinal AMA nearest the Desert Wellfield, with substantial remaining saturated thickness in the aquifer.

However, the model also predicts that water levels will be reduced by 201 to 300 feet, to between 501 and 800 feet below ground surface in the East Salt River Valley near the boundary with the Phoenix AMA over the next 100 years (see figure 16 in Arizona Department of Water Resources (2019)). This drawdown at the Phoenix AMA boundary will be cumulative with drawdown resulting from the project in the Desert Wellfield. At the boundary of the Phoenix AMA/Pinal AMA, the anticipated drawdown due to Desert Wellfield pumping is estimated to be 40 to 50 feet at the end of Resolution Copper's pumping, eventually recovering to 20 to 30 feet (see figure 3.7.1-2). The total cumulative drawdown at the Phoenix AMA/Pinal AMA boundary is therefore estimated to range from 220 to 350 feet over the next 100 years. Resolution Copper's pumping from the Desert Wellfield would contribute to anticipated drawdown in the northern part of the Pinal AMA, but would likely represent roughly 10 to 15 percent of the total drawdown experienced there. While the cumulative water level reductions anticipated near the Phoenix AMA/Pinal AMA boundary (220 to 350 feet over the next 100 years) will have ramifications on water availability and cost of pumping similar to those described in section 3.7.1, the aquifer in this area is by no means depleted. The Pinal AMA model considers any groundwater at depths greater than 1,100 feet below ground surface to be unavailable for use. Despite the anticipated drawdown, after 100 years the regional aquifer still retains 300 to 500 feet of saturated thickness (above the 1,100 foot cutoff) (see figures 17 and 21 in Arizona Department of Water Resources (2019)).

As noted above, the drought contingency plan will drive additional groundwater pumping by farmers in the Pinal AMA. The agricultural demands in the Pinal AMA are roughly 400,000 to 500,000 acre-feet per year (Arizona Department of Water Resources 2019). The potential increase resulting from the drought contingency plan (70,000 acre-feet per year) represents a 14 to 17 percent increase in agricultural pumping on an annual basis. This increase would exacerbate the anticipated groundwater conditions modeled by ADWR for the Pinal AMA.

One specific nearby project in the Pinal AMA that has been raised by commenters is the Florence Copper in-situ mining project, located approximately 10 miles south of the Desert Wellfield. This project was screened as a RFFA and identified for analysis for geology and mineral resources, and socioeconomics (SWCA Environmental Consultants 2020b). Ultimately this project only fell within the cumulative effects analysis area for socioeconomics (see section 4.3.3). The Florence Copper project was not analyzed with respect to groundwater resources for two reasons. First, there are no groundwater impacts (such as drawdown or a cone of depression) associated with the Florence Copper project that would overlap with Desert Wellfield pumping impacts. By design, the Florence Copper project maintains a stable water level through control of injection and pumping wells. Second, the Florence Copper project falls outside the cumulative effects analysis area for groundwater resources.

The Florence Copper project is in an area where substantial aquifer drawdown is anticipated unrelated to the Resolution Copper project, as noted above (200 to 300 feet). Additional drawdown may occur that is attributable to the Desert Wellfield, as described above, but would not substantially change the outcome of the Florence Copper project.

RESOLUTION COPPER GROUNDWATER RIGHTS

Resolution Copper is currently pumping groundwater near Superior to dewater the mine infrastructure and would continue to do so throughout the mine life (roughly 1,700 acre-feet per year, or 87,000 acre-feet over the mine life). In addition, Resolution Copper would pump makeup water from the Desert Wellfield, located in the East Salt River valley (this varies by alternative, with the maximum estimate for Alternative 2 at 14,300 acre-feet per year, or 590,000 acre-feet over the mine life). Both activities take place within the Phoenix AMA. As such, Resolution Copper must have appropriately issued groundwater rights or permits to conduct this pumping. Resolution Copper currently holds a dewatering permit for the pumping at the mine site (59-524492); this permit extends through 2029. It is reasonable to assume that this permit would be reissued as needed by ADWR to prevent flooding of an operational mine.

Resolution Copper has not yet obtained the groundwater rights needed to pump from the Desert Wellfield, although they do have some Type 2 Non-Irrigation Grandfathered Rights that would allow pumping (1,800 acre-feet per year, which would equate to 74,000 acre-feet over the mine life), and have also obtained a substantial amount of long-term storage credits (see below). After appropriate permitting, these long-term storage credits could be recovered from the Desert Wellfield without acquisition of further groundwater rights or permits.

In December 2022, Resolution Copper clarified agreements that are currently in place for obtaining additional long-term storage credits. Resolution Copper indicated that delivery of its Colorado River allotment was anticipated to result in additional long-term storage credits, estimated through 2024 as 5,596 acre-feet but also subject to potential drought reductions (Antone 2022b). Resolution Copper has also entered into an agreement with EPCOR to recharge effluent over the life of the mine and accrue 56,780 acre-feet of long-term storage credits in the Phoenix AMA. These long-term storage credits will be exchanged to Resolution Copper in return for long-term storage credits held in Pinal AMA. With these agreements, Resolution Copper would have roughly 318,000 acre-feet of long-term storage credits, which accounts for roughly 60 percent of the water needs for the preferred alternative.

It is foreseeable that ADWR would make the remainder of the necessary groundwater available to Resolution Copper. Resolution Copper would likely receive a Permit to Withdraw Groundwater for Mineral Extraction and Metallurgical Processing. Under State law, this is a non-discretionary permit, provided that certain conditions are met (ARS 45-514).

OTHER FUTURE WATER USERS IN THE EAST SALT RIVER VALLEY

One of the primary mechanisms by which groundwater is managed in the AMAs is the Assured Water Supply program. Under this program, the act of subdividing land for development requires proof that enough water is physically and legally available to supply those homes for 100 years. As the intent of this program is to foster use of renewable sources of water, there are restrictions on how much groundwater can be used to make this demonstration. There is a total of roughly 24,000 acre-feet of annual future committed demand through approved Assured Water Supplies in the East Salt River valley (Barter et al. 2020). This is above and beyond the amount of agricultural, industrial, and municipal pumping already taking place in this part of the basin.

Superstition Vistas is a 275-square mile area of Arizona State Trust land in the East Salt River valley. Conceptually, this area has been identified for residential and commercial development, with a number of different scenarios considered (Morrison Institute for Public Policy 2006); however, at the time of the January 2021 Rescinded FEIS, the ASLD had taken no concrete steps for auction of this land. This has since changed, but only for a small portion of the Superstition Vistas area, described in the “Analysis of Cumulative Effects in the East Salt River Valley” section below. While the lack of detailed water use plans prevents specific analysis of most of the Superstition Vistas development, some estimates indicate that a population of 900,000 could live in this area. Throughout the Resolution Copper Project NEPA process, the ASLD has raised concerns about the potential future water supply to support the Superstition Vistas development. The cumulative effects modeling described below was undertaken in part to investigate the potential impacts to the Superstition Vistas water supply.

LONG-TERM STORAGE CREDITS IN EAST SALT RIVER VALLEY

Aside from the long-term storage credit portfolio acquired by Resolution Copper, a substantial amount of groundwater in the East Salt River valley is already “spoken for” because it represents banked water or long-term storage credits acquired through physical recharge of water to the aquifer or “in-lieu” recharge of water to the aquifer (foregoing otherwise legal groundwater pumping by providing alternative water supplies, like excess CAP water). The amount of stored water is substantial. Approximately 7 million acre-feet of long-term storage credits were stored in the entire Phoenix AMA at the end of 2017 (Barter et al. 2020).

ANALYSIS OF CUMULATIVE EFFECTS IN THE EAST SALT RIVER VALLEY

The analysis of impacts to the East Salt River valley aquifer as a result of the Desert Wellfield pumping was conducted for the EIS using a groundwater flow model. This groundwater flow model was built from an existing, calibrated, regulatory model prepared by ADWR. In some form, this model has been used widely for basin-wide planning purposes since the 1990s, as well as to estimate project-specific water supply impact. The appropriateness of using this model to predict impacts from the Desert Wellfield was further assessed by the NEPA team and found to be reasonable (Walser 2020a).

An additional set of model runs was conducted through the year 2118 to simulate cumulative effects from the water users described above: existing pumping, permitted Assured Water Supplies, recovery of long-term storage credits, and pumping from the Desert Wellfield (Barter et al. 2020). The following represent the approximate stresses applied in the model (for the entire Phoenix AMA, not just the East Salt River valley):

- Non-recovery agricultural pumping: 530,000 acre-feet/year
- Non-recovery non-agricultural pumping: 200,000 acre-feet/year
- Recovery of storage credits accrued through 2017 (including Resolution Copper credits): 112,000 acre-feet/year
- Recovery of additional storage credits accrued after 2017: 14,300 acre-feet/year
- Permitted Assured Water Supply groundwater demands: 105,000 acre-feet/year
- Non-recovery Desert Wellfield pumping: 6,700 acre-feet per year

Results indicate that by 2118, groundwater levels in the East Salt River valley would experience drawdown up to roughly 450 feet below current water levels, with or without Desert Wellfield pumping. As shown in figure 4.3.4-1, Resolution Copper's pumping increases drawdown as would be anticipated, primarily in the immediate vicinity of the Desert Wellfield.

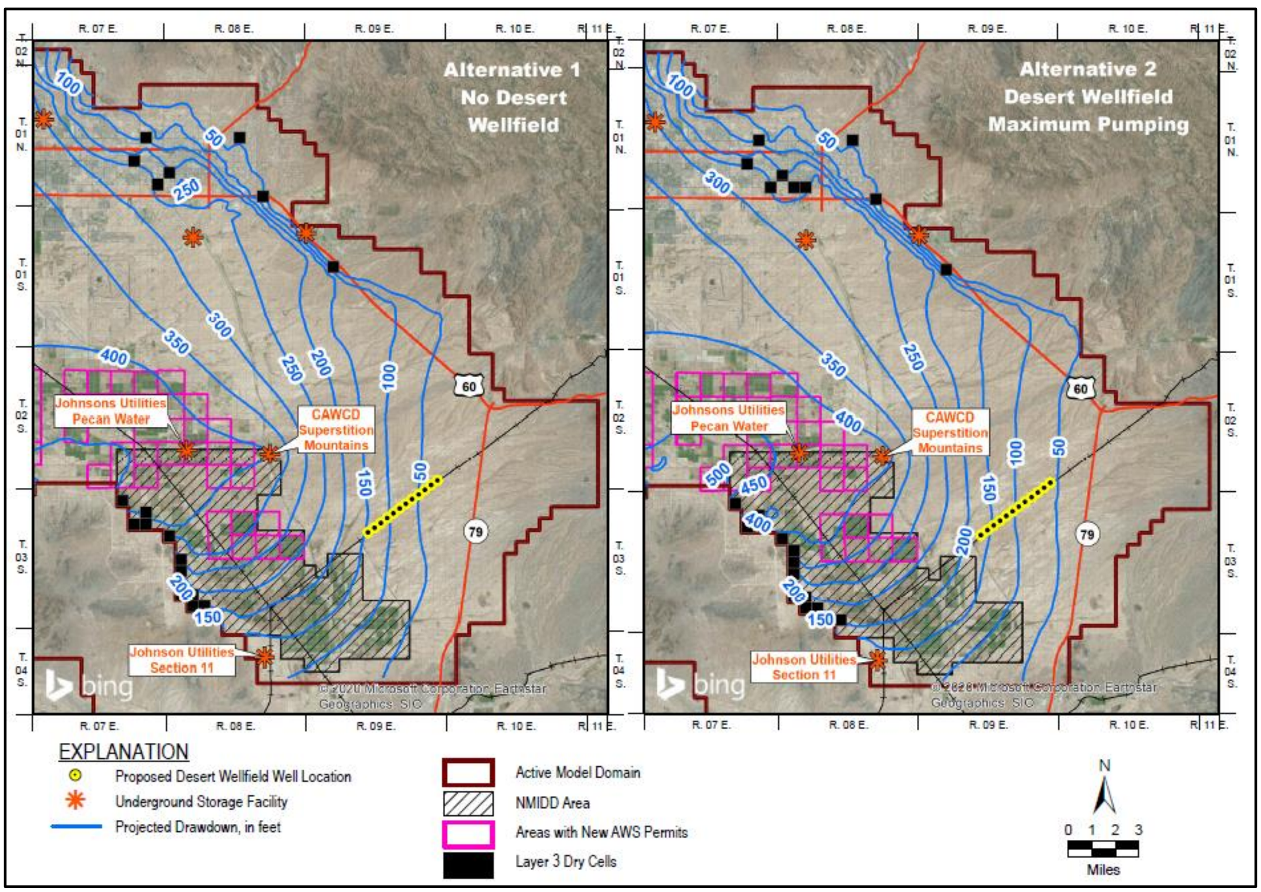

Figure 4.3.4-1. Projected drawdown in the East Salt River valley in 2118 caused by cumulative water use, with (right) and without (left) Resolution Copper pumping

In the center of the Desert Wellfield, without Resolution Copper pumping, water levels would decline roughly 75 feet from current levels by 2118. With Resolution Copper pumping, water levels would decline roughly 100 feet by 2118. Note that operational pumping has ceased, and groundwater levels have partially recovered by 2118. Maximum drawdown in the center of the Desert Wellfield of just over 200 feet would occur at the peak of operational pumping (around 2060).

A depth-to-water of 1,000 feet below land surface is often used as a limit of physically available groundwater in the Phoenix AMA. Maximum depth-to-water in 2118 with all cumulative groundwaters uses ranges up to 850 feet as shown in figure 4.3.4-2, with a large cone of depression forming near Apache Junction. In addition, some model cells near Apache Junction and at the periphery of the basin show drying by 2118, indicating that groundwater would not be available in these areas. The depth-to-water in the center of the Desert Wellfield in 2118 is 550 feet below ground surface without Resolution Copper pumping, and 575 feet below ground surface with Resolution Copper pumping.

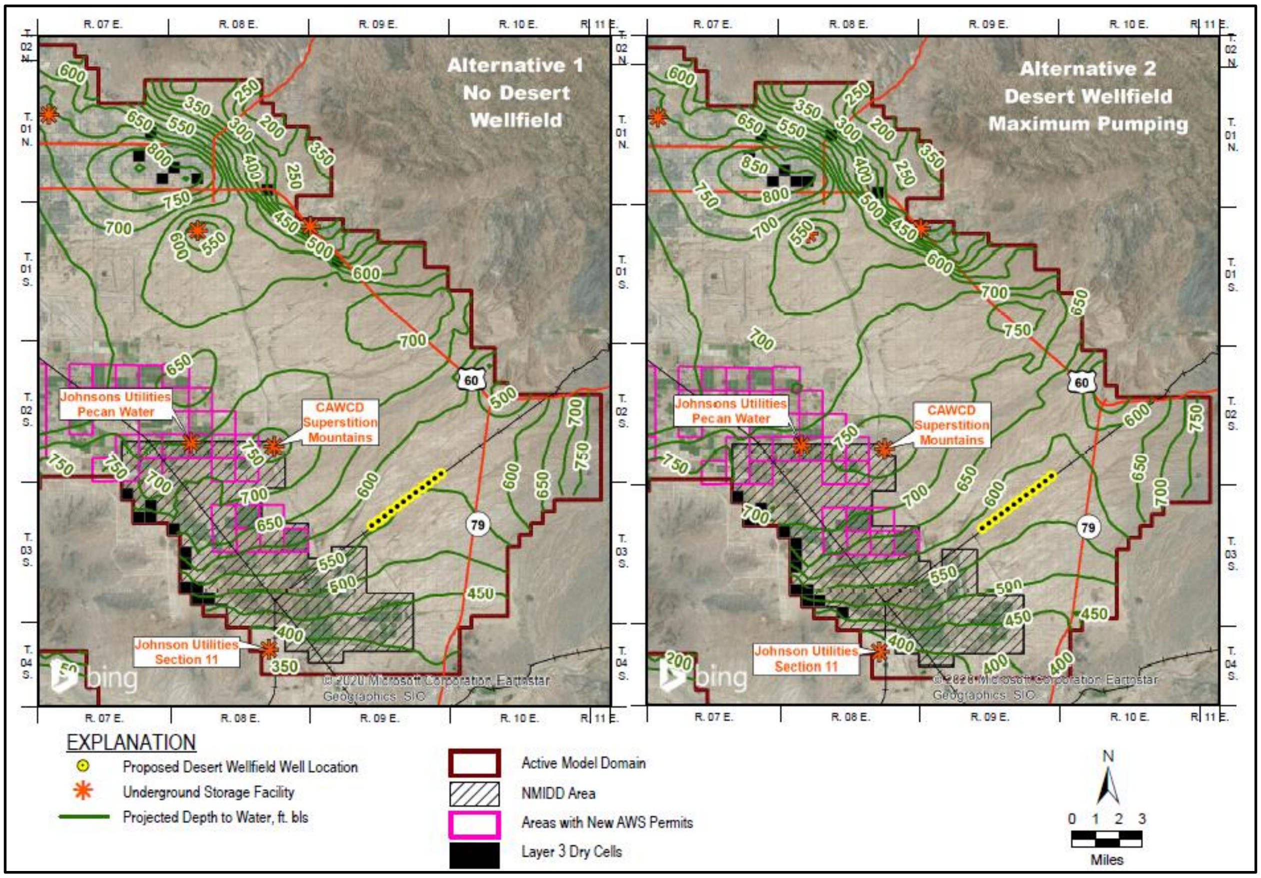

Figure 4.3.4-2. Projected depth-to-water in the East Salt River valley in 2118 caused by cumulative water use, with (right) and without (left) Resolution Copper pumping

Sufficiency of Regional Water Supplies

Groundwater modeling, using the best available estimates of all regional groundwater users over the next 100 years, indicates that regional groundwater supplies generally are sufficient to satisfy committed demands. Full drying of the aquifer is limited to peripheral areas, and depth-to-groundwater generally does not exceed limits of physical availability (1,000 feet). However, there likely would be certain areas that experience lack of well capacity and groundwater shortages, particularly around the edges of the basin.

Further, the cost and energy required for pumping increases as groundwater deepens, and infrastructure costs would increase as wells and pumps need to be lowered or replaced. According to one estimate, an additional 1.02 to 2.56 kilowatt-hours of energy, depending on pump efficiency, are required to lift an acre-foot of water an additional foot (Peacock n.d. [1996]). The above quantitative modeling analysis includes known population increases through the incorporation of permitted Assured Water Supplies. At the time of the January 2021 FEIS, no portion of Superstition Vistas had been concretely planned for development. This has now changed. The first Superstition Vistas parcels (2,783 acres) were auctioned by the ASLD in 2020, purchased by DR Horton. Prior to subdivision, this parcel will require demonstration of a 100-year water supply under the Assured Water Supply program. There are generally two ways a developer can demonstrate this 100-year water supply: either by obtaining a separate, independent Assured Water Supply for the parcel from the ADWR, or relying on a designation of Assured Water Supply already obtained by a water provider from the ADWR. In this case, the auctioned Superstition Vista parcels are relying on previous designation obtained by the Apache Junction Water Department. Sufficient water has not been demonstrated to develop the entire Superstition Vistas area, but Apache Junction Water Department has demonstrated enough water rights to begin development on the auctioned properties (Hilgartwilson LLC 2021). Importantly, those committed Assured Water Supplies were included in the Desert Wellfield modeling report described above (Barter et al. 2020).

In summary, the portion of Superstition Vistas that has a demonstrated source of water has been quantified and included in the regional cumulative effects groundwater model. Other portions of Superstition Vistas without demonstrated water supplies are speculative and not explicitly modeled.

Resolution Copper and ASLD have discussed potential wellfield layouts for Superstition Vistas, informed by these modeling results, but no firm water supply planning has been undertaken. Conceptual water use estimates for the entirety of Superstition Vistas range anywhere from 100,000 to 190,000 acre-feet/year, depending on the progressiveness of water conservation (Morrison Institute for Public Policy 2006).

While adequate groundwater exists for committed regional demands, including Resolution Copper's Desert Wellfield, as demonstrated by the cumulative effects model presented above, those demands are met in part by mining of non-renewable groundwater and result in an overall lowering of groundwater levels over the next 100 years. While the next 100 years are demonstrated through this modeling to be manageable without exhausting groundwater supplies in the East Salt River valley, ultimately, the long-term use of groundwater may become unsustainable, even without considering Superstition Vistas' growth. The potential new future residential demand from Superstition Vistas represents between seven and 13 times the annual groundwater pumping by Resolution Copper over the operational life of the mine. More importantly, these residential water demands are in perpetuity, rather than for a limited time frame (four decades in the case of Resolution Copper). While the cumulative effects modeling does not preclude the future Superstitions Vistas' development and the population growth it portends, the cumulative effects modeling suggests that regional water supplies would become more limited and would need to be carefully assessed for sufficiency based on actual development plans for the area. This assessment would take place at a basin-wide planning level by ASLD before auctioning of the land, as well as through the existing regulatory framework, which requires Assured Water Supply permitting before approving each subdivided parcel.

In its comments on the DEIS, ASLD indicated that the water use of the Desert Wellfield would preclude the development of 3,440 acres of otherwise developable State Trust land and calculated a potential loss in revenue. This comment fundamentally suggests that the Desert Wellfield and full and complete development of Superstition Vistas are mutually exclusive, based on the assumption that groundwater supplies would not be sufficient for all development. The cumulative effects modeling cannot fully answer this question. The recent auctioned land described above is an example of some Superstition Vistas parcels whose water use is already effectively included in the cumulative effects modeling. The outcome of the cumulative effects modeling indicates there is still groundwater available for use after 100 years, even after all committed demands are accounted for. Whether these water supplies would be sufficient for full development of Superstition Vistas depends on the details of that development, which do not yet exist. However, as noted above, the overall concern that regional supplies would become more limited in the future is certainly consistent with the outcome of the cumulative effects modeling.

2023 ADWR Salt River Valley Model Update

For over 30 years, ADWR has developed, updated, and used a comprehensive groundwater flow model for the Salt River valley, including the Phoenix AMA (known as the Salt River valley (SRV) model). The Desert Wellfield cumulative effects modeling described above was conducted by updating a version of this calibrated regulatory model.

In June 2023, ADWR released the results of a new predictive model run using the SRV model for the period 2022 through 2121 (ADWR 2023a, 2023b, 2023c). The release of the new model results triggered substantial public concern and news coverage, as it was accompanied by an announced moratorium on approving new Assured Water Supplies for development within the Phoenix AMA.

The 2023 SRV model results in the East Salt River valley are substantially different from the Desert Wellfield modeling used for the cumulative effects analysis:

- As noted above, the cumulative effects analysis shows that depth to water in the center of the Desert Wellfield in 2118 is 550 feet below ground surface without Resolution Copper pumping and 575 feet below ground surface with Resolution Copper pumping.
- The 2023 SRV modeling results show that depth to water in 2121 is 750 to 1,000 feet below ground surface without Resolution Copper pumping.

A review was undertaken to identify the differences between the cumulative effects modeling (Barter, Bates, and Bayley 2020) and the 2023 SRV model (ADWR 2023a, 2023b, 2023c). The review found that the difference in modeling results stems from the fact that the 2023 SRV model simulates approximately twice as much net groundwater withdrawals in the East Salt River valley than the cumulative effects modeling (Barter and Bayley 2023). Over 80 percent of this net groundwater withdrawal increase is attributable to resumed agricultural pumping within NMIDD, which ADWR simulated at 76,000 acre-feet per year for 100 years. This step was taken because ADWR assumed that as a result of curtailment of Colorado River supplies, the cessation of CAP-sourced water currently irrigating NMIDD crops would lead to full resumption of historic groundwater pumping for agriculture irrigation.

By contrast, the cumulative effects modeling for the Desert Wellfield assumes that NMIDD agricultural land will be converted to residential housing by 2030. The 2023 SRV model also assumes this conversion and includes groundwater use for residential development. However, the review found that the 2023 SRV model does not correspondingly reduce the NMIDD agricultural pumping, but rather restores it to historic levels. The review found that the 2023 SRV model is essentially double-counting the water use for NMIDD lands, including pumping for both agriculture and residential development.

The FEIS reviewers interviewed NMIDD representatives to determine whether the cumulative effects analysis used improper assumptions. NMIDD representatives confirmed the approach used in the cumulative effects modeling and estimated that future irrigation pumping will not exceed 8,000 acre-feet per year and will cease completely by 2050 due to residential development of NMIDD land (Barter and Bayley 2023).

The difference is substantial between the two models when comparing the cumulative water budget for the 100-year period for the East Salt River valley:

- Cumulative effects modeling (Barter, Bates, and Bayley 2020):
    - Inflows: 3.3 million acre-feet

- Outflows: 5.3 million acre-feet
- Total deficit: 1.9 million acre-feet

- 2023 SRV modeling (ADWR 2023a, 2023b, 2023c):
  - Inflows: 5.1 million acre-feet
  - Outflows: 15.7 million acre-feet
  - Total deficit: 10.6 million acre-feet

Both models indicate that a groundwater deficit will occur in the East Salt River valley over the next 100 years, with pumping exceeding recharge. This occurs with or without Desert Wellfield pumping, though the Desert Wellfield withdrawals will physically add to the deficit (i.e., not taking into account any long-term storage credits). Cumulative effects analysis should be based on reasonably foreseeable actions. The conversion of NMIDD lands to residential development with reductions in agricultural pumping is the most likely and reasonably foreseeable scenario for these lands. This scenario is appropriately modeled in the cumulative effects modeling used for the EIS but was not appropriately modeled in the 2023 SRV modeling.

Overall, the new analysis and subsequent policy changes in Arizona water management and the Phoenix AMA that occurred in 2023 highlight the continued deficit pumping of groundwater resources but did not result in any change to the cumulative effects assessment in this FEIS. While the next 100 years are demonstrated through the cumulative effects modeling to be manageable without exhausting groundwater supplies in the East Salt River valley, ultimately, long-term use of groundwater may become unsustainable, even without considering the growth of the Superstition Vistas development.

4.3.4.2 Future Meteorological Trends

For the DEIS, we did not handle future meteorological trends as a cumulative effect. Rather, in the face of changing guidance on how this topic should be handled during NEPA analysis, as we evaluated the issues to analyze gathered from project scoping, we chose the following approach:

- Conduct a quantitative assessment of greenhouse gas emissions of CO_2, methane, and nitrous oxide (see appendix E, Issue 8-3)
- Conduct an assessment using best available science of long-term trends in precipitation and temperature that may affect resources (see appendix E, Issue 8-8)

The quantitative assessment of greenhouse gas emissions is found in section 3.6 of the FEIS.

Future Meteorological Scenario Used for NEPA Analysis

To address the effects of long-term trends in precipitation and temperature on individual resources, we started by compiling a consistent meteorological trend scenario for all resource specialists to use, making use of the best available literature and analyses for the anticipated effects of future meteorological trends (Dugan 2018). In the FEIS, these long-term trends are analyzed in the following places:

- Section 3.3, Soils, Vegetation, and Reclamation. This analysis focuses on the anticipated effect that long-term meteorological trends would have on the success of revegetation efforts after closure.
- Section 3.6, Air Quality. This analysis focuses on the basic trends anticipated and greenhouse gas emissions.

- Section 3.7.1, Groundwater Quantity and Groundwater-Dependent Ecosystems. This analysis focuses on the effect ongoing meteorological trends would have on the hydrologic water balance in the area, particularly changes to groundwater recharge.
- Section 3.7.3, Surface Water Quantity. This analysis focuses on the effect ongoing meteorological trends would have on the hydrologic water balance in the area, particularly changes in the amount and timing of surface water runoff.
- Section 3.10.2, Fuels and Fire Management. This analysis focuses on the changes in wildfire risk that result from changes in fuel load from vegetation changes, and the higher risk of damage in the aftermath of fires from more intense storms.

The long-term meteorological trends in temperature, precipitation amount, and precipitation timing and intensity would tend to exacerbate the resource impacts from the project. In a similar way, these trends would tend to exacerbate the cumulative impacts from reasonably foreseeable future actions that are described in this chapter.

The consistent outlook is that the American Southwest would see warmer and drier conditions. There is greater certainty with temperature changes. Average temperatures in Arizona have increased about 2°F in the past century (U.S. Environmental Protection Agency 2016). In the Lower Colorado River basin, the annual mean and minimum temperature have increased by 1.8°F to 3.6°F for the time period 1900–2002. Data suggest that spring minimum temperatures for the same time period have increased by 3.6°F to 7.2°F (Dugan 2018). Annual average temperatures are projected to rise by 5.5°F to 9.5°F by 2070–2099, with continued growth in global emissions (Melillo et al. 2014).

Anticipated impacts on precipitation are less certain, with some models suggesting more precipitation, and others suggesting less. There is general agreement that the timing and intensity of precipitation events (and drought) would change. Increased temperatures are expected to diminish the accumulation of snow and the availability of snowmelt, with the most substantial decreases in accumulation occurring in lower-elevation portions of the Colorado River basin, where cool-season temperatures are most sensitive to warming (Dugan 2018).

The common effect of these changes is that vegetation would become drier and more susceptible to drought and fire, and that water sources would experience greater stress. This in turn affects the terrestrial habitat and the hydrologic systems that support aquatic and riparian habitat. The increased risk of fire, and the detrimental and cascading effects of wildfires, can lead to further negative effects, which, while infrequent, can often be catastrophic. The long-term changes also make recovery from these incidents, as well as revegetation and reclamation efforts to be undertaken for the mine, less effective with a higher risk of failure.

Note that ongoing drought and long-term meteorological trends also have effects on water supplies; these effects are discussed elsewhere in chapter 4.

Recent Research on Future Meteorological Trends

Research and predictions about future meteorological trends have continued to evolve since the NEPA analysis for the Resolution Copper Project was conducted. Building on the information already presented above and in other sections of the EIS, this section summarizes key conclusions from the most recent meteorological data and projections included in the FEIS.

GENERAL PROGNOSIS FOR SOUTHWEST WATER

Recent reports note with medium to high confidence that droughts and earlier snowmelt runoff will increase water scarcity during the summer peak water demand period especially in regions with extensive irrigated agriculture, leading to economic losses and increased pressures on limited groundwater as a substitute for diminished surface water supplies. These reports also highlight with high confidence that heavy exploitation of limited water supplies and deteriorating freshwater management infrastructure in the Southwest will compound the effects of meteorological trends and increase the risk of negative impacts in the region.

RISING TEMPERATURES

A 2022 summary of the latest meteorological data and projections for Arizona from the National Oceanic and Atmospheric Administration’s National Centers for Environmental Information (Frankson and Kunkel 2022) shows temperatures in Arizona have increased by 2.5°F since 1900, with average temperatures and frequency of extreme heat expected to continue increasing throughout the twenty-first century. Current projections also confirm that the region will experience serious ongoing threats from extended drought, while summer monsoon rainfall will remain highly variable and difficult to predict. Current assessments confirm that communities that rely on snowpack to supply their water may be especially vulnerable, as late-season snowpack accumulation declines due to increasing winter temperatures.

CONTINUED UNPREDICTABLE MONSOON RAINFALL

In southern Arizona, monsoon rains are highly unpredictable and can have negative impacts at either extreme. For example, “on September 8, 2014, extremely heavy monsoon rain associated with a decaying eastern Pacific hurricane caused significant damage and flooding around the Phoenix area. The record for single-day rainfall was broken, with several stations reporting more than 4 inches” (p. 4 in Frankson and Kunkel (2022)). At the other extreme, “the 2020 monsoon season was the driest on record, with only 1.5 inches of precipitation, well below the previous record low of 2.8 inches in 2009” (p. 4 in Frankson and Kunkel (2022)).

UNCHANGED FREQUENCY AND INTENSITY OF RAINFALL EVENTS

While many areas of the United States have already begun experiencing an increase in the frequency of extreme rainfall events, this trend has not been observed in Arizona and other southwestern states. The number of 1-inch extreme precipitation events in Arizona continues to be variable and has been near to below normal, since the 1990s, with the exception of the 2010–2014 period (Frankson and Kunkel 2022).

INCREASING SEASONAL AND LONG-TERM WATER SHORTAGES

Arizona is on the northern fringe of an area of projected decreases in spring precipitation over Mexico and Central America, indicating a risk of reduced spring precipitation. However, overall annual precipitation trends remain uncertain for Arizona (Frankson and Kunkel 2022).

Higher spring temperatures are expected to raise the snow line and make precipitation more likely to fall as rain rather than snow. The resulting reduced snowpack and earlier melting of snowpack is expected to reduce water resources available for irrigation during the summer. These impacts will be particularly pronounced at lower elevations in the mountains where snowpack is already unreliable (Frankson and Kunkel 2022).

Whether or not overall annual precipitation decreases, droughts are expected to become more intense during the cool season due to increasing temperatures resulting in increased evaporation. Increased temperature and evaporation will further reduce streamflow, soil moisture, and water supplies. Increasingly frequent droughts will result in more frequent dust storms and risk of very large wildfires (Frankson and Kunkel 2022).

Assessment of Future Meteorological Trends in Groundwater Models

There are limited studies that provide quantitative assessment of the linkages between future meteorological projections and estimated groundwater recharge, particularly at the regional level. A review of aquifer studies across the West showed average declines of 10 to 20 percent in total recharge across the southern aquifers (Meixner et al. 2016).

Groundwater recharge can be understood in four general categories: "diffuse" recharge that results when precipitation infiltrates over a large area; "focused" recharge, from streams and runoff; "mountain system" recharge from mountains and mountain streams; and "irrigation" recharge resulting from irrigation-based agriculture (Bolin et al. 2010). Meteorological trends are especially likely to reduce mountain system recharge due to decreased snowpack and mountain streamflow, particularly at lower elevations. For desert systems like the Desert Wellfield pumping in the East Salt River valley, this is likely not a large change in the overall groundwater system dynamics. For example, the Salt River valley model developed by the ADWR estimates roughly 2 percent of all recharge to the aquifer comes from mountain system recharge, with most recharge coming from agricultural recharge (Freihoefer et al. 2009). In contrast, for the mine site groundwater model, it is possible that all recharge components could be affected in some way by future meteorological trends.

The effect of future meteorological trends on the groundwater model was a topic discussed by the Groundwater Modeling Workgroup during the NEPA analysis (Morey 2018e). The primary impact of these trends to the groundwater model would be through a decrease in precipitation recharging the aquifer, or an increase in loss of water through evaporation or transpiration from higher temperatures.

In the mine site groundwater model, gain of water to the aquifer by recharge of precipitation generally occurs along stream channels, as does loss of water to the aquifer by evapotranspiration from riparian vegetation. These two influences are both combined into a single recharge input to the groundwater model. In order to understand the effects of future meteorological trends on the mine site groundwater model outcomes, the Forest Service (through the forum of the Groundwater Modeling Workgroup) requested a sensitivity analysis that adjusted recharge in the model by ±50 percent.

The purpose of this sensitivity analysis was to understand how important meteorological changes are to the outcomes of the model. Results were provided in the form of maps showing the areal extent of the 10-foot drawdown contour under each scenario and hydrographs for each groundwater-dependent ecosystem analyzed in the EIS (Meza-Cuadra et al. 2018c). Results of the recharge (±50 percent recharge) sensitivity analyses are shown in table 4.3.4-1, comparing the base case results to the sensitivity modeling run results.

Table 4.3.4-1. Results of assessment of future meteorological trends for mine site groundwater model

GDE	Base Case Drawdown (No Action) (feet)	Base Case Drawdown (Proposed Action) (feet)	Additional Drawdown at 50% Less Recharge at High Elevations (Sensitivity Run #85) (feet)	Additional Drawdown at 50% Less Recharge at Low Elevations (Sensitivity Run #87) (feet)	Change in Conclusions Resulting from Future Meteorological Trends (see EIS table 3.7.1-3 for base case conclusions)
Queen Creek and tributaries					
Queen Creek – Flowing reach from km 17.39 to 15.55	0.8	6.3	0.1	1.2	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.

GDE	Base Case Drawdown (No Action) (feet)	Base Case Drawdown (Proposed Action) (feet)	Additional Drawdown at 50% Less Recharge at High Elevations (Sensitivity Run #85) (feet)	Additional Drawdown at 50% Less Recharge at Low Elevations (Sensitivity Run #87) (feet)	Change in Conclusions Resulting from Future Meteorological Trends (see EIS table 3.7.1-3 for base case conclusions)
Arnett Creek (from Blue Spring to confluence with Queen Creek) AC 12.49 AC 4.54	1.1 0.1	2.3 0.2	0.0 0.0	1.0 0.6	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Telegraph Canyon (near confluence with Arnett Creek)	1.1	2.7	0.4	1.2	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Devil's Canyon and springs along channel					
Middle Devil's Canyon (from km 9.3 to km 6.1, including springs DC8.2W, DC6.6W, and DC6.1E) DC6.1E DC6.6W DC8.2W DC8.8W DC8.1C	0.1 1.0 −0.2 −0.1 −0.1	2.8 10.8 4.3 3.1 3.2	0.3 0.8 0.0 1.5 0.2	0.0 0.0 0.0 0.0 0.0	With the exception of DC6.6W, remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case. For DC6.6W, conclusion for base case was: "Additional drawdown due to block caving is anticipated in spring DC-6.6W with the base case model and most sensitivity modeling runs." Future meteorological trend scenario increases drawdown from 10.8 to 11.6, but reaches same conclusions as base case.
Lower Devil's Canyon (from km 6.1 to confluence with Mineral Creek, including spring DC4.1E) 5.5C 4.1E	−0.3 −0.1	2.8 0.5	0.3 −0.1	0.0 0.0	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Mineral Creek and springs along channel					
Mineral Creek (from Government Spring (km 8.7) to confluence with Devil's Canyon, including springs MC8.4C and MC3.4W (Wet Leg Spring)) MC6.9 Lower Mineral	−0.1 0.0	1.3 0.4	0.8 0.2	0.0 0.0	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Queen Creek Basin springs					
Bitter Spring	2.0	28.5	1.1	0.3	Remains 10–30 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Bored Spring	105.0	180.9	2.3	6.2	Remains >50 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Hidden Spring	90.7	90.7	1.3	4.9	Remains >50 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case

GDE	Base Case Drawdown (No Action) (feet)	Base Case Drawdown (Proposed Action) (feet)	Additional Drawdown at 50% Less Recharge at High Elevations (Sensitivity Run #85) (feet)	Additional Drawdown at 50% Less Recharge at Low Elevations (Sensitivity Run #87) (feet)	Change in Conclusions Resulting from Future Meteorological Trends (see EIS table 3.7.1-3 for base case conclusions)
Iberri Spring	0.1	0.2	0.0	0.0	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Kanes Spring	7.7	56.6	5.9	14.5	Remains >50 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case
McGinnel Mine Spring	18.0	22.7	−0.2	-3.4	Remains 10–30 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
McGinnel Spring	24.0	28.3	−0.3	0.6	Remains 10–30 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
No Name Spring	0.1	0.2	0.0	1.5	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Rock Horizontal Spring	1.3	2.0	0.0	0.0	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Walker Spring	27.1	40.9	0.5	4.2	Remains 30–50 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Water supply wells					
DHRES-16-753	3.6	21.7	0.4	1.6	Remains 10–30 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
Gallery Well	0	0.1	0.2	0.3	Remains <10 feet of drawdown. Future meteorological trend scenario reaches same conclusions as base case.
HRES-06	-0.7	9.7	5.0	0.1	Results change from <10 feet of drawdown under base case scenario to 10–30 feet of drawdown under Future meteorological trend scenario. However, because of the presence of sensitivity runs, the conclusions in table 3.7.1-3 already assumed impacts: “Additional drawdown due to block caving is anticipated for water supply wells in this area, except for those completed solely in alluvium or shallow fracture systems. Impacts could include loss of well capacity, the need to deepen wells, the need to modify pump equipment, or increased pumping costs. Applicant-committed remedy if impacts occur.” Future meteorological trend scenario reaches same conclusions as base case.

The anticipated impacts on precipitation, recharge, and evapotranspiration from continuing meteorological trends are described in section 3.7.1 and further detailed in Dugan (2018), but largely are not quantifiable. Though unquantifiable, the Groundwater Modeling Workgroup found that a ±50 change in recharge was sufficient to account for the effects of future meteorological trends on precipitation. Even under this substantial change, not a single conclusion changed for any GDEs or water supply wells.

The fundamental reason for this lack of change in conclusions is that precipitation/evapotranspiration are small components of the water budget, compared with the mine dewatering that will occur.

Future meteorological trends are anticipated to have profound impacts on the hydrologic cycle in Arizona. However, the impacts described in the groundwater model are largely influenced by groundwater withdrawals and the fundamental change in geologic structure caused by the block-caving. Changes driven by long-term meteorological trends that affect recharge and evapotranspiration have an effect, as shown in table 4.3.4-1, and exacerbate impacts caused by mine dewatering. However, these effects do not drive the model and therefore result in little change to the conclusions in the FEIS that are based on the results of the groundwater model.

Future Meteorological Trends and Ramifications for Potential Tailings Failure

Concerns have also been raised as to whether future meteorological trends has been adequately assessed in the design of the tailings storage facility. Future meteorological trends are anticipated to lead to more extreme precipitation and flooding events, as well as changes in watershed conditions.

These type of extreme events are already encompassed in the assumptions and design parameters used for the tailings storage facility. With respect to water, many design parameters are based on "return periods." These are probabilities of a given storm event or flood event occurring. These probabilities are derived from the historic record of actual precipitation events and flood events. For example, a return period of 100 years (a 100-year storm event), has a 1 percent probability of occurring for any given storm event.

The current meteorological trend research does not predict exactly how much bigger storm or flood events could become. It is not possible to predict now exactly what a 100-year storm event might look like 50 years in the future given the ongoing meteorological trends. In lieu of this understanding of how storms could perform in the future, we can look instead at more extreme events under current conditions, such as the 1,000-year event. A 1,000-year event has a 0.1 percent (one-tenth of 1 percent) probability of occurring, given the historic record.

The design of the tailings storage facility under all action alternatives already incorporates events even more extreme than the 1,000-year event (Patterson 2022). Each impoundment is designed to safely store, at a minimum, the 72-hour probable maximum flood. The probable maximum flood is defined as the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in any particular drainage. The probable maximum flood has a probability even less than that of a 10,000-year event, which has a 0.01 percent (one-hundredth of 1 percent) probability of occurring.

Since the probabilities of given floods are based on the historic record, they reflect the historic conditions of the watershed when the flood occurred. However, future meteorological trends can alter these conditions. For example, higher temperatures and lower precipitation are anticipated to lead to more frequent, and more severe, wildfire. Fire can fundamentally change how precipitation runs off a watershed by removing vegetation and even causing hydrophobic (water-repelling) soil conditions. With respect to the tailings storage facilities, the storage calculations assume that the upstream contributing area has a runoff coefficient of 1.0. This means that every drop of water falling on this area during a storm event will leave the watershed as runoff, with no infiltration to soil or groundwater. This replicates the worst conditions that could occur on a watershed due to fire. It also replicates less catastrophic situations, such as when an area has received substantial previous rainfall and soil is already saturated, leading to greater runoff.

Each tailings storage facility also has stormwater control structures designed to route upstream flow around the facility. These structures are designed for a 24-hour, 100-year storm. This relatively small-magnitude design event suggests these diversion structures may be undersized for future extreme events. The tailings storage facility designs take this into account. As an additional safety factor built into the design, the tailings storage designs assume that these diversion structures would fail during the extreme design flood event (72-hour probable maximum flood), resulting in all upstream flow instead entering the tailings storage facility. The design of the tailings storage facility can safely store all the water resulting from this scenario.

Chapter 5. Consulted Parties

5.1 Introduction

This chapter provides an overview of the consultation and coordination conducted to date between the Forest Service and Federal, State, and local agencies, Tribes, and the public. We expanded this chapter to include consultation, agency permitting activities, and additional comments and outreach activities conducted after publication of the DEIS, including cooperating agency review, Tribal consultation, the EIS public review, comment analysis, and agency response processes.

5.2 Notice of Intent and Scoping

An NOI announcing the Tonto National Forest's intent to prepare an EIS was published in the Federal Register on March 18, 2016. The notice announced the preparation of this EIS as well as opportunities for public involvement, including scoping meetings. Five public scoping meetings subsequently were held at the locations and on the dates shown in table 1.6.1-1 in chapter 1. The official scoping and public commenting period lasted 120 days, from March 18 to July 18, 2016.

Members of the public were afforded several methods for providing comments during the scoping period. These included multiple comment stations with comment forms or providing oral comments to a court reporter at the scoping meetings, or the opportunity to send emails to comments@resolutionmineeis.us. Additionally, interested parties could submit letters via U.S. mail to the Tonto National Forest, or drop off written comments in person at the Tonto National Forest Supervisor's Office located at 2324 East McDowell Road, Phoenix, Arizona 85006, during normal business hours. We received 133,653 comments during the project scoping period.

A comprehensive scoping report summarizing the public meeting and comment process and providing a detailed synopsis of the scoping comments received was released in March 2017. The scoping report (U.S. Forest Service 2017i) is available on the project website: www.ResolutionMineEIS.us. This website was created to provide access to the project schedule, updates, project and alternative information, and baseline data and reports. The website has been active since 2016.

5.3 Notice of Availability and DEIS Comment Period

A Notice of Availability (NOA) announcing the release of the Resolution Copper Project and Land Exchange DEIS was published in the Federal Register on August 9, 2019. The NOA disclosed the online location to download the DEIS, along with opportunities for public involvement, including public comment meetings. Other outreach and means of notification included 15,200+ postal mail and 23,000+ emails to individuals on the project mailing list, social media posts, news releases, website announcements, 16 newspaper notices (in English and Spanish), and posters physically displayed at 37 various local bulletin boards and areas within the project vicinity. Six public meetings were held at the locations and on the dates shown in table 5.3-1. The meeting format allowed for an open house with posters and handouts. Staff were on hand to answer questions, and a court reporter and comment table were available for receipt of verbal or written comments. Meetings also included a recorded presentation and a facilitated hearing for those wishing to provide verbal testimony.

Table 5.3-1. DEIS public meeting locations, dates, and attendance numbers

Meeting Location	Date	Number of People Who Signed In
Superior, Arizona – Superior High School	September 10, 2019	107

Meeting Location	Date	Number of People Who Signed In
San Tan, Arizona – Central Arizona College	September 12, 2019	41
Kearny, Arizona – Ray Elementary School	September 17, 2019	29
Globe, Arizona – High Desert Middle School	September 19, 2019	60
Queen Valley, Arizona – Recreation Center	October 8, 2019	118
Tempe, Arizona – Hotel Tempe, Phoenix Airport Inn	October 10, 2019	156

Comments were received via U.S. mail, hand delivery to a public meeting or Forest Service office, verbal testimony recorded at a public meeting, email, or webform. The 90-day public comment period ended on November 7, 2019. We extended the comment period for Tribes to 135 days, which ended on December 22, 2019. A seventh meeting, with the San Carlos Apache Tribe, took place on November 22, 2019. Over 29,000 submittals were received, analyzed, and responded to by the Tonto National Forest on the DEIS. Comments were reviewed and categorized by topic. Responses to comments are shown in appendix R. The FEIS was revised based on comments received.

Revisions and updates since the DEIS and since the January 2021 Rescinded FEIS are summarized in section 1.1.2, and in each resource section of chapter 3.

5.4 Project Mailing List

Early in the project NEPA process, an initial mailing list identifying individuals (as points of contact) in organizations, agencies, and interest groups was compiled from Tonto National Forest records of interested parties and from organizations and individuals who submitted comments related to the “Final Environmental Assessment: Resolution Copper Mining Baseline Hydrological and Geotechnical Data Gathering Activities Plan of Operations” (U.S. Forest Service 2016a). Those interested or who had commented on the “Apache Leap Special Management Area Management Plan Environmental Assessment” (U.S. Forest Service 2017b) are also included in this mailing list. After alternatives were developed for detailed analysis, the mailing list was once again updated to include those landowners or stakeholders who would be adjacent to the alternative tailings locations or associated corridors.

The goal of the mailing list is to enable broad distribution of information to local and regional businesses, organizations, and interested individuals about public meetings, comment period deadlines, and other key project milestones.

A mailing list was maintained throughout the project and includes interested parties, adjacent landowners, and those who have commented upon the project. At the San Tan Valley public meeting, local residents expressed concern they were not aware of the project. This led us to expand our outreach and notification efforts to include landowners beyond those immediately adjacent to the project. Previous efforts included adjacent landowners up to 1 mile from the project; after the San Tan Valley public meeting, we added landowners in the San Tan Valley up to 10 miles from the proposed project.

5.5 Tribal Consultation (Government-to-Government)

Federal agencies are required to consult with American Indian Tribes as part of the ACHP regulations, Protection of Historic Properties (36 CFR 800), implementing Section 106 of the NHPA. Accordingly, the NHPA outlines when Federal agencies must consult with Tribes and the issues and other factors this consultation must address. Pursuant to Executive Order 13175, executive departments and agencies are charged with engaging in regular and meaningful consultation and collaboration with Tribal officials in the development of Federal policies that have Tribal implications and are responsible for strengthening the government-to-government relationship between the United States and Indian Tribes. In addition, PL

113-291 requires consultation with affected Indian Tribes concerning issues of concern related to the land exchange.

The Tonto National Forest has been conducting Tribal consultation related to various Resolution Copper projects, the land exchange, and the Apache Leap SMA environmental assessment. This consultation has included formal and informal meetings, correspondence, sharing information, site visits, and documentation of Tribal comments and concerns by the Forest Service. Consultations are ongoing and will continue through the end of the project. The following Tribes are involved in the consultation process:

- Fort McDowell Yavapai Nation
- Gila River Indian Community
- Hopi Tribe
- Mescalero Apache Tribe
- Pueblo of Zuni
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tonto Apache Tribe
- White Mountain Apache Tribe
- Yavapai-Apache Nation
- Yavapai-Prescott Indian Tribe

Additional Tribes were included in consultation with the introduction of the Peg Leg alternative location. These Tribes, included at the BLM's request, are as follows:

- Ak-Chin Indian Community
- Fort Sill Apache Tribe
- Pascua Yaqui Tribe
- Tohono O'odham Nation

Consultation records include formal and informal communications between the Tonto National Forest and the Tribes. A listing of communications occurring from project initiation through FEIS publication is documented in appendix S.

As noted above, one reason for the March 2021 withdrawal of the NOA and rescinding of the January 2021 FEIS was to allow the Forest Service to re-engage with consulting Tribes to fully understand their concerns. On September 20, 2021, the Forest Service notified Tribes that the Forest Service would reinitiate Tribal consultation. This was followed by a Tribal listening session on October 19, 2021, and subsequent consultation and staff meetings thereafter. The reinitiated Tribal consultation has informed the republished FEIS.

5.6 Section 106 Consultation

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties. Section 106 consultation involves multiple parties including the SHPO, affected

Tribes, and in some cases the direct participation of the ACHP. The ACHP began participating in the Resolution Copper Section 106 consultation process in December 2017.

The ultimate outcome of consultation is often a Memorandum of Agreement or Programmatic Agreement (depending on the complexity of the project). The agreement outlines the roles and responsibilities of parties, the procedure for identification and evaluation of historic properties, assessment for effects, and each party's responsibilities for resolving adverse effects from the project. The execution of the agreement evidences the agency official's compliance with Section 106. The agency official then must ensure that the undertaking is carried out in accordance with the agreement.

A PA was pursued and drafted during the Section 106 consultation process. The Rescinded FEIS included that PA (appendix O). All signatories, other than the ACHP, had signed the PA as of January 15, 2021. On February 11, 2021, ACHP notified the Forest Service that "ACHP believes that further consultation in this case would be unproductive and therefore, we are hereby terminating consultation pursuant to 36 CFR § 800.7(a)(4)." In accordance with 36 CFR 800.7(c)(4), the Secretary of Agriculture delivered a written response to the ACHP on April 17, 2025, and that response concluded the Section 106 process for this undertaking.

Since ACHP did not sign the PA, the PA was never executed. Therefore, mitigation measures identified in the PA and any others identified subsequently will now be implemented through the final ROD and special use permit for use of Forest Service lands, and through enforcement by other State and Federal agencies as well as third parties in separate agreements. Changes in enforcement of the measures described in the draft PA are further described in appendix J.

5.7 Section 7 – Endangered Species Consultation

The Forest Service requested formal consultation with the FWS under Section 7 of the Endangered Species Act with submittal of a Biological Assessment on June 26, 2020 (SWCA Environmental Consultants 2020a). The FWS accepted the Biological Assessment on July 9, 2020 (U.S. Fish and Wildlife Service 2020c), and initiated the consultation process. Consultation included the endangered Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*), the endangered Gila chub (*Gila intermedia*) and designated critical habitat, the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and designated critical habitat, the threatened northern Mexican gartersnake (*Thamnophis eques megalops*), and the threatened yellow-billed cuckoo (*Coccyzus americanus*) and proposed critical habitat. The FWS completed consultation with the issuance of a Biological Opinion. The Biological Opinion is included in appendix P of the FEIS.

Since January 2021, some changed conditions have occurred in the project area, such as the Telegraph Fire. The Biological Opinion (included as appendix P of the FEIS) includes specific triggers to be evaluated to determine whether reinitiation of Section 7 consultation is necessary. The Forest Service considered these changed conditions and determined that none of the triggers specified in the Biological Opinion have been met as of April 2025.

5.8 Tonto National Forest Tribal Monitor Cultural Resources Program and Emory Oak Restoration Studies

5.8.1 Tribal Monitor Program

As a result of input received during ongoing consultation between the Tonto National Forest and participating Tribes, the Tonto National Forest agreed to initiate, and Resolution Copper agreed to fund, a unique program that would employ Tribal members as auxiliary specialists to assist cultural resources staff and proponent-contracted archaeologists in surveying lands proposed for development as part of the project (i.e., lands proposed for development either as component facilities of the Resolution Copper GPO or as EIS alternative facility locations). In particular, the goal of this program is to provide the Tribes with greater opportunity to identify traditional ecological knowledge places (TEKPs) and other Tribal resources that are likely not to be recognized by non-Native archaeologists.

The Tonto National Forest conducted an initial Tribal Monitor training session from January 25 through February 2, 2018, and Tribal members began accompanying contracted cultural resource survey crews in March 2018. A second training of additional Tribal members was held between October 1 and October 10, 2018, and a third training was held between September 9 and September 16, 2019, to enable representation of additional Tribes in survey efforts. Seventy-seven Tribal members from 10 Tribes completed the training. The Tribal monitors surveyed each project component to ensure not only archaeological information, but Tribal perspectives are understood and documented. Tribal monitors also received training in plant identification to assist in inventorying natural resources within the project component areas.

The Tribal monitors have proven highly effective in identifying areas, resources, and sites of importance to the four cultural groups with ties to the area (Apache, O'odham, Puebloan, and Yavapai), including springs and seeps, plant and mineral resource collecting areas, and landscapes and landmarks. They also looked for, but did not find, caches of regalia and human remains. The Tribal monitors have not only surveyed new alternative tailings locations but also revisited the Near West tailings location and Oak Flat to evaluate the areas based on their Tribal perspectives.

5.8.2 Emory Oak Restoration

As noted in chapter 1, in December 2014, Congress passed the Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015 (known as the NDAA or PL 113-291), which included as Section 3003 the "Southeast Arizona Land Exchange and Conservation Act of 2011." Under this legislatively mandated land exchange, Resolution Copper would receive lands containing the Oak Flat campground east of the town of Superior, which is a known historical and current Emory oak acorn gathering location for the Apache and Yavapai.

As stated in the Southeast Arizona Land Exchange and Conservation Act, the Tonto National Forest and Resolution Copper are to address the concerns of Indian Tribes. Because the Tribes have expressed concern about the loss of the Emory oak grove at Oak Flat, Resolution Copper committed to funding Forest Service efforts to restore Emory oak at suitable locations elsewhere in Arizona, particularly within the "Four Forests Restoration Initiative" project areas, consisting of the Kaibab, Coconino, Apache-Sitgreaves, and Tonto National Forests. This effort has been designated the Emory Oak Collaborative Tribal Restoration Initiative.

The initial 5-year phase of the Emory oak restoration program, which began in fall 2018, laid out a series of goals for each year of the program. The following is a highly summarized listing of the detailed program goals that have been set forth and agreed upon by both the Forest Service and the participating Tribes. The program was initiated in fall 2018.

- The first year consisted of initial meetings and field visits between the Forest Service and Tribal representatives to identify existing areas that have been used to collect acorn; groves that could potentially be treated and developed for acorn harvesting; and selection of existing or potential oak grove sites for further study of their feasibility for restoration as future Tribal acorn-gathering locations. Research was initiated on previous and potential treatments to improve the health and regeneration of Emory oak.

- The second year, an Elders' Advisory Board was formed from the participating Tribes (San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, and Yavapai-Apache Nation) to guide the project and ensure that treatments are done in a culturally appropriate manner. Treatments are grove-specific and include removal of understory through mechanical mastication or hand-lopping, erecting large-animal exclusion fencing in some cases, transplanting oak seedlings, and other measures. The goal is to create conditions suitable for routine burning of the groves as was done traditionally by the Apache. Fifteen groves on the Tonto and Coconino National Forests were identified for treatment. NEPA analysis was completed on the groves, and Tribal Monitors conducted Section 106 cultural and biological surveys. Another three groves were identified on the White Mountain Apache reservation with the approval of the Tribal Council and Tribal forestry staff, and Tribal Monitors performed cultural and biological surveys of the groves.
- The third and fourth years (fall 2020 and fall 2021) continued the treatments identified for each grove, monitoring treated groves, and developing recommendations on the efficacy and any modifications of the treatments. In June 2020, one of the groves was burned by a forest fire before it had been treated; another was intentionally burned to prevent burning of an inholding. Both are providing opportunities to study the effects of different types of fire regimes on oak regeneration. Field visits were arranged for elders and youth to participate in traditional activities, including acorn harvesting.
- The fifth, sixth, and seventh years brought the completion of the initial treatments on the groves. The two first-treated groves will be retreated. Additional groves have been identified by each of the Apache Tribes as traditional collecting areas and will be evaluated for their suitability for inclusion in the project.

Annual reports by Northern Arizona University document the treatments and research results to date. Research on the charcoal canker that is spreading from southern Emory oak groves into central Arizona, and the effects of climate change are also under study. The goal of the Emory Oak Collaborative Tribal Restoration Initiative research is to inform best management practices that can be shared with other forests and agencies responsible for managing this culturally important resource.

5.9 Cooperating Agencies

Forest Service NEPA regulations require identification of lead, joint lead, or cooperating agencies (36 CFR 220.5(b)(3)). A cooperating agency is any Federal agency (other than the lead agency) and any State or local agency or Indian Tribe with jurisdictional authority or special expertise with respect to any environmental impact involved in a proposal. The cooperating agencies that assisted in preparation of this EIS are listed and their respective jurisdictional authorities or areas of special expertise are described in chapter 1, section 1.6.4; for convenience, the nine participating agencies are also identified in a text box below. These agencies assisted with EIS preparation in a number of ways, including conducting or providing studies and inventories, reviewing baseline condition reports, identifying issues, assisting with the formulation of alternatives, and reviewing preliminary DEIS text and other EIS materials. Some cooperating agencies continued their involvement with technical resource workgroups that considered public comments on the DEIS and additional data used in FEIS analysis.

Not all of the cooperating agencies have participated in all aspects of the EIS preparation. Early in the cooperating agency process, each agency conferred with the Tonto National Forest and agreed to a carefully defined role and set of responsibilities in relation to the Resolution Copper Project and Land Exchange that aligned with that agency's unique jurisdictional authority or area(s) of special expertise. Individualized Memoranda of Understanding defining these roles and responsibilities were thereafter signed by representatives of both the Forest Service and of each of the agencies listed in the text box.

Cooperating Agencies for the Resolution Copper Project and Land Exchange EIS

- Arizona Department of Environmental Quality
- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Arizona State Land Department
- Arizona State Mine Inspector
- Bureau of Land Management
- Pinal County Air Quality Control District
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency

The Tonto National Forest also engaged several other agencies, though those agencies ultimately did not become cooperating agencies or participate in the preparation of the EIS. The NEPA team had sited early versions of the Peg Leg alternative on lands along the Gila River that previously had been withdrawn on behalf of the Bureau of Reclamation for potential future water projects. Ultimately, the Peg Leg alternative was resituated off of any parcels associated with the Bureau of Reclamation, but interim discussions were held with the Bureau of Reclamation to discuss the regulatory process and decision framework. The Bureau of Reclamation also was consulted regarding a separate NEPA process being undertaken for the reallocation of CAP NIA water contracts, including a possible allocation to Resolution Copper. The Tonto National Forest and Bureau of Reclamation determined that the NIA reallocation was already undergoing a separate NEPA analysis and did not need to be included in the proposed action for this EIS, although it is considered a reasonably foreseeable future action and has been considered for cumulative effects.

The Tonto National Forest engaged with the USGS early in the groundwater modeling process and discussed the potential for the USGS to be involved in various technical aspects of the project involving geological, geotechnical, or hydrologic analyses. Ultimately, the USGS declined involvement, though specialists attended early meetings of the Groundwater Modeling Workgroup. The San Carlos Apache Tribe also indicated interest in participating in the Groundwater Modeling Workgroup, and a representative attended a number of Groundwater Modeling Workgroup meetings.

5.10 Project Notifications to Other Federal, State, and County Agencies and Municipal Governments

In addition to project-related information provided to the nine cooperating agencies identified in section 5.9, each of the following Federal, State, County, and local governments and agencies has been and will continue to be provided with regular updates and other notifications regarding the project NEPA process.

5.10.1 Federal

- Advisory Council on Historic Preservation
- Bureau of Reclamation
- U.S. Fish and Wildlife Service

- U.S. House of Representatives
- U.S. Senate

5.10.2 State

- Arizona Department of Transportation
- Arizona Geological Survey
- Arizona Governor
- Arizona State Board of Regents
- Arizona State Parks (Arizona State Historic Preservation Office)

5.10.3 County

- Coconino County
- Gila County Board of Supervisors
- Gila County Planning and Zoning
- Graham County Board of Supervisors
- Maricopa County
- Pima County
- Pima County Board of Supervisors
- Pinal County Board of Supervisors
- Pinal County Public Works
- Santa Cruz County
- Yavapai County

5.10.4 Local

- Cave Creek Council
- City of Chandler
- City of Globe
- City of Mesa
- City of Phoenix
- Superior Police
- Superior Schools
- Town of Benson
- Town of Carefree
- Town of Hayden
- Town of Kearny

- Town of Mammoth
- Town of Miami
- Town of Paradise Valley
- Town of Patagonia
- Town of Payson
- Town of Queen Creek
- Town of Sierra Vista
- Town of Superior
- Town of Winkelman

5.10.5 Tribal

- Ak-Chin Indian Community
- Fort McDowell Yavapai Nation
- Fort Sill Apache Tribe
- Gila River Indian Community
- Hopi Tribe
- Mescalero Apache Tribe
- Pascua Yaqui Tribe
- Pueblo of Zuni
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tohono O'odham Nation
- Tonto Apache Tribe
- White Mountain Apache Tribe
- Yavapai-Apache Nation
- Yavapai-Prescott Indian Tribe

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Chapter 6. List of Preparers

6.1 List of Preparers

The Resolution Copper Project and Land Exchange EIS was prepared under the supervision of the Forest Service. The individuals who contributed to the preparation of this document are listed here by organization, along with their education, years of experience, and project role (tables 6.1.1-1 and 6.1.2-1).

6.1.1 Forest Service

Table 6.1.1-1. Forest Service personnel participating in the EIS

Name	Degree	Years of Experience	Project Role
Richard Adkins	Ph.D., Native American History, Western History, the Environment and Cultural Resource Management	36	Cultural Resources/Tribal Liaison
Lee Ann Atkinson	M.S., Geology-Geophysics	21	NEPA Coordinator – Minerals; Project Manager (2022)
Kelly Araiza	B.S., Environmental Science, Geology	19	Recreation
Grace Bombulum	M.S., Geology	10	Geology/Minerals
Allison Borchers	Ph.D., Economics	14	Socioeconomics/ Environmental Justice
Chris Crawford	B.S., Civil Engineering	32	Transportation/Noise
Edward Gazzetti	M.S., Geological Sciences	11	Hydrogeology
Joe Gurrieri	M.S., Geology	37	Hydrogeology
Margaret Hangan - retired	M.A., Anthropology	35	Cultural Resources
Benjamin “Chad” Harrold	M.S., Geology	14	Geology
Kristina Hill	M.A., Anthropology	24	Cultural Resources
Brandon Hollingshead	B.S., Environmental Studies	6	Recreation
Ana Ingstrom	M.S., Mining Engineering	11	Mining Engineering
Brad Johnson	Over 50 U.S. Forest Service training courses in Fuels and Fire Management	22	Fuels/Fire Management
Alex Mankin	M.S., Geology	12	Geology
Mark McEntarffer	B.S., Public Planning	25	Lands
Maria McGaha	M.S., Hazardous Waste Management, M.B.A., Business Administration	23	Lands
Chandler Mundy	B.S., Rangeland Resources	14	Rangeland Management
Kimberly Moore	M.S., Geology	2	Geology/Project Manager (2025-present)
Kelly Mott Lacroix	Ph.D., Arid Land Resource Sciences – Arid Land Hydrology	15	Hydrology/Riparian Ecology
Mary Lata	Ph.D., Geoscience	24	Fire Ecologist
Nanebah Nez-Lyndon	M.A., Anthropology	16	Tribal Liaison
Devin Quintana	B.S., Regional Development	21	Public Services Program Manager; Recreation
Mary Rasmussen - retired	M.S., Forest Ecology	35	Project Manager (2017–2022)

Name	Degree	Years of Experience	Project Role
Judd Sampson	B.S., Geological Science	13	Geology/Minerals Administration
Greg Schuster	M.S., Natural Resource Management	29	Recreation
Katherine Shaum	M.S., Anthropology	12	Cultural Resources
David Sheehan	M.A., Landscape Architecture	10	Scenery/Recreation
Timothy Stroope	Ph.D., Geoscience	15	Hydrogeology
Anne Thomas	M.S., Human Dimensions of Ecosystem Science and Management	17	NEPA Review Coordinator
Michelle Tom	Ph.D., Civil and Environmental Engineering	14	Project Manager (2023–2025); Transportation Engineering
Ron Turner	B.S., Sustainability, Parks and Protected Area Management	4	Trails/Wilderness
Drew Ullberg	M.S., Environmental Science	32	Wildlife/ESA/Vegetation and Ecology
Andrea “Jamie” Wages	B.S., Rangeland Resources	15	Rangeland Management
Peter Werner	M.S., Mining Engineering	39	Mine Engineering/Reclamation
Scott Williams	B.S., Environmental Studies and Fire Management	35	Air Quality
Tyna Yost	M.S., Plant Biology and Conservation	12	NEPA Coordinator

Source: Morey and Ritter (2016)

6.1.2 Third-Party NEPA Contractors

Table 6.1.2-1. Third-party NEPA contractor personnel participating in the EIS

Name	Degree	Years of Experience	Project Role
Victoria Amato (SWCA)	M.S., Forestry, emphasis Fire Ecology/ Habitat Management; M.S., Resource Management	16	Fire Management
Mandy Bengtson (SWCA)	Ph.D., Geoscience	18	Reclamation/Revegetation
Chris Bockey (SWCA)	B.L.A., Landscape Architecture	13	Visual Resources
Victoria Boyne (SWCA)	B.A., Sociology	15	Literature Cited/Project Record; Assistant Project Manager
Stacy Campbell (SWCA)	M.S., Wildlife Conservation and Management	22	Biology Specialist
Victoria Casteel (SWCA)	B.S., Environmental Water and Resource Economics	16	Hydrology
Terry Chute (SWCA)	A.S., Forest Technology	40	Senior Forest Service NEPA Advisor
Charles Coyle (SWCA) - retired	M.A., English	27	Deputy Project Manager
Scott Debauche (SWCA)	B.S., Urban Planning and Design	30	Cumulative Effects
Danielle Desruisseaux (SWCA)	B.A., Anthropology	36	Technical Editor
Meggan Dugan (SWCA)	M.A.S., Geographic Information Systems	7	GIS, Hazardous Materials, Socioeconomics
Sarah Epstein (SWCA)	B.S., Environmental Science	5	Reclamation/Revegetation
Erica Fraley (SWCA)	B.S., Biology	8	Biology Specialist
Aaron Gannon (SWCA)	B.S., Environmental Science	4	Environmental Planner

Name	Degree	Years of Experience	Project Role
Chris Garrett (SWCA)	B.S., Hydrology	27	Project Manager
Eleanor Gladding (SWCA)	M.S., Biology e. Herpetology	31	Wildlife/Botany
Jill Grams (SWCA)	M.L.A., Landscape Architecture, e. Environmental Planning	23	Scenery/Recreation
Suzanne Griset (SWCA)	Ph.D., Anthropology, e. North American Archaeology	42	Cultural Resources
Brynn Guthrie (SWCA)	B.S. Landscape Architecture	17	Scenery
Jeff Johnson (SWCA)	M.S., Plant Biology	16	Wildlife/Botany
Ella Kaufman (SWCA)	B.S., Environmental Science	4	Travel Management
Don Kelly (SWCA)	M.U.E.P., Urban and Environmental Planning, B.A., Anthropology	18	Socioeconomics/ Environmental Justice
Charles Kliche (SWCA)	Ph.D., Mining Engineering	48	Mine Engineering
Tyler Loomis (SWCA)	B.S., Ecology and Evolutionary Biology	8	Biology Specialist
Kristin Miller (SWCA)	B.S., Environmental Science	9	Project Assistant
Donna Morey (SWCA)	B.S., Urban Planning	14	Assistant Project Manager; Project Controller
Emily Newell (SWCA)	B.S., Environmental Science and Natural Restoration	4	Project Logistics
Heidi Orcutt-Gachiri (SWCA)	Ph.D., Linguistics and Anthropology	24	Technical Editor
Meg Perry (SWCA)	M.E.M., Ecosystem Science and Conservation	14	Cumulative Effects
Kimberly Proa (SWCA)	A.A., Anthropology	16	Publication Formatter
Kevin Rauhe (SWCA)	B.L.A., Landscape Architecture	12	Environmental Planner
Ryan Rausch (SWCA)	M.E.L.P., Environmental Law Policy and Conservation	17	Scenery/Recreation
DeAnne Rietz (SWCA) - retired	M.S., Watershed Management	19	Hydrology/Soils
Jonathan Rigg (SWCA)	M.A., Russian and Slavic Studies	11	Environmental Justice; Public Health and Safety; Socioeconomics
Steve Rinella (SWCA)	B.S., Forestry	39	Lands
Alexandra Shin (SWCA)	M.A.S., Environmental Policy and Management	11	Public Involvement/Forest Plan
Brad Sohm (SWCA)	B.S., Chemical Engineering, e. Environmental Engineering	18	Ecology/Climate Change
Michael Standart (SWCA)	B.A., Geography	11	GIS
Adrienne Tremblay (SWCA)	Ph.D., Anthropology	16	Cultural Resources
Kelcie Witzens (SWCA)	B.A., Creative Writing	5	Publication Formatter
Scott Woods (SWCA)	B.S., Geography: Environmental Planning and GIS, e. Landscape Arch/Urban Planning	27	GIS
Jennifer Wynn (SWCA)	M.P.P., Environmental Policy	10	Revegetation
Jamie Young (SWCA)	B.S., Biology	19	Wildlife/Botany
Doug Jeavons (BBC Research & Consulting)	M.A., Economics	32	Socioeconomics
Mike Verdone (BBC Research & Consulting)	Ph.D., Natural Resource and Environmental Economics	17	Socioeconomics

Name	Degree	Years of Experience	Project Role
Diana Cook-Garcia (BGC Engineering)	Ph.D., Geological Engineering	16	Mine Engineering
Robert “Nick” Enos (BGC Engineering)	M.Sc., Geosciences	31	Geology/Environmental Science
Gaston Gonzales (BGC Engineering)	M.S., Geomechanics	21	Geology/Geotechnical
Mike Henderson (BGC Engineering)	M.S., Civil Engineering	37	Mine Engineering
Derek Hrubes (BGC Engineering)	B.Sc., Civil Engineering	17	Alternatives Engineering Support
Amir Karami (BGC Engineering)	Ph.D., Rock Mechanics	24	Rock Mechanics
Elliott Matthews (BGC Engineering)	B.Sc., Geological Engineering	10	Alternatives Engineering Support
Troy Meyer (BGC Engineering)	B.S., Civil Engineering	27	Mine Engineering
Tony Monasterio (BGC Engineering)	B.S., Geological Engineering	11	Alternatives Engineering Support
Gabriele Walser (BGC Engineering)	Ph.D., Civil Engineering	34	Hydrology and Surface Water
Hamish Weatherly (BGC Engineering)	M.Sc., Geological Sciences	26	Hydrology/Soils
Mark Zellman (BGC Engineering)	M.Sc., Geographic Information Systems and Remote Sensing	23	Seismic Hazard/Geology
Nancy Ashton (DOWL)	Professional Development Classes	24	Engineering/Noise
Laurie Brandt (DOWL)	M.S., Remote Sensing	25	Minerals
Todd Cormier (DOWL)	B.S., Civil Engineering	28	Mine Engineering/ Transportation
Zaid Hussein (DOWL)	M.S., Civil Engineering	15	Noise/Transportation Engineer
Rudy Ing (DOWL)	M.B.A., Business Administration	35	Sr. Civil Engineer
Sara Nicolai (DOWL)	B.A., Civil Engineering	13	Mine Engineering/ Transportation
Sarah Patterson (DOWL)	M.S., Civil Engineering	12	Transportation/Traffic
Dean Durkee (Gannett-Fleming)	Ph.D., Geotechnical and Geoenvironmental Engineering	32	Failure Modes and Effects Analysis
Matthew Balven (Gannett-Fleming)	M.S., Civil Engineering	22	Failure Modes and Effects Analysis
Mark Williamson (Geochemical Solutions, LLC)	Ph.D., Geochemistry	31	Hydrology/Soils
Rex Bryan (GeoStat Systems LLC)	Ph.D., Mineral Economics	42	Geology
Joe Frank (HydroGeo, Inc.)	M.S., Geological Science	43	Hydrology/Soils
Fernando Fuentes Moccia (NCL)	Civil Mining Engineering	42	Mine Engineering
Deepak Malhotra (Resource Development Inc.)	Ph.D., Mineral Economics	46	Mine Engineering
Marty Rozelle (Rozelle Group)	Ph.D., Community Education and Management	38	Public Involvement
Bruce Macdonald (SLR International Corporation)	Ph.D., Atmospheric Science	45	Air Quality

Source: Morey and Ritter (2016)

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Chapter 8. Glossary; Acronyms and Abbreviations

8.1 Glossary

Acid-forming materials	Earth materials that contain sulfide minerals or other materials that, if exposed to air, water, or weathering processes, form acids that may create acid drainage (as in potentially acid generating or reactive rock).
Acid mine drainage	1. Drainage with a pH of 2.0 to 4.5 from mines and mine wastes. It results from the oxidation of sulfides exposed during mining, which produces sulfuric acid and sulfate salts. The acid dissolves minerals in the rocks, further degrading the quality of the drainage water. 2. Acidic run-off water from mine waste dumps and mill tailings ponds containing sulfide minerals. Also refers to groundwater pumped to surface from mines.
Alluvium (alluvial)	Loose or unconsolidated material, like clay, silt, sand, or cobbles, deposited as a result of water. Alluvium is found in varying thicknesses along stream channels and in geologic basins, and often contains groundwater.
Apex tunnel	An existing structure at the West Plant Site that diverts off-site flows from north of the site to the Silver King Wash west of the site.
Apron feeder	A metal conveyor (or conveyor with metal plates) operated to control the rate of delivery to a standard belt conveyor. The metal-plate construction allows the apron feeder to withstand the weight and force of rock material being dumped from a chute onto a bin.
Aquifer	A body of permeable sediment or rock that contains and can transmit groundwater.
Aquifer test	The controlled pumping of groundwater from a well or other structure, accompanied by measurements of changes in groundwater level in the aquifer, that is used to estimate the ability of the aquifer to transmit groundwater.
Artesian	Refers to an aquifer in which the groundwater is naturally pressurized because of an overlying impermeable rock or sediment layer. If the pressure is great enough, when a well penetrates the impermeable layer the water level in the well may rise to the ground surface, which is commonly known as an artesian or flowing well.
Bank storage	Water that infiltrates the ground and is stored in the bed and banks of a lake or river, usually during periods of high flow in response to precipitation events, and then later drains out and returns to the lake or river after during low-flow periods to provide base flow.
Base flow	The portion of flow in a stream that occurs consistently between precipitation events, fed by a groundwater aquifer or bank storage. The counterpart of base flow is storm flow or runoff.
Bedrock	Solid rock that underlies loose or unconsolidated material, such as alluvium.
Belt tilter	A mechanism on a belt conveyor that allows material to be discharged into a bin or silo.
Cave	Caving of the ore is induced by undercutting the ore zone, which removes its ability to support the overlying rock material. Fractures spread throughout the area to be extracted, causing it to collapse and form a cave underground, which propagates upward throughout the mining process.
Civilian Conservation Corps	The Civilian Conservation Corps (CCC) was a public work relief program that operated from 1933 to 1942 in the United States for unemployed, unmarried men. The CCC was a major part of President Franklin D. Roosevelt’s New Deal, which provided unskilled manual labor jobs related to the conservation and development of natural resources in rural lands owned by Federal, State, and local governments.
Copper Triangle	Area in Arizona between the towns of Superior, Globe/Miami, and Hayden/Winkelman that is the general location of more than 30 historical and active copper mines.
Crosscut	A passageway driven at an angle to the drifts of a mine. The crosscuts connect the parallel drifts.
Crushers	Machines that reduce large rocks into smaller rocks.
Cyclone tailings	Hydrocyclone classifiers (cyclones) would process both ore and tailings. The centrifugal force separates the tailings into both fines deposited into the tailings facility and sand which is used in embankment raises.
Dewatering	Since much of the underground mine lies below the groundwater table, in order to conduct mining operations groundwater must be removed from the aquifer by pumping water from shafts or wells.
Discharge	Water that flows out of or is lost from a groundwater system. Common sources of discharge are pumping from wells, and stream reaches that gain water from the aquifer with that water then flowing downstream in the stream channel.
Diurnal	A rhythm to each day; in biology, being active or open during the day.

Drawdown	The lowering of the groundwater level, usually due to the removal of groundwater by pumping.
Drift	A horizontal or nearly horizontal underground opening.
Dry	A change house for mine workers. Contains lockers and clothes baskets and is equipped with shower, toilets, and sinks.
East Plant Site	Current exploratory shaft sinking site, historic Magma Mine site, future mine site, and area impacted by block caving.
Entrainment	The capture of water within the pore space of a porous material, especially when applied to water that is contained in the pore spaces of tailings material.
Ephemeral	A water source that flows or has a presence of water only in response to precipitation events.
Equilibrium	Used in the context of a groundwater system or aquifer, the condition where groundwater inflows roughly equal groundwater outflows, leading to stable groundwater levels. For groundwater models, equilibrium is often expressed as the length of time needed for the groundwater system to come back to stable conditions after an imposed stress (like mining or pumping).
Evaporation, evapotranspiration	Evaporation is the conversion of liquid water into water vapor by the sun's heat, which is then lost to the atmosphere. Evapotranspiration is the combination of evaporation and water that is lost to the atmosphere after being used by vegetation.
Fault	In geology, a fault is a planar fracture or zone of fractures across which there has been substantial movement of the rocks on either side.
Fire intensity	Fire intensity refers to the rate at which a fire produces heat at the flaming front and should be expressed in terms of temperature or heat yield.
Fire severity	Fire severity is a measure of the physical change in an area caused by burning.
Flotation	Process of separating small particles of various materials by treatment with chemicals in water in order to make some particles adhere to air bubbles and rise to the surface for removal while others remain in the water.
Fracture	In geology, a crack or usually a network of cracks in a solid rock unit, that separates the rock and especially allows water to move through the rock unit.
Fracture limit	The fracture limit is the outer limit of any potential large-scale surface cracking (or fracturing) that consists of an area around the cave crater in which the ground surface could be broken with open tension cracks and rotational blocks.
Galloway	Temporary working platform suspended above the bottom of the shaft under construction, to support the ongoing drilling, blasting, and mucking.
Gangue	Commercially worthless material that surrounds, or is closely mixed with a wanted mineral in an ore deposit.
Geothermal	Referring to heat produced from the inside of the earth, often used when referring to anomalously hot groundwater encountered in an aquifer.
Graben	An elongated block of the earth's crust lying between at least two faults and displaced downward relative to the blocks on either side.
Grizzly	A coarse screening or scalping device that prevents oversized bulk material from entering a material transfer system, such as an ore pass or ore chute. A grizzly is typically constructed of rails, bars, or steel beams.
Groundwater-dependent ecosystem	Groundwater-dependent ecosystems are communities of plants, animals, and other organisms whose extent and life processes rely on access to or discharge of groundwater. In the EIS these are categorized as either springs or stream segments. Any aquatic habitat and riparian vegetation that may be present at these locations is assumed to be an integral part of the groundwater-dependent ecosystem.
Groundwater flux	The amount of groundwater flowing through an aquifer or groundwater system.
Groundwater gradient	The slope and direction of the groundwater table that determines where and how fast groundwater will flow.
Groundwater inflow	See "recharge".
Groundwater model	A computer simulation of a groundwater system, usually attempting to simulate the major inflows and outflows of water, and used to predict how the amount of water stored in the groundwater system, the inflows and outflows, and groundwater levels would change due to some new condition (like mining).
Groundwater model boundaries	The defined edges of a groundwater model, typically corresponding to some sort of real-world hydrologic boundary (such as a groundwater divide, a river, or an impermeable rock unit) that can be simulated with some certainty in the groundwater model.

Groundwater model calibration	The process by which the predictions of a groundwater model are compared to real-world, known measurements in order to judge how accurate the groundwater model is at simulating the real-world groundwater system. Typically calibration uses measurements of groundwater levels or surface flow.
Groundwater outflow	See "discharge".
Groundwater storage	The amount of water residing in a groundwater system or aquifer. When inflows/recharge exceed outflows/discharge, groundwater storage will increase, because more water resides in the aquifer than before. When outflows/discharge exceed inflows/recharge, groundwater storage will decrease, because less water resides in the aquifer than before.
Historic property	As defined in the implementing regulations of Section 106, 36 CFR 800.16(l), historic properties are any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP under one of four significance criteria: a) association with events that have made a significant contribution to the broad patterns of history; b) association with a significant person in the past; c) embodiment of the distinctive characteristics of a type, period, or method of construction, or represents the work of a master or possess high artistic values; d) the potential to yield information important about the past (National Park Service 1997).
Intermittent	A water source that has a consistent presence of water seasonally, but not throughout the entire year. Intermittent water sources may derive partially from a groundwater aquifer, or from bank storage. The term intermittent can be applied both to geography and time. For geography, this indicates that only some segments of a stream have persistent presence of water, while others do not. For time, this indicates that a given reach of a stream may have water during some seasons or years, but not continuously.
Loadout facility	A proposed facility where copper concentrate would be filtered to remove water and then sent to off-site smelters via rail cars or trucks.
Long-term storage credit	Under Arizona law, a groundwater accounting unit that is accrued by actively recharging water into the aquifer or by preventing groundwater from being pumped from the aquifer. Long-term storage credits allow a user to recover stored water at a later date, often at a different location within the same groundwater basin.
Low-flow	A seasonal condition of a stream when flow is at its lowest levels, but not fully dry. Low-flow conditions often occur in late spring/early summer.
Makeup water	Despite the numerous recycling loops and water reuse, the mining process loses a substantial amount of water, especially through evaporation. Makeup water is the fresh water fed back into the mine water supply in order to make up these losses.
MARRCO corridor	Magma Arizona Railroad Company railroad corridor that begins at the Union Pacific Line at Magma Junction and continues to the town of Superior. The corridor would be used for water pipelines, concentrate pipelines, power and pump stations.
MARRCO right-of-way	The existing easement through public and private property associated with the MARRCO railway.
Mineralization	The process or processes by which a mineral or minerals are introduced into a rock, resulting in a valuable or potentially valuable deposit. It is a general term, incorporating various types; e.g., fissure filling, impregnation, and replacement.
MODFLOW	A computerized groundwater flow model originally developed by the U.S. Geological Survey that is widely used for simulating groundwater conditions.
Mountain-front recharge	The movement of water that falls as precipitation, infiltrates in mountainous areas through fractures, and then moves underground from the mountains into aquifers in an adjacent basin. This also occurs at the margin of the mountains, where collected runoff from the mountains encounters basin sediments and then infiltrates into the ground.
New Magma Irrigation and Drainage District (NMIDD)	An irrigation and water conservation district located west of Phoenix, between Queen Creek and the Gila River. It encompasses 27,410 acres, of which 26,900 are irrigable.
Numerical groundwater model	A type of groundwater model in which the groundwater system is simulated by solving equations based on the real physics of groundwater flow. Mathematical equations are solved using computer code, usually in an iterative manner, and often for many separate individual components of the groundwater system.
Ore	The naturally occurring material from which a mineral or minerals of economic value can be extracted at a reasonable profit.
Panel caving	A high-volume underground mining technique. A variation of block caving, typically used on low-grade, massive ore bodies.

Perched aquifer	An aquifer that is located physically above the regional aquifer, typically where there is an impermeable layer of rock or sediment located at an elevation above the main water table/aquifer but below the land surface.
Perennial	A water source that has a continuous presence of water throughout the year, often indicating that the water source is derived at least in part from a groundwater aquifer.
Permeability	A measurement of the ease by which groundwater can move through geologic materials, such as a rock unit or alluvium.
Precision	The degree to which repeated measurements of the same condition are similar to each other. Decimal places are the most common example of precision: the value 0.0123 is more precise than the value 0.01. Precision is often used in conjunction with accuracy. Accuracy reflects how close measurements are to the real-world condition. Measurements may be very precise but still not accurate if they do not reflect the real-world condition.
Predictive groundwater model runs	After a groundwater model has been demonstrated to be adequately calibrated by accurately simulating real-world hydrologic conditions in the past or present, predictive groundwater model runs extend the model into the future to estimate future conditions of the groundwater system.
Recharge	Water that flows into or is added to a groundwater system. Common sources of recharge are precipitation that infiltrates into the aquifer, and stream reaches that lose water to the aquifer.
Riparian	The communities of vegetation that exist along the margin or bank of a stream, river, or spring. Riparian communities may have varying levels of reliance on water. Hydroriparian communities require consistent water. Mesoriparian communities thrive with consistent water but are also able to survive for some time without. Xeroriparian communities thrive solely on rainfall and runoff.
Runoff	Water that flows on the surface of the ground in a downstream direction, resulting from any rainfall or snowmelt that does not soak into the ground or evaporate.
Seepage	The slow draining of water over time from a porous material, usually under the force of gravity. Seepage in the EIS usually refers to water draining from the tailings storage facility over time.
Semi-autogenous grinding (SAG)	A type of grinding mill designed to break a solid material into smaller pieces. It is essentially autogenous but uses some balls to aid in grinding steel.
Semi-autonomous	Equipment with instrumentation and computer controls to be operated with minimal or no manual oversight.
Sensitive receptor	Those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur.
Sensitivity groundwater model runs	A series of groundwater model runs that systematically vary key modeling parameters in order to assess how important these variables are to the outcomes. Often used as one method to assess the uncertainty of a groundwater model.
Skip	A bucket used to hold broken ore and development rock that is hoisted from a mine via a shaft.
Slot raise	A shaft driven upward from a lower level to a higher level.
Slurry	Mixture of a fine-grained solid material—such as copper ore concentrate or tailings—and water.
Steady-state model	A groundwater model run that has no time component, and the model simply runs until all the inflows and outflows specified in the groundwater model reach a balance.
Store and release cover	A reclamation cover that minimizes infiltration into the underlying material by acting like a sponge to store water from precipitation events until it is evaporated or transpired by plants growing in the cover material.
Subsidence	The process by which underground excavation collapses and movement of material connects all the way to the surface where a depression or deformation in the land surface is formed.
Sulfide enrichment	Enrichment of a deposit by replacement of one sulfide by another of high value, as pyrite by chalcocite.
Tailings	The processed waste component that results from copper ore processing.
Tailings (PAG)	The tailings produced in the copper-molybdenum potentially acid generating (PAG) circuit.
Tailings (NPAG)	The tailings product that would be produced from rougher/non-potentially acid generating (NPAG) circuit.
Tailings corridor	The corridor that begins at the West Plant Site and ends at the tailings storage facility and is used for water and tailings pipelines and access.
Tailings storage facility	The final storage area for unrecoverable and uneconomic metals, minerals, chemicals, organics and process water.
Transient model	A groundwater model run that occurs over a specified period of time, with each time step using the model results from the previous time step as a starting point.

Waste rock	Valueless rock that must be fractured and removed from a mine to keep the mining scheme practical and gain access to ore.
Water budget	The description and quantification of all water inflows and outflows from a natural system like an aquifer, or from an artificial system like an industrial process, including any change in water storage within the system.
Water (CAP)	This water is the fresh makeup water that is drawn either directly from the Central Arizona Project (CAP) canal or through pumping of groundwater available through banking of CAP credits.
Water (effluent)	Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall.
Water (filtrate)	The water removed from the concentrate filtration process.
Water (mine)	Groundwater that accumulates in underground mine workings and must be pumped out in order to operate the mine.
Water (mine service)	Water used at the mine for the refrigeration and ventilation systems, dust suppression, washdown water, and direct cooling.
Water (potable)	Potable water is defined as “water that meets the standards for drinking purposes of the State of Arizona and those of the US Environmental Protection Agency’s National Primary Water Regulations.” This water is kept completely separate from the other waters, and is supplied by Arizona Water Company.
Water (process)	Water which comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product. The project creates this through milling, grinding, thickener overflows, and other mine processes. Other types of water that come into contact with process water by mixing into the process water pond or at the tailings distribution box are considered process water from that point forward. Process water is reused and recycled to the greatest extent possible within the mill area. Ore moisture is considered a process water due to its contact with raw materials.
Water (reclaim)	Decanted water pumped from a set of barges in the tailings storage facility to the process water pond. Includes tailings storage facility stormwater runoff and tailings storage facility seepage captured by seepage collection embankments.
Water (service)	Fresh water stored at the CAP water distribution tank, used in several ways at the concentrator complex. It is used for dust suppression and wash-down water, as well as for gland water.
Water (void)	The tailings consist of a matrix of solid waste material and water. This water, which fills the annular spaces between the solid particles, is called void water.
Watershed	A geographic area within which any precipitation that falls and becomes runoff will flow downstream to a single point (located at the outlet of the watershed).
West Plant Site	Current site of water treatment plant, historic Magma Mine concentrator and smelter, legacy tailings/waste rock, future site of concentrator.

8.2 Acronyms and Abbreviations

§	section
§§	sections
°C	degree(s) Celsius
°F	degree(s) Fahrenheit
|C|	absolute contrast threshold
ΔE	color contrast for gray terrain
μg/m^3	micrograms per cubic meter
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AEP	annual exceedance probability

af/yr	acre-feet per year
AGFD	Arizona Game and Fish Department
Ag pool	Agriculture Excess pool
AIRFA	American Indian Religious Freedom Act of 1978
ALRIS	Arizona Land Resources Information System
AMA	Active Management Area
amsl	above mean sea level
ANFO	ammonium nitrate-fuel oil
APE	area of potential effects
APP	Aquifer Protection Permit
APS	Arizona Public Service Company
ARPA	Archaeological Resources Protection Act of 1979
ARS	Arizona Revised Statutes
ASL	Average Sky Luminance
ASLD	Arizona State Land Department
ATV	all-terrain vehicle
AUM	animal unit month
AWQS	Arizona Numeric Aquifer Water Quality Standards
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technology
BGEPA	Bald and Golden Eagle Protection Act
BLM	U.S. Department of the Interior Bureau of Land Management
CAG	Central Arizona Governments
CAP	Central Arizona Project
CDP	census designated place
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CO2e	carbon dioxide equivalents
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
DAT	deposition analysis thresholds
dB	decibel(s)
dBA	A-weighted decibel(s)
DEIS	draft environmental impact statement
DSHA	deterministic seismic hazard analysis

EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ERU	Ecological Response Unit
ESA	Endangered Species Act
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
FMEA	failure modes and effects analysis
FONSI	Finding of No Significant Impact
forest plan	“Tonto National Forest Land Management Plan”
Forest Service	U.S. Department of Agriculture Forest Service
FR	Federal Register
FSH	Forest Service Handbook
FSM	Forest Service Manual
FWS	U.S. Department of the Interior Fish and Wildlife Service
FY	fiscal year
g/ha/year	grams per hectare per year
GDE	groundwater-dependent ecosystem
GIS	geographic information system
Global Industry Standard	Global Industry Standard on Tailings Management
GMU	Game Management Unit
GPO	General Plan of Operations
GTES	General Terrestrial Ecosystem Survey
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HDD	horizontal directional drilling
HDMS	Arizona Heritage Data Management System
HDPE	high-density polyethylene
HPTP	historic properties treatment plan
HUC	Hydrologic Unit Code
ICMM	International Council on Mining and Metals
ID	interdisciplinary
IMPLAN	Impact Analysis for Planning
INA	Irrigation Non-expansion Area

in/sec.	inches per second
InSAR	interferometry synthetic aperture radar
ISO	Insurance Services Office
ITRB	Independent Technical Review Board
kg TNTe	kilograms TNT equivalent
km	kilometer(s)
kmh	kilometers per hour
KOP	key observation point
kV	kilovolt(s)
L10	noise level exceeded 10 percent of the time
land exchange	Southeast Arizona Land Exchange
LCI	Lettis Consultants International
Ldn	day-night average sound level
LED	light-emitting diode
Leq	equivalent sound level
Leq(h)	hourly equivalent sound level
Lmax	maximum sound level
LiDAR	light detection and ranging
LOS	level of service
LOST	Legends of Superior Trails
m	meter(s)
M	magnitude
MA	Management Area
MAC	Mining Association of Canada
MARRCO	Magma Arizona Railroad Company
MBTA	Migratory Bird Treaty Act
Merrill Ranch	Merrill Ranch Master Planned Community Project
mg/L	milligram(s) per liter
MIBC	methyl isobutyl carbinol
Mining Law	General Mining Act of 1872
MIS	management indicator species
MM	Modified Mercalli
mph	mile(s) per hour
MPO	mine plan of operations
MSDS	Mojave-Sonoran Desert Scrub
MSHA	Mine Safety and Health Administration
Myd^3	million cubic yards
MW	megawatt(s)

N	nitrogen
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NDAA	Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015
NEPA	National Environmental Policy Act of 1969, as amended
NFMA	National Forest Management Act of 1976
NFS	National Forest System
NFS Road	National Forest System Road
NH_4	ammonium
NHPA	National Historic Preservation Act
NIA pool	Non-Indian Agricultural pool
NMIDD	New Magma Irrigation and Drainage District
NNP	net neutralizing potential
NO_2	nitrogen dioxide
NO_3	nitrate
NOx	nitrogen oxides
NOA	Notice of Availability
NOI	Notice of Intent
NPAG	non-potentially acid generating
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Properties
O_3	ozone
Oak Flat Federal Parcel	2,422-acre area of land involved in the Southeast Arizona Land Exchange
Oak Flat Withdrawal Area	760 acres of National Forest System land, including the Oak Flat campground, previously withdrawn from mineral entry
OHV	off-highway vehicle
PA	Programmatic Agreement
PAG	potentially acid generating
Pb	lead
PBRISD	Performance-Based Risk-Informed Safe Design
PCAQCD	Pinal County Air Quality Control District
PCE	primary constituent element
PILT	payments in lieu of taxes
PL	Public Law
$PM_{2.5}$	particulate matter 2.5 microns in diameter or smaller
PM_{10}	particulate matter 10 microns in diameter or smaller
ppm	part(s) per million
PPV	peak particle velocity
project	Resolution Copper Project and Land Exchange

PSD	prevention of significant deterioration
PSHA	probabilistic seismic hazard analysis
Resolution Copper	Resolution Copper Mining LLC
Resolution Copper Project	any operations on National Forest System land associated with a proposed large-scale underground mine
RFFA	reasonably foreseeable future action
RMS	root mean squared
ROD	record of decision
ROS	recreation opportunity spectrum
Rosemont	Rosemont Copper Company
RUG	recreation user group
S	sulfur
SCC	Species of Conservation Concern
SEP	Simplified Estimation Procedure
SERI	Species of Economic and Recreational Importance
SGCN	Species of Greatest Conservation Need
SHPO	Arizona State Historic Preservation Office
SIO	Scenic Integrity Objective
SIP	State Implementation Plan
SIPX	sodium isopropyl xanthate
SMA	Special Management Area
SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasures plan
SPLP	synthetic precipitate leaching procedure
SR	Arizona State Route
SRMA	Special Recreation Management Area
SRP	Salt River Project
SRV	Salt River valley
SSURGO	Soil Survey Geographic
Standard	Global Industry Standard on Tailings Management
SWCA	SWCA Environmental Consultants
SWPPP	stormwater pollution prevention plan
SWReGAP	Southwest Regional Gap Analysis Project
TCP	traditional cultural place
TDR	time domain reflectometer
TEK	cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment
TEKP	traditional ecological knowledge place

TENORM	technologically enhanced naturally occurring radioactive materials
THPO	Tribal Historic Preservation Officer
TKP	traditional knowledge place
TMDL	total maximum daily load
U.S.	United States
U.S. 60	U.S. Route 60
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Service
UTV	utility task vehicle
VdB	vibration decibel(s)
VOC	volatile organic compound
VQO	Visual Quality Objective
VRM	Visual Resource Management
WUI	wildland-urban interface

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Chapter 9. Index

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Appendix A. Section 3003 of Public Law 113-291

PL 113-291 Section 3003

Sec. 3003 Southeast Arizona Land Exchange and Conservation.

(a) PURPOSE. – The purpose of this section is to authorize, direct, facilitate, and expedite the exchange of land between Resolution Copper and the United States.

(b) DEFINITIONS. – In this section:

(1) APACHE LEAP. – The term “Apache Leap” means the approximately 807 acres of land depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Apache Leap” and dated March 2011.

(2) FEDERAL LAND. – The term “Federal land” means the approximately 2,422 acres of land located in Pinal County, Arizona, depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Federal Parcel-Oak Flat” and dated March 2011.

(3) INDIAN TRIBE. – The term “Indian tribe” has the meaning given the term in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b).

(4) NON-FEDERAL LAND. – The term “non-Federal land” means the parcels of land owned by Resolution Copper that are described in subsection (d)(1) and, if necessary to equalize the land exchange under subsection (c), subsection (c)(5)(B)(i)(I).

(5) OAK FLAT CAMPGROUND. – The term “Oak Flat Campground” means the approximately 50 acres of land comprising approximately 16 developed campsites depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-0ak Flat Campground” and dated March 2011.

(6) OAK FLAT WITHDRAWAL AREA. – The term “Oak Flat Withdrawal Area” means the approximately 760 acres of land depicted on the map entitled "Southeast Arizona Land Exchange and Conservation Act of 2011-0ak Flat Withdrawal Area” and dated March 2011.

(7) RESOLUTION COPPER. – The term “Resolution Copper” means Resolution Copper Mining, LLC, a Delaware limited liability company, including any successor, assign, affiliate, member, or joint venturer of Resolution Copper Mining, LLC.

(8) SECRETARY. – The term “Secretary” means Secretary of Agriculture.

(9) STATE. – The term “State” means the State of Arizona.

(10) TOWN. – The term “Town” means the incorporated town of Superior, Arizona.

(11) RESOLUTION MINE PLAN OF OPERATIONS. – The term “Resolution mine plan of operations” means the mine plan of operations submitted to the Secretary by Resolution Copper in November, 2013, including any amendments or supplements.

(c) LAND EXCHANGE. –

(1) IN GENERAL. – Subject to the provisions of this section, if Resolution Copper offers to convey to the United States all right, title, and interest of Resolution Copper in and to the non-Federal land, the Secretary is authorized and directed to convey to Resolution Copper, all right, title, and interest of the United States in and to the Federal land.

(2) CONDITIONS ON ACCEPTANCE. – Title to any non-Federal land conveyed by Resolution Copper to the United States under this section shall be in a form that-

A. is acceptable to the Secretary, for land to be administered by the Forest Service and the Secretary of the Interior, for land to be administered by the Bureau of Land Management; and

B. conforms to the title approval standards of the Attorney General of the United States applicable to land acquisitions by the Federal Government.

(3) CONSULTATION WITH INDIAN TRIBES. –

A. IN GENERAL. – The Secretary shall engage government-to-government consultation with affected Indian Tribes concerning issues of concern to the affected Indian tribes related to the land exchange.

B. IMPLEMENTATION. – Following the consultations under paragraph (A), the Secretary shall consult with Resolution Copper and seek to find mutually acceptable measures to-

i. address the concerns of the affected Indian tribes; and

ii. minimize adverse effects on the affected Indian tribes resulting from mining and related activities on the Federal land conveyed to Resolution Copper under this section.

(4) APPRAISALS. –

A. IN GENERAL. – As soon as practicable after the date of enactment of this Act, the Secretary and Resolution Copper shall select an appraiser to conduct appraisals of the Federal land and non-Federal land in compliance with the requirements of section 254.9 of title 36, Code of Federal Regulations.

B. REQUIREMENTS. –

i. IN GENERAL. – Except as provided in clause (ii), an appraisal prepared under this paragraph shall be conducted in accordance with national recognized appraisal standards, including –

I. the Uniform Appraisals Standards for Federal Land Acquisitions; and

II. the Uniform Standards of Professional Appraisal Practice.

ii. FINAL APPRAISED VALUE. – After the final appraised values of the Federal land and non-Federal land are determined and approved by the Secretary, Secretary shall not be required to reappraise or update the final appraised value –

I. for a period of 3 years beginning on the date of the approval by the Secretary of the final appraised value; or

II. at all, in accordance with section 254.14 of title 36, Code of Federal Regulations (or a successor regulation), after an exchange agreement is entered into by Resolution Copper and the Secretary.

iii. IMPROVEMENTS. – Any improvements made by Resolution Copper prior to entering an exchange agreement shall not be included in the appraised value of the Federal land.

iv. PUBLIC REVIEW. – Before consummating the land exchange under this section, the Secretary shall make the appraisals of the land to be exchange (or a summary thereof) available for public review.

C. APPRAISAL INFORMATON. – The appraisal prepared under this paragraph shall include a detailed income capitalization approach analysis of the market value of the Federal land which may be utilized, as appropriate, to determine the value of the Federal land, and shall be the basis for calculation of any payment under subsection (e).

(5) EQUAL VALUE LAND EXCHANGE. –

A. IN GENERAL. – The value of the Federal land and non-Federal land to be exchanged under this section shall be equal or shall be equalized in accordance with this paragraph.

B. SURPLUS OF FEDERAL LAND VALUE. –

i. IN GENERAL. – If the final appraised value of the Federal land exceeds the value of the non-Federal land, Resolution Copper shall –

I. convey additional non-Federal land in the State to the Secretary or the Secretary of the Interior, consistent with the requirements of this section and subject to the approval of the applicable Secretary;

II. make a cash payment to the United States; or

III. use a combination of the methods described in subclauses (I) and (II), as agreed to by Resolution Copper, the Secretary, and the Secretary of the Interior.

ii. AMOUNT OF PAYMENT. – The Secretary may accept a payment in excess of 25 percent of the total value of the land or interests conveyed, notwithstanding section 206(b) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1716(b)).

iii. DISPOSITION AND USE OF PROCEEDS. – Any amounts received by the United States under this subparagraph shall be deposited in the fund established under Public Law 90-171 (commonly known as the "Sisk Act" 16 U.S.C. 484a) and shall be made available to the Secretary for the acquisition of land or interests in land in Region 3 of the Forest Service.

C. SURPLUS OF NON-FEDERAL LAND. – If the final appraised value of the non-Federal land exceeds the value of the Federal land –

i. the United States shall not make a payment to Resolution Copper to equalize the value; and

ii. except as provided in subsection (h), the surplus value of the non-Federal land shall be considered to be a donation by Resolution Copper to the United States.

(6) OAK FLAT WITHDRAWAL AREA. –

A. PERMITS. – Subject to the provisions of this paragraph and notwithstanding any withdrawal of the Oak Flat Withdrawal Area from the mining, mineral leasing, or public land laws, the Secretary, upon enactment of this Act, shall issue to Resolution Copper-

i. if so requested by Resolution Copper, within 30 days of such request, a special use permit to carry out mineral exploration activities under the Oak Flat Withdrawal Area from existing drill pads located outside the Area, if the activities would not disturb the surface of the Area; and

ii. if so requested by Resolution Copper, within 90 days of such request, a special use permit to carry out mineral exploration activities within the Oak Flat Withdrawal Area (but not within the Oak Flat Campground), if the activities are conducted from a single exploratory drill pad which is located to reasonably minimize visual and noise impacts on the Campground.

B. CONDITIONS. – Any activities undertaken in accordance with this paragraph shall be subject to such reason- able terms and conditions as the Secretary may require.

C. TERMINATION. – The authorization for Resolution Copper to undertake mineral exploration activities under this paragraph shall remain in effect until the Oak Flat Withdrawal Area land is conveyed to Resolution Copper in accordance with this section.

(7) COSTS. – As a condition of the land exchange under this section, Resolution Copper shall agree to pay, without compensation, all costs that are –

A. associated with the land exchange and any environ- mental review document under paragraph (9); and

B. agreed to by the Secretary.

(8) USE OF FEDERAL LAND. – The Federal land to be conveyed to Resolution Copper under this section shall be available to Resolution Copper for mining and related activities subject to and in accordance with applicable Federal, State, and local laws pertaining to mining and related activities on land in private ownership.

(9) ENVIRONMENTAL COMPLIANCE. –

A. IN GENERAL. – Except as otherwise provided in this section, the Secretary shall carry out the land exchange in accordance with the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.).

B. ENVIRONMENTAL ANALYSIS. – Prior to conveying Federal land under this section, the Secretary shall prepare a single environmental impact statement under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), which shall be used as the basis for all decisions under Federal law related to the proposed mine and the Resolution mine plan of operations and any related major Federal actions significantly affecting the quality of the human environment, including the granting of any permits, rights-of-way, or approvals for the construction of associated power, water, transportation, processing, tailings, waste disposal, or other ancillary facilities.

C. IMPACTS ON CULTURAL AND ARCHAEOLOGICAL RESOURCES. – The environmental impact statement prepared under subparagraph (b) shall –

i. assess the effects of the mining and related activities on the Federal land conveyed to Resolution Copper under this section on the cultural and archeological resources that may be located on the Federal land; and

ii. identify measures that may be taken, to the extent practicable, to minimize potential adverse impacts on those resources, if any.

D. EFFECT. – Nothing in this paragraph precludes the Secretary from using separate environmental review documents prepared in accordance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) or other applicable laws for exploration or other activities not involving –

i. the land exchange; or

ii. the extraction of minerals in commercial quantities by Resolution Copper on or under the Federal land.

(10) TITLE TRANSER. – Not later than 60 days after the date of publication of the final environmental impact statement, the Secretary shall convey all right, title, and interest of the United States in and to the Federal land to Resolution Copper.

(d) CONVEYANCE AND MANAGEMENT OF NON-FEDERAL LAND. –

(1) CONVEYANCE. – On receipt of title to the Federal land, Resolution Copper shall simultaneously convey-

A. to the Secretary, all right, title, and interest that the Secretary determines to be acceptable in and to –

i. the approximately 147 acres of land located in Gila County, Arizona, depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-Turkey Creek” and dated March 2011;

ii. the approximately 148 acres of land located in Yavapai County, Arizona, depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-Tangle Creek” and dated March 2011;

iii. the approximately 149 acres of land located in Maricopa County, Arizona, depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-Cave Creek” and dated March 2011;

iv. the approximately 640 acres of land located in Coconino County, Arizona, depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-East Clear Creek” and dated March 2011; and

v. the approximately 110 acres of land located in Pinal County, Arizona, depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-Apache Leap South End” and dated March 2011; and

B. to the Secretary of Interior, all rights, title, and interest that the Secretary of Interior determines to be acceptable in and to –

i. the approximately 3,050 acres of land located in Pinal County, Arizona, identified as “Lands to DOI” as generally depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011- Non-Federal Parcel-Lower San Pedro River” and dated July 6, 2011;

ii. the approximately 160 acres of land located in Gila and Pinal Counties, Arizona, identified as “Lands to DOI” as generally depicted on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-Dripping Springs” and dated. July 6, 2011; and

iii. the approximately 940 acres of land located in Santa Cruz County Arizona identified as “Lands to DOI” as generally ‘depicted’ on the map entitled “Southeast Arizona Land Exchange and Conservation Act of 2011-Non-Federal Parcel-Appleton Ranch” and dated July 6, 2011.

(2) MANAGEMENT OF ACQUIRED LAND. –

A. LAND ACQUIRED BY THE SECRETARY. –

i. IN GENERAL. – Land acquired by the Secretary under this section shall –

I. become part of the national forest in which the land is located; and

II. be administered in accordance with laws applicable to the National Forest System.

ii. BOUNDARY REVISION. – On the acquisition of land by the Secretary under this section, the boundaries of the national forest shall be modified to reflect the inclusion of the acquired land.

iii. LAND AND WATER CONSERVATION FUND. – For purposes of section 7 of the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-9), the boundaries of a national forest in which land acquired by the Secretary is located shall be deemed to be the boundaries of that forest as in existence on January 1, 1965.

B. LAND ACQUIRED BY THE SECRETARY OF INTERIOR. –

i. SAN PEDRO NATIONAL CONSERVATION AREA. –

I. IN GENERAL. – The land acquired by the Secretary of the Interior under paragraph (1)(B)(i) shall be added to, and administered as part of, the San Pedro National Conservation Area in accordance with the laws (including regulations) applicable to the Conservation Area.

II. MANAGEMENT PLAN. – Not later than 2 years after the date on which the land is acquired, the Secretary of the Interior shall update the management plan for the San Pedro National Conservation Area to reflect the management requirements of the acquired land.

ii. DRIPPING SPRINGS. – Land acquired by the Secretary of the Interior under paragraph (1)(B)(ii) shall be managed in accordance with the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.) and applicable land use plans.

iii. LAS CIENEGAS NATIONAL CONSERVATION AREA. – Land acquired by the Secretary of the Interior under paragraph (1)(B)(iii) shall be added to, and administered as part of, the Las Cienegas

National Conservation Area in accordance with the laws (including regulations) applicable to the Conservation Area.

(e) VALUE ADJUSTMENT PAYMENT TO UNITED STATES. –

(1) ANNUAL PRODUCTION REPORTING. –

A. REPORT REQUIRED. – As a condition of the land exchange under this section, Resolution Copper shall submit to the Secretary of the Interior an annual report indicating the quantity of locatable minerals produced during the preceding calendar year in commercial quantities from the Federal land conveyed to Resolution Copper under subsection (c). The first report is required to be submitted not later than February 15 of the first calendar year beginning after the date of commencement of production of valuable locatable minerals in commercial quantities from such Federal land. The reports shall be submitted February 15 of each calendar year thereafter.

B. SHARING REPORTS WITH STATE. – The Secretary shall make each report received under subparagraph (A) available to the State.

C. REPORT CONTENTS. – The reports under subparagraph (A) shall comply with any recordkeeping and reporting requirements prescribed by the Secretary or required by applicable Federal laws in effect at the time of production.

(2) PAYMENT OF PRODUCTION. – If the cumulative production of valuable locatable minerals produced in commercial quantities from the Federal land conveyed to Resolution Copper under subsection (c) exceeds the quantity of production of locatable minerals from the Federal land used in the income capitalization approach analysis prepared under subsection (c)(4)(C), Resolution Copper shall pay to the United States, by not later than March 15 of each applicable calendar year, a value adjustment payment for the quantity of excess production at the same rate assumed for the income capitalization approach analysis prepared under subsection (c)(4)(C).

(3) STATE LAW UNAFFECTED. – Nothing in this subsection modifies, expands, diminishes, amends, or otherwise affects any State law relating to the imposition, application, timing, or collection of a State excise or severance tax.

(4) USE OF FUNDS. –

A. SEPARATE FUNDS. – All funds paid to the United States under this subsection shall be deposited in a special fund established in the 'treasury and shall be available, in such amounts as are provided in advance in appropriation Acts, to the Secretary and the Secretary of the Interior only for the purposes authorized by subparagraph (B).

B. AUTHORIZED USES. – Amounts in the special fund established pursuant to subparagraph (A) shall be used for maintenance, repair, and rehabilitation projects for Forest Service and Bureau of Land Management assets.

(f) WITHDRAWAL. – Subject to valid existing rights, Apache Leap and any land acquired by the United States under this section are withdrawn from all forms of –

(1) entry, appropriation, or disposal under the public land laws;

(2) location, entry, and patent under the mining laws;

(3) disposition under the mineral leasing, mineral materials, and geothermal leasing laws.

(g) APACHE LEAP SPECIAL MANAGEMENT AREA. –

(1) DESIGNATION. – To further the purpose of this section, the Secretary shall establish a special management area consisting of Apache Leap, which shall be known as the “Apache Leap Special Management Area” (referred to in this subsection as the “special management area”).

(2) PURPOSE. – The purposes of the special management area are-

A. to preserve the natural character of Apache Leap;

B. to allow for traditional uses of the area by Native American people; and

C. to protect and conserve the cultural and archeological resources of the area.

(3) SURRENDER OF MINING AND EXTRACTION RIGHTS. – As a condition of the land exchange under subsection (c), Resolution Copper shall surrender to the United States, without compensation, all rights held under the mining laws and any other law to commercially extract minerals under Apache Leap.

(4) MANAGEMENT. –

A. IN GENERAL. – The Secretary shall manage the special management area in a manner that furthers the purposes described in paragraph (2).

B. AUTHORIZED ACTIVITIES. – The activities that are authorized in the special management area are –

i. installation of seismic monitoring equipment on the surface and subsurface to protect the resources located within the special management area;

ii. installation of fences, signs, or other measures necessary to protect the health and safety of the public; and

iii. operation of an underground tunnel and associated workings, as described in the Resolution mine plan of operations, subject to any terms and conditions the Secretary may reasonably require.

(5) PLAN. –

A. IN GENERAL. – Not later than 3 years after the date of enactment of this Act, the Secretary, in consultation with affected Indian tribes, the Town, Resolution Copper, and other interested members of the public, shall prepare a management plan for the Apache Leap Special Management Area.

B. CONSIDERATIONS. – In preparing the plan under subparagraph (A), the Secretary shall consider whether additional measures are necessary to –

i. protect the cultural, archaeological, or historical resources of Apache Leap, including permanent or seasonal closures of all or a portion of Apache Leap; and

ii. provide access for recreation.

(6) MINING ACTIVITIES. – The provisions of this subsection shall not impose additional restrictions on mining activities carried out by Resolution Copper adjacent to, or outside of, the Apache Leap area beyond those otherwise applicable to mining activities on privately owned land under Federal, State, and local laws, rules and regulations.

(h) CONVEYANCES TO TOWN OF SUPERIOR, ARIZONA. –

(1) CONVEYANCES. – On request from the Town and subject to the provisions of this subsection, the Secretary shall convey to the Town the following:

A. Approximately 30 acres of land as depicted on the map entitled "Southeast Arizona Land Exchange and Conservation Act of 2011-Federal Parcel-Fairview Cemetery" and dated March 2011.

B. The reversionary interest and any reserved mineral interest of the United States in the approximately 265 acres of land located in Pinal County, Arizona, as depicted on the map entitled "Southeast Arizona Land Exchange and Conservation Act of 2011-Federal Reversionary Interest-Superior Airport" and dated March 2011.

C. The approximately 250 acres of land located in Pinal County, Arizona, as depicted on the map entitled "Southeast Arizona Land Exchange and Conservation Act of 2011-Federal Parcel-Superior Airport Contiguous Parcels" and dated March 2011.

(2) PAYMENT. – The Town shall pay to the Secretary the market value for each parcel of land or interest in land acquired under this subsection, as determined by appraisals conducted in accordance with subsection (c)(4).

(3) SISK ACT. – Any payment received by the Secretary from the Town under this subsection shall be deposited in the fund established under Public Law 90-171 (commonly known as the "Sisk Act") (16 U.S.C. 484a) and shall be made available

to the Secretary for the acquisition of land or interests in land in Region 3 of the Forest Service.

(4) TERMS AND CONDITIONS. – The conveyances under this subsection shall be subject to such terms and conditions as the Secretary may require.

(i) MISCELLANEOUS PROVISIONS. –

(1) REVOCATION OF ORDERS; WITHDRAWAL. –

A. REVOCATION OF ORDERS. – Any public land order that withdraws the Federal land from appropriation or disposal under a public land law shall be revoked to the extent necessary to permit disposal of the land.

B. WITHDRAWAL. – On the date of enactment of this Act, if the Federal land or any Federal interest in the non-Federal land to be exchanged under subsection (c) is not withdrawn or segregated from entry and appropriation under a public land law (including mining and mineral leasing laws and the Geothermal Steam Act of 1970 (30 U.S.C. 1001 et seq.)), the land or interest shall be withdrawn, without further action required by the Secretary concerned, from entry and appropriation. The withdrawal shall be terminated-

i. on the date of consummation of the land exchange; or

ii. if Resolution Copper notifies the Secretary in writing that it has elected to withdraw from the land exchange pursuant to section 206(d) of the Federal Land Policy and Management Act of 1976, as amended (43 U.S.C. 1716(d)).

C. RIGHTS OF RESOLUTION COPPER. – Nothing in this section shall interfere with, limit, or otherwise impair, the unpatented mining claims or rights currently held by Resolution Copper on the Federal land, nor in any way change, diminish, qualify, or otherwise impact Resolution Copper's right-and ability to conduct activities on the Federal land under such unpatented mining claims and the general mining laws of the United States, including the permitting or authorization of such activities.

(2) MAPS, ESTIMATES, AND DESCRIPTIONS. –

A. MINOR ERRORS. – The Secretary concerned and Resolution Copper may correct, by mutual agreement, any minor errors in any map, acreage estimate, or description of any land conveyed or exchanged under this section.

B. CONFLICT. – If there is a conflict between a map, an acreage estimate, or a description of land in this section, the map shall control unless the Secretary concerned and Resolution Copper mutually agree otherwise.

C. AVAILABILITY. – On the date of enactment of this Act, the Secretary shall file and make available for public inspection in the Office of the Supervisor, Tonto National Forest, each map referred to in this section.

(3) PUBLIC ACCESS IN AND AROUND OAK FLAT CAMPGROUND. – As a condition of conveyance of the Federal land, Resolution Copper shall agree to provide access to the surface of the Oak Flat Campground to members of the public, including Indian tribes, to the maximum extent practicable, consistent with health and safety requirements, until such time as the operation of the mine precludes continued public access for safety reasons, as determined by Resolution Copper.

Appendix B. Existing Conditions of Offered Lands

Existing Conditions of Offered Lands

Overview of Land Exchange

Section 3003 of the Carl Levin and Howard P. 'Buck' McKeon National Defense Authorization Act for Fiscal Year 2015 (Public Law (PL) 113-291) directs the conveyance of 2,422 acres of specified National Forest System (NFS) lands to Resolution Copper Mining LLC (Resolution Copper) if Resolution Copper offers to convey 5,460[134] acres of private lands to the United States, which Resolution Copper has done. Table B-1 provides a brief summary of the land exchange parcels. A detailed description of the land exchange can be found in section 2.2.2.1 of the final environmental impact statement (FEIS).
The complete Section 3003 of PL 113-291 is provided in appendix A of the FEIS.

Table B-1. Summary of land exchange parcels

Parcel Landownership	Description of Parcels to Be Exchanged
Parcels transferred from the United States to Resolution Copper	• 2,422 acres near Superior in Pinal County, Arizona, known as the **Oak Flat Federal Parcel**, to become private lands
Parcels transferred from Resolution Copper to the United States, to be included in the NFS	• 140 acres* near Superior in Pinal County, Arizona, known as the **Apache Leap South End Parcel**, to be administered by the Tonto National Forest • 148 acres in Yavapai County, Arizona, known as the **Tangle Creek Parcel**, to be administered by the Tonto National Forest • 147 acres in Gila County, Arizona, known as the **Turkey Creek Parcel**, to be administered by the Tonto National Forest • 149 acres near Cave Creek in Maricopa County, Arizona, known as the **Cave Creek Parcel**, to be administered by the Tonto National Forest • 640 acres north of Payson in Coconino County, Arizona, known as the **East Clear Creek Parcel**, to be administered by the Coconino National Forest
Parcels transferred from Resolution Copper to the U.S. Department of the Interior	• 3,120 acres† near Mammoth in Pinal County, Arizona, known as the **Lower San Pedro River Parcel**, to be administered by the U.S. Department of the Interior Bureau of Land Management (BLM) as part of the San Pedro Riparian National Conservation Area • 956 acres‡ south of Elgin in Santa Cruz County, Arizona, known as the **Appleton Ranch Parcel**, to be administered by the BLM as part of the Las Cienegas National Conservation Area • 160 acres near Kearny in Gila and Pinal Counties, Arizona, known as the **Dripping Springs Parcel**, to be administered by the BLM
If requested by the Town of Superior, Arizona, land would be transferred from the United States to the Town of Superior	• 30 acres associated with the Fairview Cemetery • 250 acres associated with parcels contiguous to the Superior Airport • 265 acres of Federal reversionary interest associated with the Superior Airport

* Using updated survey information and increase in 32 additional private acres provided by Resolution Copper, the U.S. Forest Service revised the Apache Leap South End Parcel from 110 acres (as presented in Section 3003 of PL 113-291) to 140 acres.

† Final cadastral surveys were completed by BLM on the Lower San Pedro River Parcel, resulting in additional 70 private acres being transferred to Federal ownership.

‡ Final cadastral surveys were completed by BLM on the Appleton Ranch Parcel, resulting in additional 16 private acres being transferred to Federal ownership.

[134] Section 3003 disclosed the anticipated acres exchanged from private to Federal management as approximately 5,376 acres. After Bureau of Land Management (BLM) cadastral surveys were completed, the final acres to be conveyed will be 5,460 acres. These acreages reflect those offered by Resolution Copper to the Federal Government, after completion of surveys. Ultimately, the Federal Government may not accept all portions of these lands. The exact parcels and acreage would be assessed in the appraisal process.

Offered Lands – Forest Service

Details of the eight private parcels that would be transferred to the United States with management by the U.S. Department of Agriculture Forest Service (Forest Service) are in the following text. Additional details regarding the special status species present on the offered lands being transferred to the Tonto National Forest, Coconino National Forest, and BLM are summarized in tables B-2, B-3, and B-4, respectively, at the end of this appendix.

APACHE LEAP SOUTH END PARCELS

As noted later in this section, the Apache Leap South End Parcels would become part of the Apache Leap Special Management Area (SMA), administered by the Tonto National Forest, Globe Ranger District. The NDAA required completion of a management plan for the Apache Leap SMA. Preparation of the management plan was conducted through a separate National Environmental Policy Act (NEPA) process, which resulted in an environmental assessment (August 2017) and the final management plan (December 2017). Substantial information about the Apache Leap South End Parcels can be found in that environmental assessment (see "Key Documents Describing Apache Leap South End Parcels" later in this section). The Apache Leap management plan would exclude future grazing leases and limit construction and motorized vehicles to protect the natural character of the area.

Parcel Description

The Apache Leap South End Parcels consist of three parcels that total 140 acres, located near the eastern edge of the town of Superior in Pinal County, Arizona (figures B-1 and B-2). The Apache Leap South End Parcels are surrounded by NFS lands and would become part of the Apache Leap SMA, administered by the Tonto National Forest, Globe Ranger District. Upon completion of the land exchange, Resolution Copper would surrender all mining claims and interests to the parcels. Portions of the parcels are accessible by unimproved roads and trails from below Apache Leap via Ray Road/Apache Leap Road from Arizona State Route (SR) 177, or from above Apache Leap via NFS Road 315 via Magma Mine Road.

Figure B-1. Photograph of Apache Leap South parcels

The parcels include lands located above and below Apache Leap, an escarpment of sheer cliff faces, hoodoos, and buttresses that forms the scenic backdrop to the town of Superior. Current land uses on the parcels include livestock grazing and informal recreation such as hiking, rock climbing, nature viewing, and hunting. Additionally, there are multiple historical mining features and remnants of old mining-related roads located throughout the parcels, including small open cuts, shafts, tunnels, raises, crosscuts, and more extensive underground workings. The major underground mines in this area were principally known as the Grand Pacific and Belmont Mines. Entrances to these mines are found on portions of the parcels and appear to date to the early 1900s, with evidence of having been explored historically for the presence of economic minerals. In a few instances, this exploration led to mineral development and exploitation.

Geological Setting

This area lies in a transitional zone on the northeastern edge of the Basin and Range physiographic province. The western edge of this area is generally very steep, with the cliffs of the Apache Leap escarpment rising abruptly above the town of Superior. There is roughly up to 1,970 feet of vertical displacement along the escarpment and Superior is in a down-dropped fault basin. The Tertiary-aged Apache Leap Tuff, the youngest consolidated formation in the area, forms the Apache Leap escarpment, and the underlying Paleozoic sedimentary rocks and Precambrian sedimentary rocks are exposed at the foot of the escarpment. Tertiary-aged Whitetail Conglomerate is present, with limited exposure at the toe of the slope on the west side of Apache Leap. A Quaternary alluvial deposit overlies the Apache Leap Tuff in a small area in the southwestern portion of the parcels.

Biological and Water Resources

Major biotic communities within the Apache Leap South Parcels include the Arizona Upland subdivision – Sonoran Desertscrub vegetation community in lower elevations and Interior Chaparral along the top of the Apache Leap escarpment (Brown 1994). Interior Chaparral species also occur on north-facing slopes in lower elevations west of the Apache Leap escarpment.

Vegetation found in the Arizona Upland subdivision typically consists of shrubs, cacti, and leguminous trees such as foothill paloverde, saguaro, and velvet mesquite. Additional species common to this area include goldenflower century plant, Mormon tea, fairyduster, barrel cactus, catclaw mimosa, jojoba, catclaw acacia, wolfberry, brittlebush, teddybear cholla, buckhorn cholla, cactus apple, Engelmann's hedgehog, shrubby buckwheat, flattop buckwheat, Louisiana sagewort, desert marigold, Coues' cassia, desert globemallow, and purple three-awn.

The Interior Chaparral vegetation type is characterized by dense stands of woody evergreens and shrubs. A common (diagnostic) species of Interior Chaparral in central Arizona is scrub live oak. In the Apache Leap SMA, this community is best represented by scrub live oak, pointleaf manzanita, red barberry, alderleaf mountain mahogany, deerbrush, and sugar sumac. Other common species include crucifixion thorn, hopbush, Wright's silktassel, and broom snakeweed.

Three special status plant species have the potential to occur within the parcels: Arizona hedgehog cactus, Pima Indian mallow, mapleleaf false snapdragon, and Gila rockdaisy. All may occur but are not known to occur. There is suitable habitat for Arizona hedgehog cactus in the northern portion of the parcels, and the parcels are near known populations of the species. However, the species' presence was not confirmed during site visits or during informal surveys specifically searching for the species by Forest Service biologists over the past several years.

Drainages within the project area do not contain permanent surface water features and do not support riparian vegetation. Instead, the drainages generally contain greater densities of the same species that are present in the adjacent uplands. Additionally, no known springs occur within the Apache Leap South End Parcels.

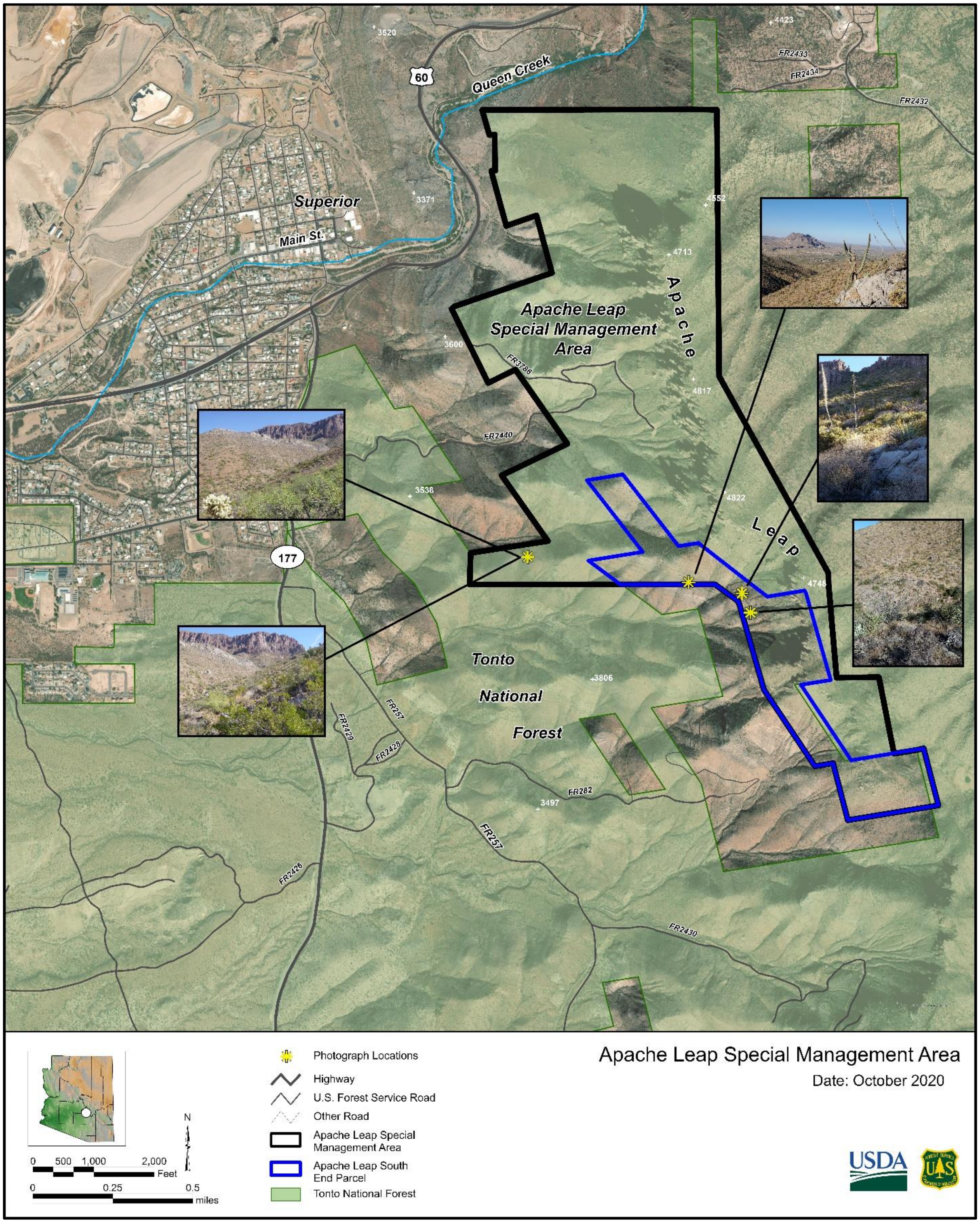

Figure B-2. Apache Leap Special Management Area and land exchange parcel

Hazardous Materials

A Phase 1 environmental site assessment was completed for the property in May 2025 that identified no recognized environmental conditions (RECs) on the property. Historic-era mine features were noted during the work. However, while there is potential for the historic mine features to impact groundwater or produce acid mine drainage, no discoloration or distressed vegetation was noted around the existing features. In addition, potential for impacts on surface or groundwater by contact with mineralized rock is not considered likely. Most adits are closed for human safety while allowing continued bat use.

Cultural Resources

The parcels are generally characterized as undeveloped open space with no evidence of human occupation. A Class III cultural resources inventory was performed in 2016 that found three archaeological sites, two of which were new discoveries. Of these, one site was considered eligible for the National Register of Historic Places (NRHP). Additionally, numerous cultural resources inventories have identified sites representing precontact, ethnohistoric, and historic-era Native American occupations and activities spanning several thousand years in the areas surrounding the parcels. Historic-era Euro-American activities have also been identified, including ranching, transportation, and utilities in combination with mining operations; these date to the late nineteenth century through the middle twentieth century.

Key Documents Describing Apache Leap South End Parcels

- WestLand Resources Inc. 2025. “Phase I Environmental Site Assessment, Apache Leap South End, Pinal County, Arizona.” May 15, 2025 (WestLand Resources Inc. 2025a)
- WestLand Resources Inc. 2020. “Phase I Environmental Site Assessment Apache Leap South End [Phase I Environmental Assessment Non-Federal Parcel Apache Leap South End Gila County, Arizona].” September 4, 2020 (WestLand Resources Inc. 2020c)
- SWCA Environmental Consultants. 2017. “Apache Leap Special Management Area Management Plan: Heritage Resources Report.” August 1, 2017 (Tremblay 2017)
- SWCA Environmental Consultants. 2017. “Apache Leap Special Management Area Wildlife and Vegetation Specialist Report.” August 1, 2017 (Dugan 2017)
- SWCA Environmental Consultants. 2017. “Apache Leap Special Management Area Biological Evaluation.” August 1, 2017 (Campbell and Dugan 2017)
- U.S. Forest Service. 2017. “Apache Leap Special Management Area Management Plan: Environmental Assessment and Finding of No Significant Impact.” August 1, 2017 (U.S. Forest Service 2017b)
- U.S. Forest Service. 2017. “Apache Leap Special Management Area: Management Plan.” December 1, 2017 (U.S. Forest Service 2017d)
- U.S. Forest Service. 2017. “Apache Leap Special Management Area Management Plan: Errata to Final Environmental Assessment.” December 1, 2017 (U.S. Forest Service 2017c)
- WestLand Resources Inc. 2015. “Phase I Environmental Site Assessment Apache Leap South End [Phase I Environmental Assessment Non-Federal Parcel Apache Leap South End Gila County, Arizona].” August 13, 2015 (WestLand Resources Inc. 2015b)
- WestLand Resources Inc. 2016. “A Cultural Resources Inventory of 106 Acres Along the South End of Apache Leap for Resolution Copper Mining, LLC, Pinal County, Arizona.” June 23, 2016 (Daughtrey 2016)

- U.S. Forest Service. 2014. Tonto National Forest's Nomination of *Chí'chil Biłdagoteel*, commonly known as Oak Flat and Apache Leap, to the National Register of Historic Places as an Apache Traditional Cultural Property. October 31, 2014 (Nez 2014)

TANGLE CREEK PARCEL

Parcel Description

Located in Yavapai County, Arizona, approximately 35 miles north of the towns of Cave Creek and Carefree, the Tangle Creek Parcel is a 148-acre private inholding within the Tonto National Forest (figures B-3 and B-4). The parcel would be administered by the Tonto National Forest, Cave Creek Ranger District. The Tangle Creek parcel lies within the Central Highlands physiographic province, a transition zone between the Basin and Range and the Colorado River provinces.

Figure B-3. Photograph of Tangle Creek parcel

The Tangle Creek Parcel is located near the center of a broad valley known as Bloody Basin, a rugged, scenic basin in central Arizona with abundant hiking, camping, and hunting opportunities. The parcel was homesteaded in the 1890s by the Babbitt family and used for livestock grazing and farming through the 1990s. Developed features within the parcel were limited; the only remaining associated improvements include an overgrown dirt road, remnants of a concrete dam/revetment structure, and a small concrete foundation. The historically cultivated farm fields are in the process of reverting to open woodlands and thickets of hackberry, mesquite, and catclaw acacia. Resolution Copper does not use the parcel for any specific purpose. Several unimproved roads provide public access to the area and are likely used for recreational, grazing, and agricultural purposes. The parcel is within a grazing allotment that includes surrounding lands in all directions. The parcel also contains a power line transmission corridor. No active mining claims exist within the parcel.

The parcel can be accessed from the west via Bloody Basin Road (NFS Road 269) from Interstate (I-) 17 or by traveling north from Carefree along Cave Creek Road (NFS Road 24).

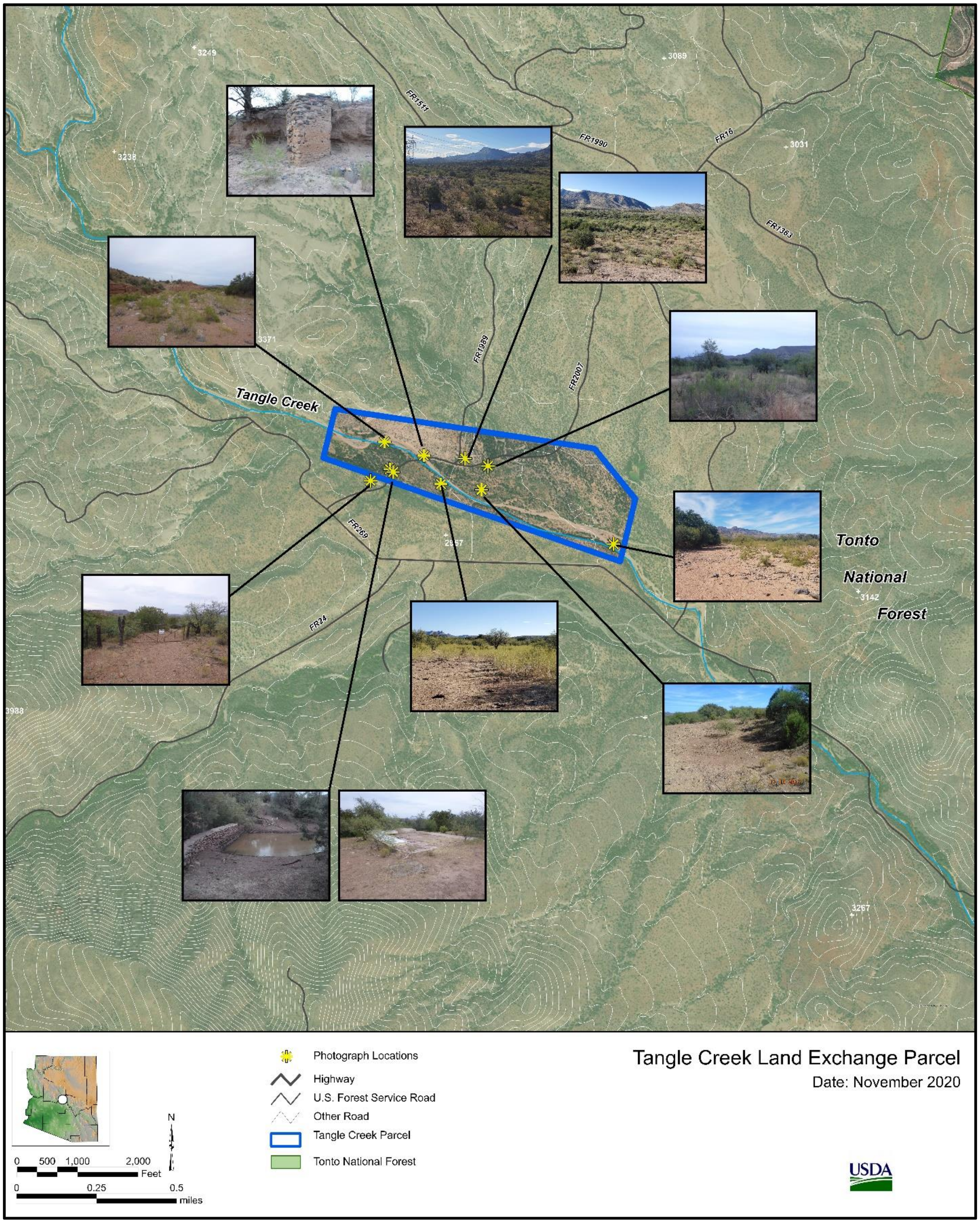

Figure B-4. Tangle Creek land exchange parcel

Geological Setting

This parcel is located along Tangle Creek in Bloody Basin, which is in the Central Highlands physiographic province, a transitional zone between the Basin and Range and the Colorado Plateau. The Bloody Basin area is a graben, bounded to the west by Cooks Mesa and to the east by the Mazatzal Mountains. It is mapped as Tertiary-aged deposits.

Biological and Water Resources

Upland vegetation of the parcel is mapped as Great Basin Conifer Woodland; however, vegetation characteristic of the Arizona Upland Subdivision of the Sonoran Desertscrub, the Semi-Desert Grassland, and Sonoran Deciduous Riparian Forest biotic communities were also observed during field reconnaissance. Common plant species include one-seed juniper, oats grama, saguaro, sycamores, ash, and desert willow.

Features of the Tangle Creek Parcel include Tangle Creek, a spatially intermittent to perennial stream that bisects the parcel and acts as a substantial tributary to the Verde River (located approximately 10 miles downstream) and associated riparian habitat, as well as mature netleaf hackberry, mesquite, ash, and sycamore trees, which provide habitat for migratory birds and nesting songbirds. No aquatic biology surveys have been conducted. One spring, LX Spring, exists outside the parcel, and water from this spring was conveyed to the parcel by pipeline. The water right for LX Spring water use at the Tangle Creek parcel is no longer active. The pipeline and site have been reclaimed, and cleanup is complete.

No critical habitats exist within the parcel. The 2004 ecological overview identified three special status species (under the Endangered Species Act (ESA)) with some potential to occur within the property: Arizona agave (endangered), Arizona cliffrose (endangered), and bald eagle (now delisted, but still protected under the Bald and Golden Eagle Protection Act (BGEPA)). More recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA, BGEPA, or identified as a Tonto National Forest sensitive species or Species of Conservation Concern (SCC))[135]:

- ESA: western yellow-billed cuckoo (threatened); southwestern willow flycatcher (endangered); Gila chub (endangered); spikedace (endangered)
- BGEPA: golden eagle
- Tonto National Forest sensitive species or SCC: lowland leopard frog; peregrine falcon; broad-billed hummingbird; MackGillivray’s warbler; elf owl; Gila longfin dace; desert sucker; headwater chub; roundtail chub; pale Townsend’s big-eared bat; spotted bat; Allen’s lappet-browed or big-eared bat; California leaf-nosed bat; western red bat; Sonoran desert tortoise; Parker’s cylloepus riffle beetle; monarch butterfly.

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified no RECs on the property. A prior Phase I environmental site assessment in 2004 had identified numerous potential environmental conditions associated with a building, but it was subsequently determined that the

[135] In December 2023, the revised “Tonto National Forest Land Management Plan” (forest plan) was implemented (U.S. Forest Service 2023d). The revised forest plan describes Species of Conservation Concern (SCC), which are 52 species identified that are native to and known to occur in the analysis area and for which there are substantial concerns about the species’ ability to persist within the analysis area. This appendix (appendix B) has been updated to reflect analysis of consistency with the revised forest plan; additional SCC have been included in this revision to support that analysis. Forest Service Sensitive Species is no longer a valid designation under the forest plan revision. However, previous analyses of Forest Service Sensitive Species were retained in this document.

building was not on the parcel itself. In 2016, the only item noted was a drum that did not appear to contain more than traces of fluid and was not observed to be leaking. Resolution Copper undertook a substantial cleanup of the Tangle Creek parcel in 2018 to remove trash and other materials.

Cultural Resources

A Class III cultural resources inventory was performed in 2016, recording 10 previously unidentified archaeological sites, seven of which were recommended eligible for inclusion in the NRHP. In addition, 22 archaeological sites had been previously discovered within the vicinity of the parcel, many of which are indicative of substantial Formative period occupation.

Key Documents Describing Tangle Creek Parcel

- WestLand Resources Inc. 2025. "Phase I Environmental Site Assessment, Tangle Creek, Yavapai County, Arizona." May 15, 2025 (WestLand Resources Inc. 2025g)
- WestLand Resources Inc. 2020. "Phase I Environmental Assessment Non-Federal Parcel, Tangle Creek (LX Bar Ranch) Yavapai County, Arizona, Resolution Copper." September 22, 2020 (WestLand Resources Inc. 2020h)
- WestLand Resources Inc. 2016. "A Cultural Resources Inventory of the 148-Acre Tangle Creek Parcel, Yavapai County, Arizona: Resolution Copper." September 28, 2016 (Charest 2016b)
- WestLand Resources Inc. 2016. "Phase I Environmental Assessment Non-Federal Parcel, Tangle Creek (LX Bar Ranch) Yavapai County, Arizona, Resolution Copper." October 1, 2016 (WestLand Resources Inc. 2016d)
- WestLand Resources Inc. 2004. "Ecological Overview LX Bar Ranch Parcel, Yavapai County Arizona." March 8, 2004 (WestLand Resources Inc. 2004d)

TURKEY CREEK PARCEL

Parcel Description

The Turkey Creek Parcel is a 147-acre parcel located approximately 8 miles southeast of the community of Pleasant Valley in Gila County, Arizona (figures B-5 and B-6). Also known as JX Ranch, the Turkey Creek Parcel is a private inholding within the Tonto National Forest and would be administered by the Tonto National Forest, Pleasant Valley Ranger District. It is located within the streambed and adjacent upland areas along Turkey Creek and Rock Creek in the Sierra Ancha Mountains within the Central Highlands physiographic province, a transitional zone between the Basin and Range and the Colorado Plateau provinces.

The parcel was formerly homesteaded in the 1880s and associated with Elmer D. Boody. Development included a series of buildings and property improvements such as a house, barn, kitchen, storehouse, tool house, shop, well, and cultivated area. The parcel also includes remains of a house foundation, trail (NFS Road 701), a small apple orchard, and a scattering of historical artifacts. A dry-laid masonry well that appears to have been filled in almost entirely by sediment or possibly trash was observed on the former homestead location. The Boody homestead would eventually become known as JX Ranch. Under Resolution Copper ownership, the parcel is not used for any purpose; however, there is evidence of dispersed recreation, including hunting, nature viewing, hiking, picnicking, camping, and off-highway vehicle use. Overall, the parcel is characterized as mainly vacant open space that appears to have been used in the past for historical homesteading and grazing. Currently, there are no active mining claims within the parcel.

The parcel can be accessed by going east and north approximately 22 miles from SR 188 along multiple NFS roads (71, 609, 416, and 2768).

Figure B-5. Photograph of Turkey Creek parcel

Geological Setting

This parcel is located in the Sierra Ancha Mountains, which are in the Central Highlands physiographic province, a transitional zone between the Basin and Range and the Colorado Plateau. The parcel has middle Tertiary-aged conglomerate on the canyon's upper slopes, Precambrian-aged (middle Proterozoic) Dripping Springs Quartzite exposed in cliff faces adjacent to the stream bed, and Quaternary alluvium within the valley floor along Turkey Creek and Rock Creek.

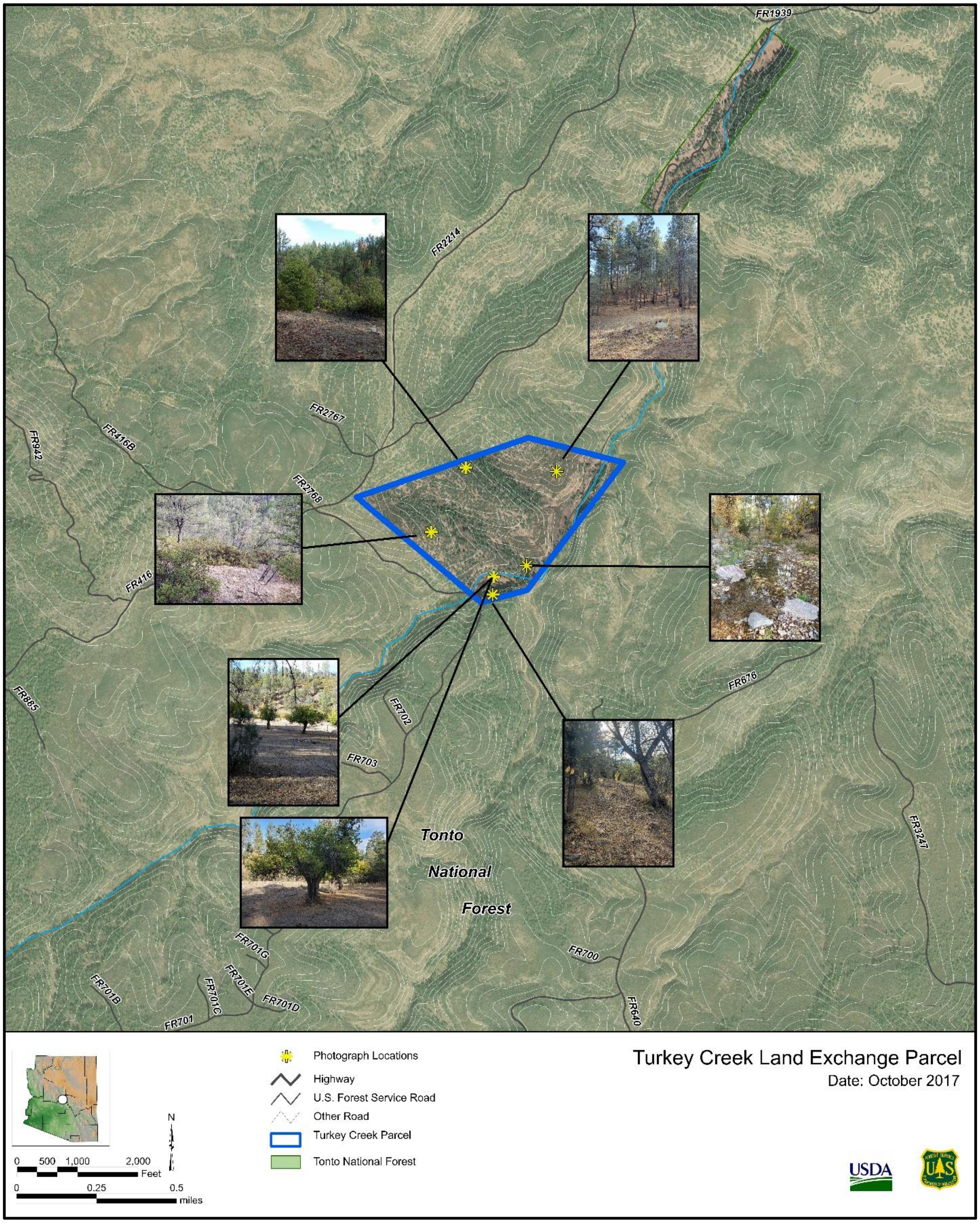

Figure B-6. Turkey Creek land exchange parcel

Biological and Water Resources

Four biotic communities were observed during field reconnaissance: Petran Montane Conifer Forest, Madrean Evergreen Woodland, Interior Chaparral, and Great Basin Conifer Woodland; however, the upland vegetation on the parcel is only mapped as Great Basin Conifer Woodland biotic community. Common plants include ponderosa pine on north-facing slopes and alligator juniper, manzanita, and grasses on south-facing slopes. Riparian vegetation such as narrowleaf cottonwood, New Mexico locust, Arizona sycamore, and Gambel oak are present along Turkey Creek. Approximately one-third of the vegetation within the parcel was impacted by fires in the early 2000s, with some areas burning intensely, resulting in losses of entire stands of juniper, ponderosa pine, and manzanita. Natural vegetation is reestablishing, however. Within the parcel there is habitat for elk, mule deer, and native fish.

Additionally, the parcel is within Forest Service lands that contain Mexican spotted owl critical habitat, as well as two Mexican spotted owl protected activity centers. The 2004 ecological overview identified three special status species with some potential to occur within the property: Arizona agave (endangered), Chiricahua leopard frog (threatened), and bald eagle (now delisted, but still protected under the BGEPA). More recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA, BGEPA, or identified as a Tonto National Forest sensitive species or SCC):

- ESA: western yellow-billed cuckoo (threatened); southwestern willow flycatcher (endangered); Chiricahua leopard frog (threatened); Mexican spotted owl (threatened); Gila chub (endangered); spikedace (endangered); northern Mexican gartersnake (threatened); narrow-headed gartersnake (threatened)
- BGEPA: golden eagle
- Tonto National Forest sensitive species or SCC: lowland leopard frog; peregrine falcon; northern goshawk; red-faced warbler; olive-sided flycatcher, elf owl; Pacific wren; Gila longfin dace; Sonora sucker; desert sucker; headwater chub; roundtail chub; pale Townsend’s big-eared bat; spotted bat; Allen’s lappet-browed or big-eared bat; western red bat; fringed myotis; monarch butterfly.

Turkey Creek is the dominant drainage feature in the parcel and has intermittent to perennial flow. Surface water features comprise ephemeral channels that are tributary to Turkey Creek in the Salt River’s watershed.

Wildfires in the area over the past few years have greatly affected the surrounding lands but have not affected the property.

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified no RECs on the property.

Cultural Resources

A Class III cultural resources inventory of the parcel was performed in 2016 and found six previously undiscovered archaeological sites, with five of the sites recommended eligible for inclusion in the NRHP. Sites were dated to the Late Formative period (over a range of 1,000 years) and the Late Historic period.

Key Documents Describing Turkey Creek Parcel

- WestLand Resources Inc. 2025. “Phase I Environmental Site Assessment, Turkey Creek, Gila County, Arizona.” May 15, 2025 (WestLand Resources Inc. 2025h)

- WestLand Resources Inc. 2020. "Phase I Environmental Site Assessment Non-Federal Parcel, Turkey Creek (JX Bar Ranch) Gila County, Arizona." September 4, 2020 (WestLand Resources Inc. 2020i)
- WestLand Resources Inc. 2016. "A Cultural Resources Inventory of the 146.78-Acre Turkey Creek Parcel, Gila County, Arizona: Resolution Copper." September 28, 2016 (Charest 2016b)
- WestLand Resources Inc. 2016. "Phase I Environmental Site Assessment Non-Federal Parcel, Turkey Creek (JX Bar Ranch) Gila County, Arizona." October 1, 2016 (WestLand Resources Inc. 2016g)
- WestLand Resources Inc. 2004. "Ecological Overview JX Ranch Parcel, Gila County, Arizona." March 31, 2004 (WestLand Resources Inc. 2004c)

CAVE CREEK PARCEL

Parcel Description

The Cave Creek Parcel is a 149-acre parcel located approximately 7 miles north of Cave Creek in Maricopa County, Arizona, known also as 6L Ranch (figures B-7 and B-8). The Cave Creek Parcel is a private inholding surrounded by Tonto National Forest lands. Upon completion of the land exchange, the parcel would be administered by the Tonto National Forest, Cave Creek Ranger District. The parcel lies along the canyon floor and adjacent upland areas of Cave Creek in the Central Highlands physiographic province.

Figure B-7. Photograph of Cave Creek parcel

The Cave Creek parcel is located north of the Spur Cross Ranch Conservation Area, used for dispersed recreation activities such as hunting, camping, nature viewing, and hiking. The parcel was initially colonized in the 1880s and used as a residence until the 1920s. Livestock grazing occurred on the parcel through 2001. Several ranching features were observed through field reconnaissance and include development such as a concrete watering trough, pipes, a steel cistern, a well, a collapsed dry-laid masonry outbuilding with tin roof, a wooden cattle chute, and a corral area. The parcel is largely devoid of development, and there is no evidence of recent human occupation within the parcel. The Cave Creek parcel can be accessed via Cave Creek Road and Spur Cross road to Forest Trail 4, on which a 100-minute walk on foot is required to reach the parcel. Drivable access is limited at the Maricopa County Spur Cross Ranch Conservation Fence. No active mining claims exist within the parcel.

Geological Setting

This parcel is located along Cave Creek, which drains the southern portion of the New River Mountains, a rugged range defining the eastern portion of the Agua Fria River valley. Notable peaks around this parcel are Skull Mesa to the east, Sugarloaf Mountain to the southwest, and Black Mesa to the west and north. The parcel lies in the Central Highlands physiographic province. The New River Mountains comprise Quaternary- and Tertiary-aged basalt-covered tablelands cut by streams through Precambrian-aged metavolcanic rocks. Most of the parcel is mapped as volcanic and sedimentary rock dating from the middle Miocene to Oligocene. Small portions of the north and south ends of the parcel are mapped as Early Proterozoic Metavolcanic rocks.

Biological and Water Resources

Three biotic communities have been observed within the parcel: Interior Chaparral, Arizona Upland Subdivision of Sonoran Desertscrub, and Deciduous Riparian Forest along Cave Creek. Common plant species include saguaro, foothill paloverde, ironwood, barberry, buckbrush, Arizona sycamore, velvet ash, and Goodding’s willow. Wildlife habitat for migratory songbirds, raptors, amphibians, javelina, mule deer, and coyotes has been identified within the parcel. No aquatic species surveys have been conducted within the parcel.

The 2004 ecological overview identified three special status species with some potential to occur within the property: bald eagle (now delisted, but still protected under the BGEPA), Gila topminnow (endangered), and cactus ferruginous pygmy-owl (now delisted).

More recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA, BGEPA, or identified as a Tonto National Forest sensitive species or SCC):

- ESA: western yellow-billed cuckoo (threatened); southwestern willow flycatcher (endangered); lesser long-nosed bat (since delisted)
- BGEPA: golden eagle
- Tonto National Forest sensitive species or SCC: lowland leopard frog; peregrine falcon; gilded flicker; broad-billed hummingbird; MackGillivray’s warbler; Lewis’ woodpecker; elf owl; desert purple martin; Gila longfin dace; pale Townsend’s big-eared bat; spotted bat; Allen’s lappet-browed or big-eared bat; western red bat; western yellow bat; California leaf-nosed bat; Sonoran desert tortoise; Parker’s cylloepus riffle beetle; monarch butterfly.

Surface water features include Cave Creek, which originally flowed south toward the Salt River in Phoenix. However, the flow is now intercepted by the Cave Creek Dam in the northern Phoenix metropolitan area and the canal system in Phoenix, which diverts the stream to discharge to the Agua Fria River. The Cave Creek riparian corridor runs through the center of the parcel and drains the southern portion of the New River Mountains. It is ephemeral to intermittent, with some perennial reaches in the vicinity of the parcel.

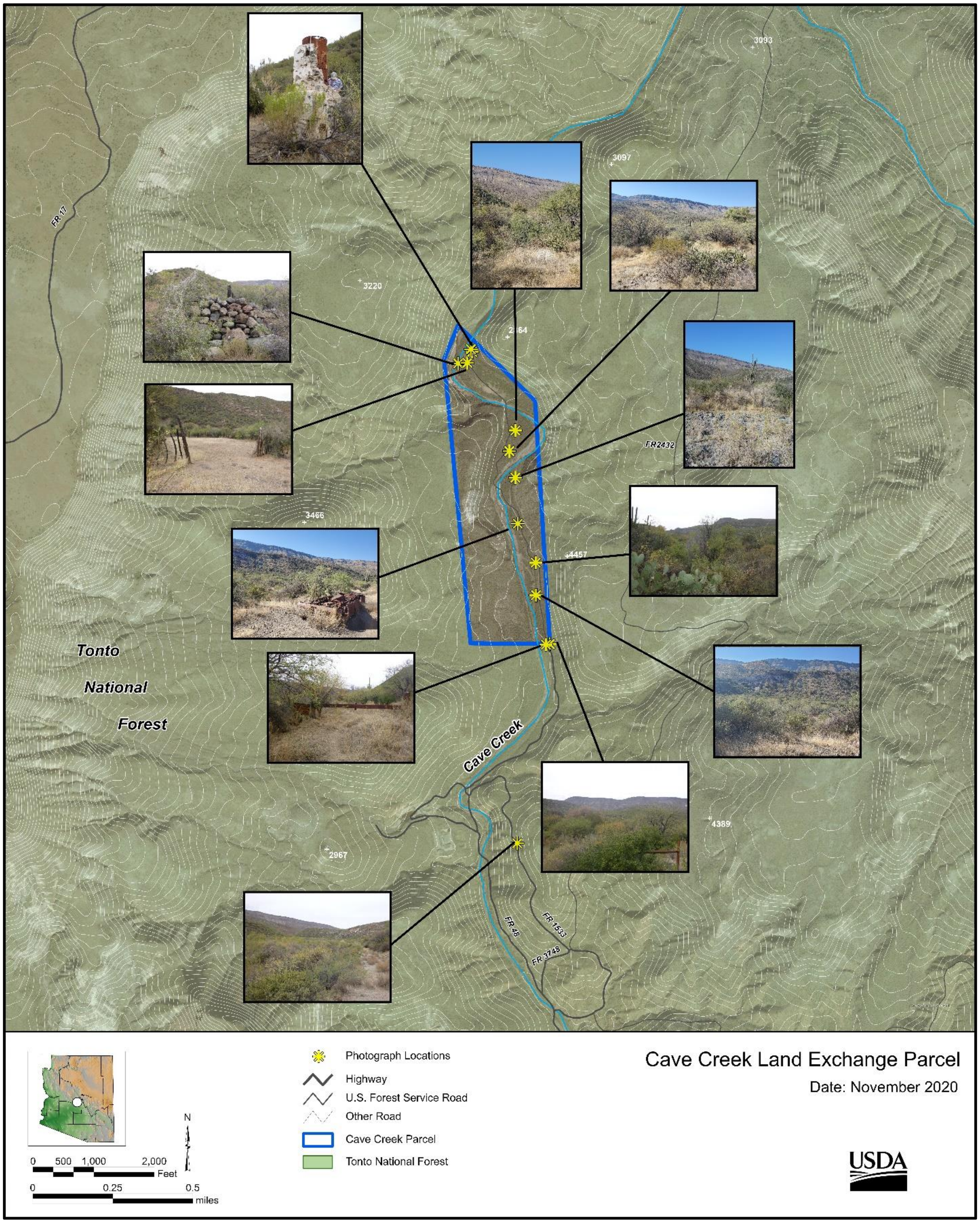

Figure B-8. Cave Creek land exchange parcel

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified no RECs on the property.

Cultural Resources

Since time immemorial, the parcel and area were extensively used and occupied by Indigenous people with different cultures. A Class III cultural resource inventory was performed in 2016 that identified six archaeological sites, including four that were newly identified. All six sites were recommended for inclusion in the NRHP. The sites date to the Late Archaic and Early to Middle, Middle, and Late Formative periods, as well as to the Late Historic period, and include precontact petroglyphs. Additionally, stone structures, grinding areas, and more petroglyphs have been found in areas surrounding the parcel.

Key Documents Describing Cave Creek Parcel

- WestLand Resources Inc. 2025. "Phase I Environmental Site Assessment, Cave Creek, Maricopa County, Arizona." May 15, 2025 (WestLand Resources Inc. 2025c)
- WestLand Resources Inc. 2020. "Phase I Environmental Site Assessment Cave Creek (6L Ranch), Maricopa County, Arizona." September 4, 2020 (WestLand Resources Inc. 2020e)
- WestLand Resources Inc. 2016. "Phase I Environmental Site Assessment Non-Federal Parcel, Cave Creek (6L Ranch) Maricopa County, Arizona, Resolution Copper." September 1, 2016 (WestLand Resources Inc. 2016f)
- WestLand Resources Inc. 2016. "A Cultural Resources Inventory of the 149.18-Acre Cave Creek Parcel, Maricopa County, Arizona: Resolution Copper." September 28, 2016 (Charest and Francis 2016)
- WestLand Resources Inc. 2004. "Ecological Overview: 6L Ranch Parcel, Yavapai County, Arizona." July 19, 2004 (WestLand Resources Inc. 2004a)

EAST CLEAR CREEK PARCEL

Parcel Description

The East Clear Creek Parcel is a 640-acre private inholding on the Coconino National Forest, located north of Payson in Coconino County, Arizona (figures B-9 and B-10). The parcel would be administered by the Mogollon Rim Ranger District. The East Clear Creek Parcel is located along the canyon floor and adjacent upland areas of East Clear Creek in the Colorado Plateau physiographic province, a transitional zone between the upper plateau and riparian ecosystems on the Mogollon Rim.

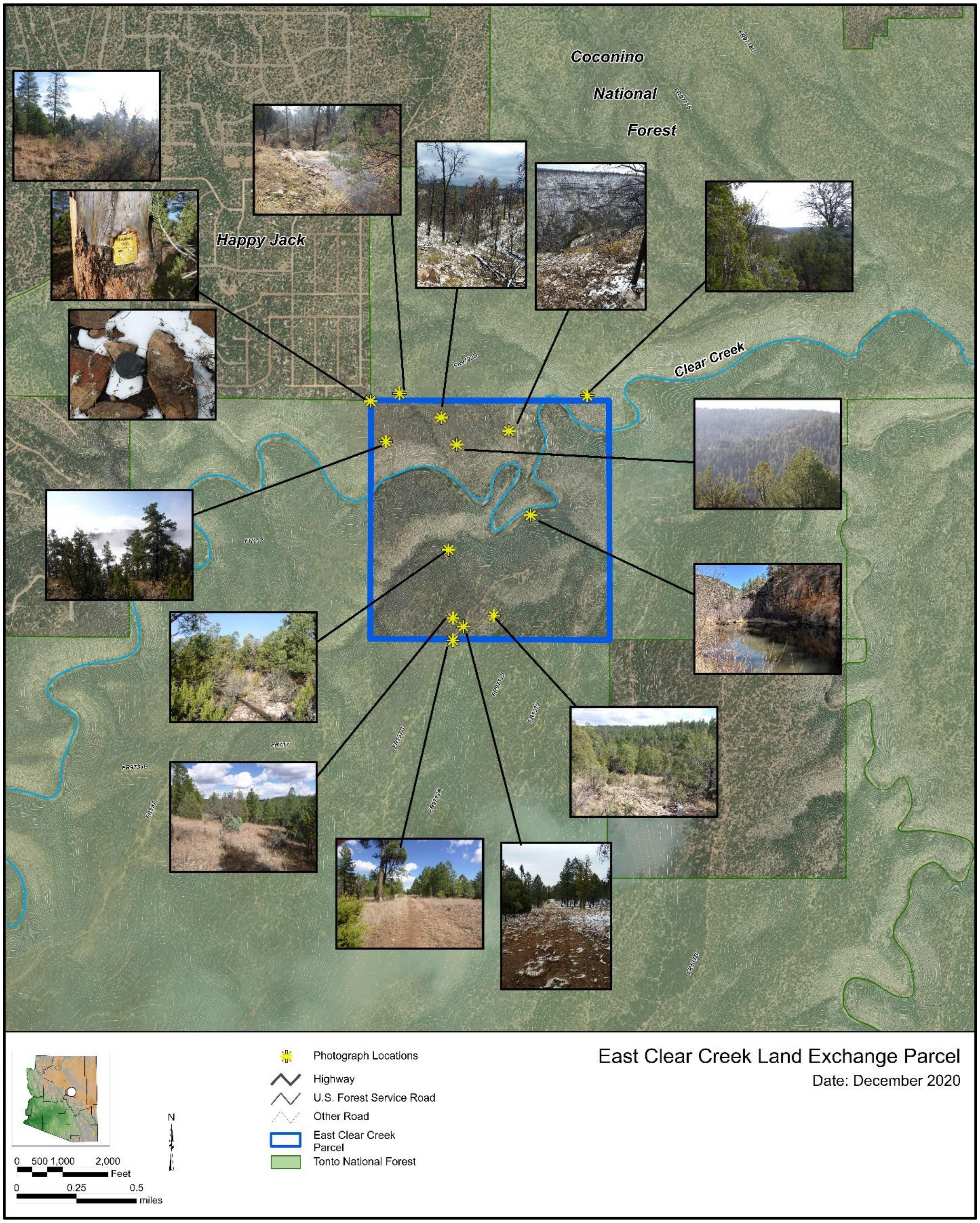

Figure B-9. East Clear Creek land exchange parcel

The only known current and historical uses of the area are recreation and logging. Designated pack trails are present on NFS land south and east of the parcel. Hiking, fishing, nature viewing, hunting, and camping are available on the public lands surrounding the parcel. The parcel is surrounded by the T Bar grazing allotment; however, Resolution Copper does not manage this grazing lease. BLM records show a record of patent for the parcel to the Santa Fe Pacific Railroad Company for the purpose of constructing a railroad and telegraph line from Missouri and Arkansas to the Pacific Coast; however, there is no evidence within the parcel or adjoining areas that the railroad was ever developed. Logging has historically been conducted in the vicinity of the parcel, with the most recent timber sale occurring in the late 1980s. There is a stock tank near the southern boundary of the parcel, suggesting livestock grazing as a potential historical land use, although not within at least the past 10 years. There is no recent development on the parcel. Dirt roads are the only developed, formal use. No active mining claims exist within the parcel.

Figure B-10. Photograph of East Clear Creek parcel

The parcel can be accessed from the south via SR 87 and traveling approximately 12 miles to the east and north. There is no designated access into the property from the north, but it is adjacent to the Starlight Pines subdivision.

Geological Setting

This parcel is located in the canyon floor and adjacent uplands along East Clear Creek. The East Clear Creek parcel is in the Colorado Plateau physiographic province, which is bounded on the south by the Mogollon Rim and is characterized by nearly horizontal, stratified sedimentary rocks that have been eroded into numerous canyons, plateaus, and scarps. The canyon walls are steep adjacent to East Clear Creek and upland areas are rugged. The entire parcel is mapped as Permian-aged sedimentary rocks.

Biological and Water Resources

The upland vegetation on the East Clear Creek parcel has one recorded biotic community: Petran Montane Conifer Forest, although field reconnaissance also documented Interior Riparian Deciduous Forest and Great Basin Conifer Woodland biotic communities. The upland vegetation is dominated by second-growth ponderosa pine with Gambel oak and New Mexico locust on north-facing slopes, while south-facing slopes are generally scrub live oak woodland with juniper and pinyon pine. Riparian habitat includes species such as boxelder, cottonwood, Arizona alder, and Bonpland willow. Riparian wildlife habitat and raptor nesting and roosting sites are present within the parcel.

The 2017 ecological overview and more recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA, BGEPA, or identified as a Coconino National Forest sensitive species):

- ESA: Little Colorado spinedace (threatened); Mexican spotted owl (threatened); Chiricahua leopard frog (threatened)
- BGEPA: bald eagle; golden eagle
- Coconino National Forest sensitive species: peregrine falcon; Little Colorado sucker; northern goshawk; rock fleabane; roundtail chub; Arizona toad

The dominant surface water feature on the parcel is East Clear Creek, a substantial perennial tributary of the Little Colorado River located approximately 71 river miles downstream (northeast) of the parcel. Analytical results from water quality sampling in 1976 suggest that all chemical constituents in East Clear Creek are within acceptable water quality standards for the support of cold-water fisheries habitat. More recent data from the U.S. Environmental Protection Agency suggest that water quality in East Clear Creek is fully supportive of agricultural use; fish, shellfish, and wildlife protection and propagation; and primary-contact recreation. Other surface water features include minor tributaries that are likely ephemeral to intermittent. Active registered instream flow surface water rights in the Little Colorado watershed sourced from East Clear Creek exist in the parcel as well. In 1993, preliminary analysis was conducted to document a 25-mile portion of East Clear Creek as being eligible with a scenic designation under the Wild and Scenic Rivers Act (U.S. Forest Service 1993). The outstanding remarkable values of this segment include scenic resources and threatened and endangered fish species habitat. The East Clear Creek parcel is within the proposed eligible section. As of 2019, the segment has not been officially designated.

Wildfires in the area in 2018 have affected the property and surrounding lands.

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified no RECs on the property.

Cultural Resources

A Class III cultural resources inventory performed in 2016 identified three newly recorded archaeological sites, all of which were recommended for inclusion in the NRHP. These archaeological sites point to use by Indigenous people and to Late Historic period Euro-American uses. In addition, one historic-era feature was identified just outside the boundary of the parcel.

Key Documents Describing East Clear Creek Parcel

- WestLand Resources Inc. 2025. “Phase I Environmental Site Assessment, East Clear Creek, Coconino County, Arizona.” May 15, 2025 (WestLand Resources Inc. 2025e)

- WestLand Resources Inc. 2020. "Phase I Environmental Assessment Non-Federal Parcel, East Clear Creek, Coconino County, Arizona, Resolution Copper." September 4, 2020 (WestLand Resources Inc. 2020b)
- WestLand Resources Inc. 2017. "Ecological Overview for East Clear Creek Parcel, Coconino County, Arizona, Resolution Copper." January 24, 2017 (WestLand Resources Inc. 2017b)
- WestLand Resources Inc. 2016. "Phase I Environmental Assessment Non-Federal Parcel, East Clear Creek, Coconino County, Arizona, Resolution Copper." September 1, 2016 (WestLand Resources Inc. 2016c)
- WestLand Resources Inc. 2016. "A Cultural Resources Inventory of the 633.88-Acre East Clear Creek Parcel, Coconino County, Arizona." September 28, 2016 (Charest 2016d)

Offered Parcels – Bureau of Land Management

Parcels to be transferred from Resolution Copper to the United States and administered by the BLM are detailed in the following text. Additional details regarding the special status species present on the offered lands being transferred to the BLM are summarized in table B-4 at the end of this appendix.

LOWER SAN PEDRO RIVER PARCEL

Parcel Description

The Lower San Pedro River Parcel is a 3,120-acre parcel located near Mammoth in Pinal County, Arizona (figures B-11 and B-12). It lies within the Basin and Range physiographic province, characterized by mountain ranges trending northwest-southeast, separated by broad alluvial valleys. The parcel is located within one of these valleys, with the Galiuro Mountains to the east and the Santa Catalina Mountains to the south. In November 1988, Congress designated 40 miles and 58,000 acres of the upper San Pedro corridor as the San Pedro Riparian National Conservation Area. The parcel would be administered by the BLM Gila District, Tucson Field Office. The parcel is patented private land for which Swift Land and Cattle, LLC, a subsidiary of Resolution Copper, holds active mining claims.

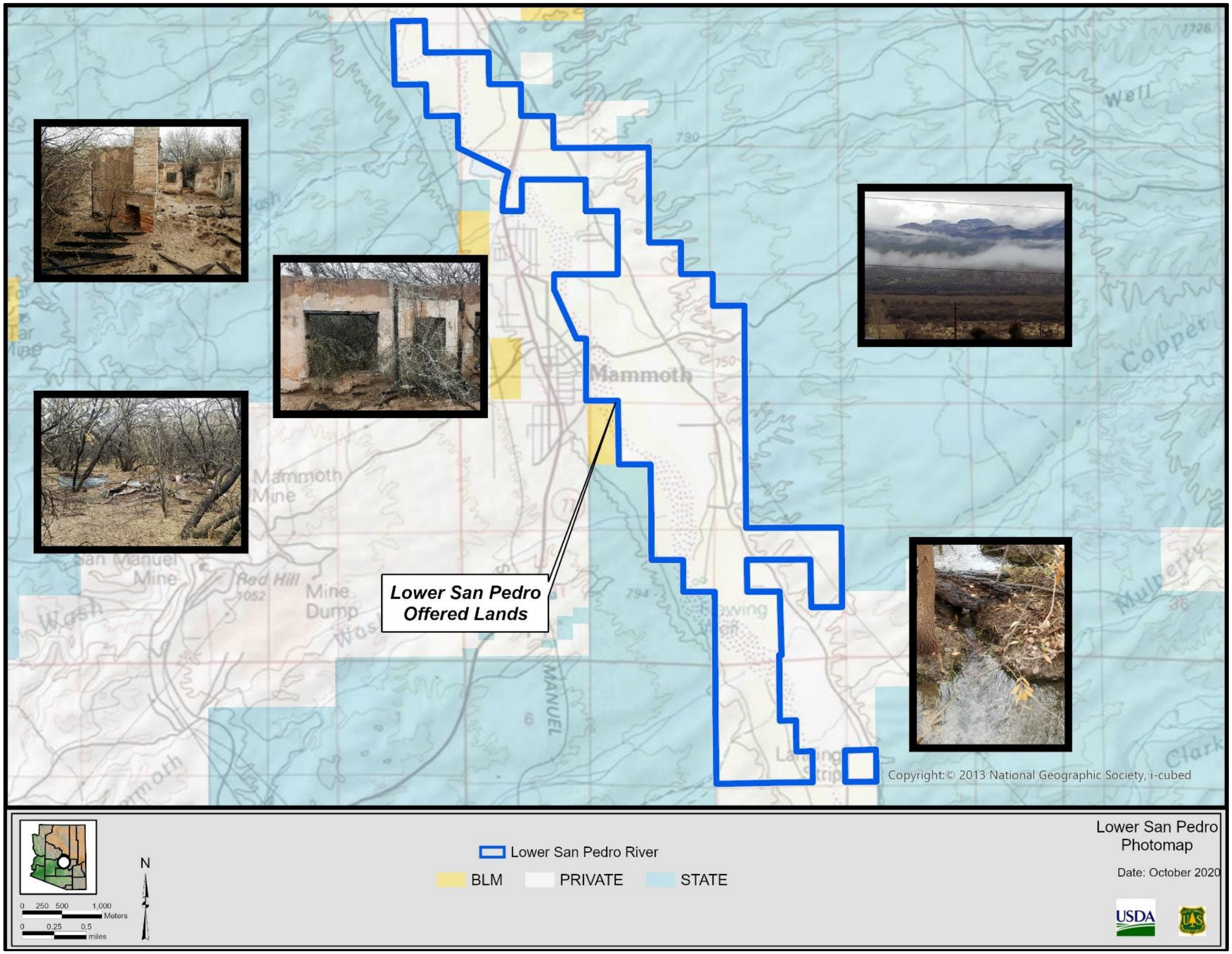

Figure B-11. Lower San Pedro River land exchange parcel

Figure B-12. Photograph of Lower San Pedro River parcel

The Lower San Pedro River Parcel is mostly undeveloped, and the parcel is surrounded by some housing, a materials quarry, the Town of Mammoth Cielo Wastewater Treatment Plant, and undeveloped land. The developed areas have been primarily used, either currently or historically, for grazing, other agricultural, former residential, or research uses, as seen from abandoned structures, corrals, and farm fields. Approximately 15 percent of the parcel has been cleared of native vegetation. Other known uses of the Lower San Pedro River Parcel are primarily recreational: off-road vehicle use, hunting, and shooting facilities. A 1.2-mile-long trail for public access is located within the parcel south of Copper Creek Road. Transfer of the Lower San Pedro River Parcel would render the area unavailable for future housing development. A shooting range, managed by the Lions Club, is not part of the current property to be transferred.

Portions of the parcel were cultivated from at least 1945 until at least the 1950s, when lead and arsenate pesticides and defoliants were historically used on certain crops in Arizona, leading to the possible presence of pesticide residuals in the formerly cultivated soils within the parcel. The parcel is currently managed as an open space by The Nature Conservancy on behalf of Resolution Copper. An on-site storage unit is used for the property manager’s gear.

Current management practices by The Nature Conservancy include monitoring of hydrologic and habitat conditions, removal of grazing within the mesquite bosque, management of fuel loads, and fencing to restrict illegal firewood cutting and access; in the past, practices have included rehabilitating former agricultural areas with the goal of restoring natural hydrologic functions to the area (Nature Conservancy 2016).

Geological Setting

This parcel is located within the Basin and Range physiographic province, which is characterized by elongated mountain ranges trending northwest-southeast, separated by broad alluvial valleys. The parcel is in a broad alluvial valley with the Galiuro Mountains to the east and the Santa Catalina Mountains to the south. Most of the surface geology of the parcel is Holocene-aged river alluvium. An upland area in the eastern portion of the parcel is mapped as deposits from the Pliocene to Middle Miocene, and the extreme southwestern corner of the parcel is mapped as Quaternary-aged surficial deposits.

Biological and Water Resources

Vegetation on the Lower San Pedro River Parcel includes the Arizona Uplands Subdivision of Sonoran Desertscrub and Sonoran Deciduous Riparian Forest biotic communities. Plant species commonly occurring within the parcel include saguaro, velvet mesquite, creosote bush, several species of cholla cacti, and foothill paloverde. The riparian corridor in the parcel includes more than 800 acres of mesquite woodland that features a wetland fed by a flowing thermal artesian well. The parcel's riparian areas and woodlands provide habitat for a wide variety of wildlife, including many migratory bird species, lowland leopard frogs, and native fish. Other riparian species present include desert willow, Goodding's willow, graythorn, Fremont cottonwood, and the non-native tamarisk.

The 2003 ecological overview identified three special status species with some potential to occur within the property: cactus ferruginous pygmy-owl (now delisted); southwestern willow flycatcher (endangered); and western yellow-billed cuckoo (threatened). More recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA or BGEPA, or identified as a BLM sensitive species):

- ESA: Gila chub (endangered); jaguar (endangered); ocelot (endangered)
- BGEPA: bald eagle; golden eagle
- BLM Gila District sensitive species with known or potential occurrence: peregrine falcon; lowland leopard frog; Arizona grasshopper sparrow; ferruginous hawk; gilded flicker; desert purple martin; Gila longfin dace; desert sucker; Sonora sucker; roundtail chub; monarch butterfly; pale Townsend's big-eared bat; greater western mastiff bat; Allen's lappet-browed or big-eared bat; lesser long-nosed bat; California leaf-nosed bat; cave myotis; Sonoran desert tortoise; desert ornate box turtle

Several large washes exist on the parcel, including Cooper, Mammoth, and Turtle Washes, all tributary to the San Pedro River. The San Pedro River is ephemeral to intermittent along the approximately 53,800-foot reach through the parcel; an uncapped artesian well supports a wetland adjacent to the river channel. The San Pedro River is unique as it is one of only two major rivers that flow north out of Mexico into the United States and is one of the few remaining free-flowing rivers in the Southwest. The unique qualities of the San Pedro River ecosystem have earned this riverine system The Nature Conservancy's designation as one of the "Last Great Places on Earth," and it is one of the more important riparian habitats in the Sonoran and Chihuahuan Deserts.

The parcel contains registered wells that indicate that water levels are generally shallow, at less than 60 feet below the ground surface. Two wells on-site that are monitored by The Nature Conservancy of Arizona indicate that groundwater levels are less than 35 feet below the ground surface. Active surface water rights exist for diverting water for wildlife use on the parcels.

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified several RECs on the property. These include two known fuel releases at the property boundaries (but not within the property); the Town of Mammoth wastewater treatment plant, which has permits to discharge pollutants to both the aquifer and surface water upstream of the property; a nearby dry-cleaning operation; and informal dumping. In addition, the former cultivation of the land from at least 1945 until at least the 1950s was noted, as lead and arsenate (arsenic) pesticides and defoliants were historically used on certain crops in Arizona. It is unknown whether routine agricultural application of pesticides has occurred on the property; therefore, it is possible that pesticide residuals (chlorinated pesticides, arsenic, and lead) may be present in the formerly cultivated soils on the property. RECs are not indications that contamination actually exists; these are typically noted so further investigation can take place.

Several cleanups have taken place on the property and were completed in conjunction with the BLM to identify the structures and features desired to remain after completion of the land exchange.

Cultural Resources

A Class III cultural resources inventory performed in 2017 identified 59 archaeological sites within the parcel; 37 of these sites had not been previously identified. Forty sites are recommended eligible for inclusion in the NRHP, and one site has been determined eligible. The sites cover a wide range of periods, from precontact to historic.

Key Documents Describing Lower San Pedro River Parcel

- WestLand Resources Inc. 2025. “Phase I Environmental Site Assessment, Lower San Pedro River, Pinal County, Arizona.” May 15, 2025 (WestLand Resources Inc. 2025f)
- WestLand Resources Inc. 2020. “Phase I Environmental Site Assessment Non-Federal Parcel, Lower San Pedro River, Pinal County, Arizona, Resolution Copper.” September 23, 2020 (WestLand Resources Inc. 2020g)
- WestLand Resources Inc. 2017. “A Cultural Resources Inventory of 3,125 Acres of Private Land Along the Lower San Pedro River Near Mammoth, Pinal County, Arizona, Resolution Copper.” April 11, 2017 (Gruner 2017)
- WestLand Resources Inc. 2017. “Phase I Environmental Site Assessment Non-Federal Parcel, Lower San Pedro River, Pinal County, Arizona, Resolution Copper.” November 1, 2017 (WestLand Resources Inc. 2017d)
- The Nature Conservancy. 2016. “7B Ranch Management Plan.” October 1, 2016 (Nature Conservancy 2016)
- Tucson Audubon Society. 2010. “Avian surveys conducted by Audubon Arizona IBA Program at 7B Ranch, Lower San Pedro River, Mammoth, Arizona, 2006–2010.” January 1, 2010 (Wilbor 2010)
- WestLand Resources Inc. 2003. “Ecological Overview: San Pedro River Parcel, Pinal County, Arizona.” September 10, 2003 (WestLand Resources Inc. 2003)

APPLETON RANCH PARCEL

Parcel Description

The Appleton Ranch Parcel includes 956 acres of non-contiguous private lands south of Elgin in Santa Cruz County, Arizona (figures B-13 and B-14). The parcels are within the Appleton-Whittell Research

Ranch and Las Cienegas National Conservation Area. The parcels are to be administered by the BLM Gila District, Tucson Field Office, as part of the Las Cienegas National Conservation Area. The Las Cienegas National Conservation Area, established in 2000, is a 45,000-acre conservation area containing cottonwood-willow riparian forests and marshlands associated with Cienega Creek, rolling grasslands, and woodlands. Established in 1969 by the Appleton family in partnership with the National Audubon Society, Forest Service, and BLM, the Appleton-Whittell Research Ranch is a sanctuary for native plants and animals and a research facility for the study of grassland ecosystems. The ranch is currently managed by the National Audubon Society.

Figure B-13. Photograph of Appleton Ranch parcel

The parcels that make up the Appleton Ranch Parcel consist of private land and therefore have no mining claims. Federal and State lands surrounding the area are used principally for livestock grazing as well as dispersed recreational activities, including hunting, camping, off-road vehicle use, and hiking. Grazing operations were the primary use until 1969, when the property owner ceased ranching operations to enter into agreements with the BLM, Forest Service, and Audubon Society to use the Research Ranch to study grassland ecology. Although technically not part of the Research Ranch, management on the parcels has been essentially the same: no livestock grazing or other ranching operations, limited residential use, and low-impact ecological study.

Remaining structures within the parcel include a few windmills, wells, and numerous small earthen-bermed reservoirs. These features are accessible via primitive dirt roads from the Research Ranch primitive road network. Additionally, one area was used for residential purposes from the 1980s until 2002, when it was destroyed by a fire. The fire debris was disposed of off-site, leaving only the house foundation and septic system.

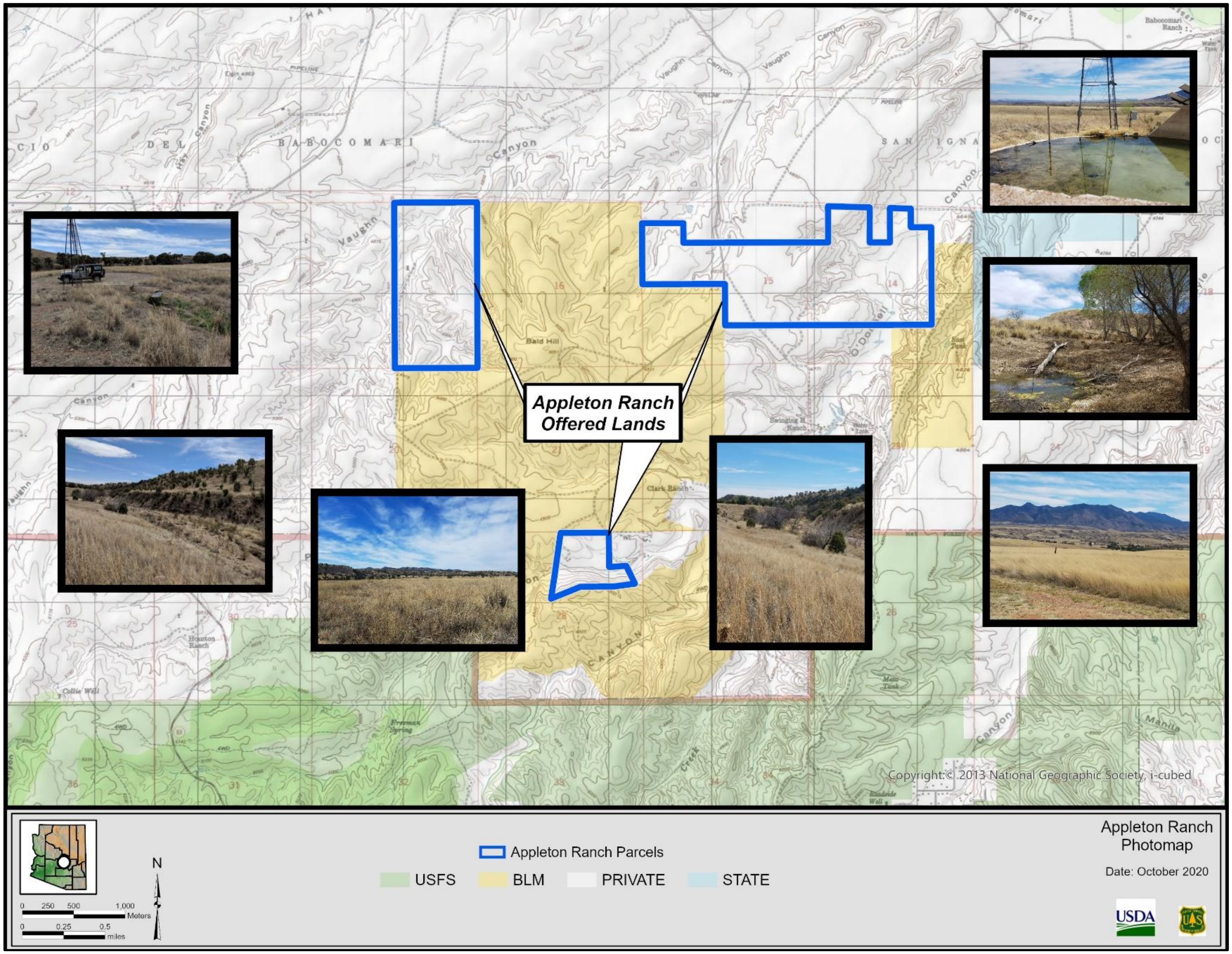

Figure B-14. Appleton Ranch land exchange parcels

Geological Setting

These parcels are located along the streambeds and adjacent upland areas of Post, Vaughn, and O'Donnell Canyons. The upland areas drained by the three on-site streams are known as the Canelo Hills, consisting of rolling terrain that includes the parcels that make up the Appleton Ranch Parcel. The Canelo Hills are in the southern Basin and Range physiographic province and are composed of volcanic and sedimentary rocks. A veneer of soil overlies the bedrock on the upland areas, and eroded material from these uplands has accumulated as alluvium in canyon bottoms. The easternmost parcel's surface geology is mapped as surficial deposits that are predominantly from the Early Pleistocene to Late Pliocene; the western portion is mapped as deposits dating from the Pliocene to Middle Miocene; and the southeast corner is mapped as sedimentary rocks from the Middle Miocene to Oligocene. The other two parcels are mapped as deposits from the Pliocene to Middle Miocene.

Biological and Water Resources

The ranch contains more than 90 species of native grass and 480 native plant species and is used by more than 200 species of birds for wintering, breeding, or migratory habitat.

Biotic communities within the parcels include Semi-Desert Grassland and Madrean Evergreen Oak Woodland. Grasslands are much more extensive than are the oak woodlands. The grassland varies markedly in species composition, density, and structure in the northern part of the Appleton Ranch Parcel, with short-grass grasslands found on south-facing slopes, medium-sized grass stands in swales and north-facing ridges, and tall-grass stands of sacaton in the broader floodplains along several of the washes. Woody vegetation is present in some upland areas as juniper woodlands and along watercourses as mesquite bosques with very limited stands of cottonwood and desert willow. Transfer of the parcels to public ownership would ensure seamless management of the surrounding ecological preserve and contribute to its continued protected status. Primary values of the surrounding Research Ranch that would become extended to Appleton Ranch through acquisition include the following: to provide a wildlife sanctuary that is ungrazed by cattle, conduct or promote ecological research, and provide education about sustainable land management. Large mammals such as pronghorn, deer, peccaries, and coyotes are present within the parcel and pass through often.

The 2004 ecological overview identified 13 special status species with some potential to occur within the property: Huachuca water umbel (endangered); Canelo Hills ladies' tresses (endangered); Gila chub (endangered); Gila topminnow (endangered); desert pupfish (endangered); Chiricahua leopard frog (threatened); Mexican spotted owl (threatened); bald eagle (since delisted but still protected under the BGEPA); western yellow-billed cuckoo (threatened); ocelot (endangered); jaguar (endangered); lesser long-nosed bat (since delisted); and Huachuca springsnail (candidate species, not listed). More recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA or BGEPA, or identified as a BLM sensitive species):

- ESA: northern Mexican gartersnake (threatened)
- BGEPA: bald eagle; golden eagle
- BLM Gila District sensitive species with known or potential occurrence: peregrine falcon; lowland leopard frog; Arizona grasshopper sparrow; ferruginous hawk; gilded flicker; Gila longfin dace; desert sucker; Sonora sucker; roundtail chub; monarch butterfly; pale Townsend's big-eared bat; greater western mastiff bat; Allen's lappet-browed or big-eared bat; lesser long-nosed bat; California leaf-nosed bat; cave myotis; Sonoran desert tortoise; desert ornate box turtle; western burrowing owl

The parcels that make up the Appleton Ranch Parcel are located along streambeds and adjacent upland areas of Post, Vaughn, and O'Donnell Canyons, all of which flow north-northeast toward the Babocomari

River approximately 1.5 miles north of the closest parcel boundaries. The Babocomari River is a tributary to the perennial San Pedro River and varies from ephemeral to perennial along its length. The San Pedro River flows north and northwest to join the Gila River; the Gila River eventually flows westward across Arizona to the Colorado River.

Groundwater levels on or near the property appear at relatively shallow depths (i.e., generally less than 100 feet below surface). Surface water rights exist for stock ponds and erosion-control structures on the parcels that make up the Appleton Ranch Parcel.

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified no RECs on the property.

Cultural Resources

A Class III cultural resources inventory performed in 2015 identified three archaeological sites within the parcel, related to Indigenous resource procurement and processing activities and historic-era ranching. Two sites were recommended eligible for inclusion in the NRHP.

Key Documents Describing Appleton Ranch Parcels

- WestLand Resources Inc. 2025. "Phase I Environmental Site Assessment, Appleton Ranch, Santa Cruz County, Arizona." May 15, 2025 (WestLand Resources Inc. 2025b)
- WestLand Resources Inc. 2020. "Phase I Environmental Site Assessment Non-Federal Parcel, Appleton Ranch, Santa Cruz County, Arizona Resolution Copper." September 4, 2020 (WestLand Resources Inc. 2020d)
- WestLand Resources Inc. 2016. "Phase I Environmental Site Assessment Non-Federal Parcel, Appleton Ranch, Santa Cruz County, Arizona Resolution Copper." September 1, 2016 (WestLand Resources Inc. 2016e)
- WestLand Resources Inc. 2015. "A Cultural Resources Inventory of 940 Acres Within the Appleton-Whittell Research Ranch for Resolution Copper Mining, LLC." December 1, 2015 (Daughtrey 2015)
- Cogan, R.C., Conservation Coordinator, Appleton-Whittell Research Ranch, National Audubon Society. 2012. "Herpetofauna of the Appleton-Whittell Research Ranch." November 1, 2012 (Cogan 2012)
- WestLand Resources Inc. 2004. "Ecological Overview Appleton Ranch Parcel, Santa Cruz County, Arizona." May 26, 2004 (WestLand Resources Inc. 2004b)
- Breckenfeld, D.J., and D. Robinett, Natural Resources Conservation Service. 2001. "Soil and Range Resource Inventory of the National Audubon Society Appleton-Whittell Research Ranch, Santa Cruz County, Arizona." April 1, 2001 (Breckenfeld and Robinett 2001)
- McLaughlin, S.P., E.L. Geiger, and J.E. Bowers. 2001. "Flora of the Appleton-Whittell Research Ranch, northeastern Santa Cruz County, Arizona." January 1, 2001 (McLaughlin et al. 2001)

DRIPPING SPRINGS PARCEL

Parcel Description

The Dripping Springs Parcel is a 160-acre parcel located northeast of Kearny in Gila and Pinal Counties, Arizona, in the Basin and Range physiographic province (figures B-15 and B-16). It lies within a rugged upland area northeast of the Gila River, which is the main drainage feature for the area. The parcel, situated in the Dripping Spring Mountains near Tam O'Shanter Peak and Steamboat Mountain, is almost completely surrounded by BLM-administered lands, with some adjacent ASLD-administered State Trust land. The parcel would be administered by the BLM Gila District, Tucson Field Office. The parcel consists of private land and therefore has no mining claims.

The parcel's abundant rock formations are known for offering recreational rock-climbing opportunities. Hunting is also a permitted recreational activity in the area. Historically, the areas surrounding the parcel were the focus of prospecting, mining, and settlement during the Historic period. In general, the parcel is characterized as undeveloped open space, with past land use limited to small-scale mine exploration, intermittent hunting and recreational shooting, and possibly hiking. Land use in the surrounding areas appears to be similar to the Dripping Springs Parcel but may also include livestock grazing. Vehicular access to the parcel is unavailable as no road accesses the area. Because the property is only accessible by overland hiking across rugged terrain, the parcel has been effectively isolated from human use and has not been subjected to overuse by hikers, off-road vehicle use, hunters, miners, or ranchers.

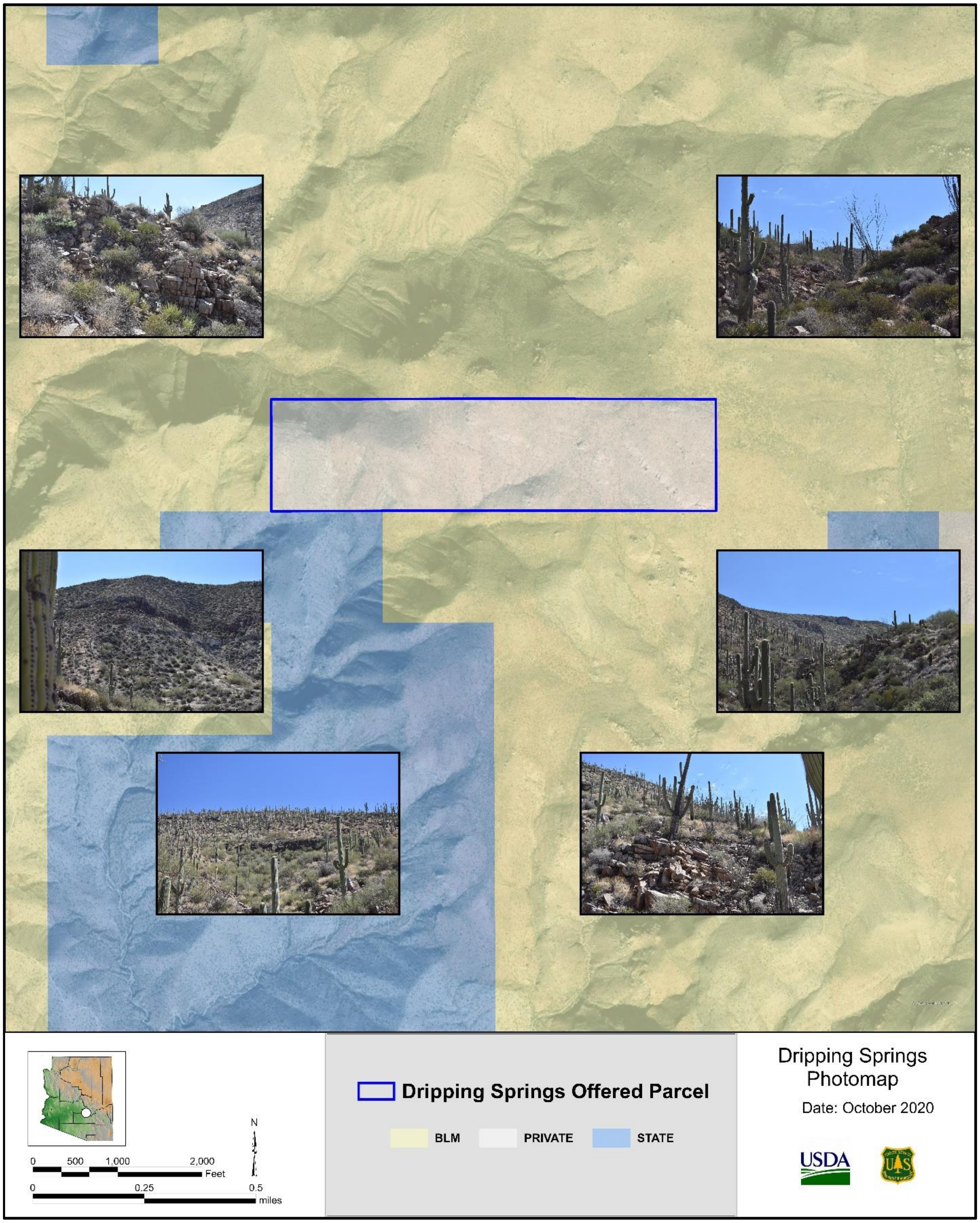

Figure B-15. Dripping Springs land exchange parcel

Figure B-16. Photograph of Dripping Springs parcel

Geological Setting

This parcel is in the Dripping Spring Mountains northeast of Kearny, which is a rugged upland area northeast of the Gila River, the main drainage feature for the region. Notable peaks are Steamboat Mountain to the west and Tam O'Shanter Peak to the southeast. This parcel is within the Basin and Range physiographic province and the Dripping Spring Mountains have extensive and complex fault systems composed of tilted fault blocks. The surface geology of the parcel is predominantly sedimentary rocks of Precambrian age (Middle Proterozoic). A fault bisects the parcel and defines the boundary between two tilted fault blocks. The western portion of the parcel is mapped as sedimentary rocks from the Mississippian, Devonian, and Cambrian.

Biological and Water Resources

Vegetation on the parcel encompasses two biotic communities: Arizona Upland Subdivision of the Sonoran Desertscrub and Semi-desert Grassland. The western portion of the parcel includes both biotic communities, whereas the eastern portion is entirely grasslands. Common plant species within the Dripping Springs Parcel include saguaro, paloverde, jojoba, velvet mesquite, desert hackberry, hopbush, brittlebush, cholla, and prickly pear cacti. Grassland species include desert spoon, Palmer's agave, catclaw acacia, scrub live oak, beargrass, one-seed juniper, threeawn grasses, sideoats grama grass, black grama grass, curly mesquite grass, bullgrass, and broom snakeweed. Groupings of limestone endemics were also noted within the parcel, including sandpaper bush, Mariola, crucifixion thorn, desert zinnia, and beebush. The xeric washes on the parcel support dense velvet mesquite and catclaw mimosa.

The 2016 ecological overview and more recent screening identified a number of other special status species with some potential to occur within the property (either under the ESA or BGEPA, or identified as a BLM sensitive species):

- ESA: western yellow-billed cuckoo (threatened); ocelot (endangered); jaguar (endangered); southwestern willow flycatcher (endangered). Further comments received from BLM suggest that habitat for these species likely does not exist on the Dripping Springs Parcel.
- BGEPA: bald eagle; golden eagle
- BLM Gila District sensitive species with known or potential occurrence: peregrine falcon; gilded flicker; monarch butterfly; pale Townsend's big-eared bat; greater western mastiff bat; Allen's lappet-browed or big-eared bat; lesser long-nosed bat; California leaf-nosed bat; cave myotis; Sonoran desert tortoise; pinyon jay; desert purple martin

No surface water features appear to be present within the Dripping Springs Parcel, with the exception of very minor ephemeral headwater drainage features that are tributary to the Gila River.

Hazardous Materials

A Phase I environmental site assessment was completed for the property in May 2025 that identified no RECs on the property. Historic-era mine features were noted during the work. However, although there is the potential for these mine features to impact groundwater or produce acid mine drainage, no discoloration or distressed vegetation was noted around the existing features. In addition, the potential for impacts on surface or groundwater by contact with mineralized rock is not considered likely.

Cultural Resources

A Class III cultural resources inventory performed in 2016 identified four newly recorded archaeological sites, two of which were recommended for inclusion in the NRHP. These archaeological sites point to use by Indigenous people and to Late Historic period Euro-American uses.

Key Documents Describing Dripping Springs Parcel

- WestLand Resources Inc. 2025. " Phase I Environmental Site Assessment, Dripping Springs, Gila and Pinal Counties, Arizona." May 15, 2025 (WestLand Resources Inc. 2025d)
- WestLand Resources Inc. 2020. "Phase I Site Assessment Non-Federal Parcel - Dripping Springs Gila County, Arizona." September 4, 2020 (WestLand Resources Inc. 2020f)
- WestLand Resources Inc. 2016. "A Cultural Resources Inventory of the 159.64-Acre Dripping Spring Parcel, Gila and Pinal Counties, Arizona." September 28, 2016 (Charest 2016a)
- WestLand Resources Inc. 2016. "Ecological Overview Dripping Springs Parcel Gila and Pinal Counties, Arizona: Resolution Copper." December 1, 2016 (WestLand Resources Inc. 2016b)
- WestLand Resources Inc. 2015. "Phase I Site Assessment Non-Federal Parcel - Dripping Springs Gila County, Arizona." June 1, 2015 (WestLand Resources Inc. 2015a)

Town of Superior Lands

PARCEL DESCRIPTION

If requested by the Town of Superior, Section 3003 additionally authorizes and directs the transfer of 545 acres of NFS lands to the Town of Superior (figure B-17). On October 15, 2021, the Town of Superior requested to purchase the Superior Airport Contiguous Parcels and the Federal reversionary interest to the 265-acre Superior Airport Parcel. On March 25, 2022, the Town updated its request to purchase to include the 30-acre parcel known as Fairview Cemetery.

Figure B-17. Photograph of Town of Superior parcel

The NFS lands to be conveyed to the Town of Superior include a 30-acre parcel known as Fairview Cemetery and 250 acres contained in four parcels known as the Superior Airport Contiguous Parcels. In addition, the Town of Superior lands include a Federal reversionary interest to a 265-acre Superior Airport parcel. The Superior Airport parcel was originally owned by the Federal Government, then deeded to Pinal County, and subsequently conveyed to the Town of Superior with the condition that it could only be used as an airstrip. Any other use would cause the property to revert to Federal land (the reversionary interest). As part of the land exchange, the Federal reversionary interest would be removed, after which time the parcel could be used for non-airport purposes.

Wildlife Species Occurrence on Offered Lands

The following tables contain analysis of which special status species occur on lands managed by either Tonto National Forest (see table B-2), Coconino National Forest (see table B-3), or BLM (see table B-4).

Each of these administrative jurisdictions has a separate list of species that are considered to have special status.

Plant Species Occurrence on Offered Lands

Special status plants also occur on the various parcels and are listed in table B-5. Each of these administrative jurisdictions has a separate list of species that are considered to have special status. The jurisdictions are also concerned with noxious weeds and their presence for management goals. The likelihood of occurrence of noxious and invasive weeds is shown in table B-6.

Table B-2. Special status wildlife species for offered lands under Tonto National Forest jurisdiction

Unless otherwise noted, range or habitat information is from the following sources: Arizona Game and Fish Department (2025); Brennan (2008); eBird (2025); NatureServe Explorer (2025); Tonto National Forest (2000); U.S. Fish and Wildlife Service (2016b); U.S. Forest Service (2017f)

Common Name (*Scientific Name*)	**Status***	**HDMS Records within 2 miles**	**Baseline Data Records**	**Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)**	**Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)**	**Geographic Range in Arizona**	**Likelihood of Occurrence in Offered Lands Parcels**
Amphibians							
Western barking frog (*Craugastor augusti cactorum*)	TNF: S†	No	No	No	Species prefers outcrops or cave on rocky slopes in oak/pine-oak associations; elevational range of 4,200–6,200 feet above mean sea level (amsl).	Occurs in rocky outcrops in Cochise and southern Pima and Santa Cruz Counties, in the Quinlan, Santa Rita, Patagonia, Huachuca, and Pajarito Mountain ranges	Unlikely to occur
Chiricahua leopard frog (*Lithobates chiricahuensis*)	ESA: T (Gila, Pinal, Yavapai Counties)	No	No	No	Species is known from mid-elevation wetland communities such as tanks, lakes, reservoirs, streams, and rivers; often surrounded by an arid environment. Elevational range of 3,281–8,890 feet amsl.	Occurs along the Mogollon Rim and in mountainous areas of southeastern Arizona	Possible site: Turkey Creek
Northern leopard frog (*Lithobates pipiens*)	TNF: S†	No	No	No	Range of habitats that includes grasslands, brush land, and forests, usually in permanent water; elevational range of 2,640–9,155 feet amsl.	Found in northern and central Arizona	Unlikely to occur
Lowland leopard frog (*Lithobates yavapaiensis*)	TNF: S, SCC	No	No	No	Aquatic systems in elevations ranging from 480–6,200 feet amsl; species is found using a variety of habitats, both natural and human made.	Occurs in central and southeastern Arizona	Possible sites: Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek
Birds							
Northern goshawk (*Accipiter gentilis*)	TNF: S†	Yes, Turkey Creek	No	No	Species is found in wide variety of forest associations, including deciduous, coniferous, and mixed forests; prefers mature forests for breeding in elevations ranging from 4,750–9,120 feet amsl.	Occurs throughout Arizona	Possible site: Turkey Creek
Clark's grebe (*Aechmophorus clarkia*)	TNF: SCC‡	No	No	No	Requires large, deep bodies of water for fishing.	Occurs throughout the Arizona in winter; breeding occurs in Mohave and La Paz Counties.	Unlikely to occur
Western grebe (*Aechmophorus occidentalis*)	TNF: SCC‡	No	No	No	Requires large, deep bodies of water for fishing.	Occurs throughout the Arizona in winter; breeding occurs in Coconino, Yavapai, Maricopa, Pinal, and Pima Counties.	Unlikely to occur
Golden eagle (*Aquila chrysaetos*)	BGEPA: Yes	No	Yes, Apache Leap South (WestLand Resources Inc. 2017c)	eBird	Species prefers mountainous areas; nesting occurs at elevations between 4,000 and 10,000 feet amsl.	Occurs throughout Arizona	Known site: Cave Creek; possible sites: Apache Leap, Tangle Creek, Turkey Creek
Red-faced warbler (*Cardellina rubrifrons*)	TNF: SCC‡	No	No	No	Summer resident only; occurs in montane fir (*Abies* spp.), pine, and pine-oak woodlands	Occurs in mountain ranges from southeastern Arizona to Mogollon Rim.	Possible site: Turkey Creek
American dipper (*Cinclus mexicanus*)	TNF: SCC	No	No	No	Fast-flowing montane streams.	Occurs in central and northern Arizona.	Unlikely to occur
Western yellow-billed cuckoo (DPS) (*Coccyzus americanus*)	ESA: T (All Arizona counties)	Yes, Apache Leap South, Tangle Creek	No	eBird	Typically found in riparian woodland vegetation (cottonwood [*Populus* spp.], willow [*Salix* spp.], or saltcedar [*Tamarix* spp.]) at elevations below 6,600 feet amsl. Dense understory foliage appears to be an important factor in nest site selection.	Occurs throughout Arizona	Known site: Cave Creek; possible sites: Tangle Creek, Turkey Creek,
Gilded flicker (*Colaptes chrysoides*)	TNF: SCC	Yes, Cave Creek	Yes, Apache Leap South, Cave Creek (WestLand Resources Inc. 2017c)	eBird: Apache Leap South, Cave Creek	Habitat includes stands of large saguaros (*Carnegiea gigantea*), Joshua trees (*Yucca* spp.), and low-elevation riparian groves.	Occurs in southern, central, and western Arizona.	Known site: Apache Leap, Cave Creek
Olive-sided flycatcher (*Contopus cooperi*)	TNF: SCC‡	No	No	No	Species is only present in summer; breeding habitat includes mixed-conifer forests near open areas with lots of snags; in migration can be found in almost any habitat.	Occurs throughout Arizona.	Possible site: Turkey Creek
Broad-billed hummingbird (*Cynanthus latirostris*)	TNF: SCC‡	Yes, Apache Leap South	No	No	Preferred habitat is rocky canyons in desert-like mountain habitats; can be found in foothills, canyons, arroyos, along streams, and in deserts.	Occurs in southeast and central Arizona.	Known site: Apache Leap; possible sites: Cave Creek, Tangle Creek

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Parcels
Southwestern willow flycatcher (*Empidonax traillii extimus*)	ESA: E (All counties except Navajo County)	No	No	No	Found in dense riparian habitats along streams, rivers, and other wetlands where cottonwood (*Populus* spp.), willow (*Salix* spp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus* spp.), and arrowweed (*Pluchea sericea*) are present. Nests are found in thickets of trees and shrubs, primarily those that are 13 to 23 feet tall, among dense, homogeneous foliage. Habitat occurs at elevations below 8,500 feet amsl.	Occurs throughout Arizona	Possible sites: Cave Creek, Tangle Creek, Turkey Creek
American peregrine falcon (*Falco peregrinus anatum*)	TNF: S†	No	Yes, Apache Leap South (WestLand Resources Inc. 2017c)	eBird: Cave Creek, Apache Leap South	Species is found near cliffs overlooking habitats that support large numbers of birds; elevational range from 400–9,000 feet amsl.	Occurs throughout Arizona	Known sites: Cave Creek, Apache Leap; possible sites: Tangle Creek, Turkey Creek
MacGillivray's warbler (*Geothlypis tolmiei*)	TNF: SCC‡	Yes, Cave Creek	No	eBird: Apache Leap South, Cave Creek	The species is primarily a migratory species in Arizona; however, during breeding season, the species is known to take residence over the higher, forested elevations of northern Arizona, especially along the Mogollon Rim. Preferred habitat during breeding season includes mixed-coniferous forests with riparian areas that have low shrubs; in migration species can be found in a variety of habitats.	Occurs throughout Arizona.	Possible sites: Apache Leap, Cave Creek, Tangle Creek
Yellow-eyed junco (*Junco phaeonotus*)	TNF: S, SCC	No	No	No	Habitat consists of open coniferous forest and pine-oak associations.	Occurs in central and southeastern Arizona	Unlikely to occur
Lewis's woodpecker (*Melanerpes lewis*)	TNF: SCC‡	No	No	No	Distribution of the species is across the Four Corner states, the northern Rocky Mountains, and over the interior mountainous regions of Oregon and California. In Arizona, the species is common year-round across the higher, forested elevations of northern Arizona with some expansion of range into the southern Arizona deserts during the winter. Breeding habitats include open forests and woodlands that include oaks, ponderosa, pine (*Pinus ponderosa*), riparian woodlands, and orchards.	Occurs throughout Arizona.	Possible sites: Cave Creek
Elf owl (*Micrathene whitneyi*)	TNF: SCC‡	No	No	No	Species is present during breeding season only; found in desert-woodland washes, riparian forests, upland deserts, evergreen woodlands, and canyon riparian forests.	Occurs in the southern half of Arizona.	Possible sites: Cave Creek, Tangle Creek, Turkey Creek
Sulphur-bellied flycatcher (*Myiodynastes luteiventris*)	TNF: S†, SCC‡	No	No	No	Preferred habitat includes sycamore-walnut canyons; species only present during breeding season.	Occurs in southeast and central Arizona	Unlikely to occur
Desert purple martin (*Progne subis hesperia*)	TNF: SCC‡	No	No	No	Habitat consists of Sonoran Desert with many large saguaros near water.	Occurs in southern and central Arizona.	Possible sites: Apache Leap, Cave Creek
Yuma Ridgeway's rail (*Rallus longirostris yumanensis*)	ESA: E (Gila, La Paz, Maricopa, Mohave, Pinal, and Yuma Counties)	No	No	No	In Arizona, found at elevations below 4,500 feet amsl in freshwater marshes, which are often dominated by cattails (*Typha* spp.), bulrushes (*Isolepis* spp.), and sedges (*Carex* spp.).	Occurs in western and central Arizona	Unlikely to occur
Mexican spotted owl (*Strix occidentalis lucida*)	ESA: T (All counties except La Paz and Yuma Counties)	No	No	No	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–Gambel oak. Nests in live trees on natural platforms (e.g., dwarf mistletoe [*Arceuthobium* spp.] brooms), snags, and canyon walls at elevations between 4,100 and 9,000 feet amsl.	Occurs throughout Arizona, except La Paz and Yuma Counties	Possible site: Turkey Creek
Pacific wren (*Troglodytes pacificus*)	TNF: SCC	No	No	No	Commonly found from the coastal islands of Alaska southward to the northern Rockies and northern California, the species has been known to winter near the Mogollon Rim. Wintering habitat in Arizona consists of woodlands and brushy vegetation.	Occurs along the Mogollon Rim.	Possible sites: Cave Creek, Turkey Creek
Fish							
Gila longfin dace (*Agosia chrysogaster chrysogaster*)	TNF: SCC‡	Yes, Apache Leap South, Tangle Creek, Turkey Creek, Cave Creek	No	No	Habitat varies from intermittent hot low-desert streams to clear, cool streams at higher elevations; prefers medium to small sized streams with sandy/gravely bottoms and pools with some cover. Species is normally found below 4,900 feet amsl.	Occurs in central, southern, and southeastern Arizona.	Possible sites: Cave Creek, Tangle Creek, Turkey Creek

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Parcels
Desert sucker (*Catostomus clarki*)	TNF: S †	Yes, Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek	No	No	Species is found in flowing pools of streams and rivers with a gravel substrate; elevational range of 480–8,840 feet amsl.	Occurs in central, southern, and southeastern Arizona	Possible sites: Tangle Creek, Turkey Creek
Sonora sucker (*Catostomus insignis*)	TNF: S †	Yes, Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek	No	No	Found in a variety of habitats from warm rivers to cool streams, prefers gravelly or rocky pools in elevations ranging from 1,210–8,730 feet amsl.	Occurs in central, southern, and southeastern Arizona	Possible sites: Turkey Creek
Desert pupfish (*Cyprinodon macularius*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Santa Cruz, and Yavapai Counties)	No	No	No	Found in shallow waters of springs, marshes and small streams, prefers soft substrates and clear water; elevational range of 1,200–3,450 feet amsl.	Occurs in Cochise, Gila, Graham, Maricopa, Pima, Santa Cruz, and Yavapai Counties	Unlikely to occur
Gila chub (*Gila intermedia*)	ESA: E (Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties)	No	No	No	Normally found in smaller headwater streams, cienegas, and springs or marshes of the Gila River Basin at elevations between 2,720 and 5,420 feet amsl.	Occurs in Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties	Possible sites: Tangle Creek, Turkey Creek
Headwater chub (*Gila nigra*)	TNF: S †	No	No	No	Species is found in the middle to headwater reaches of medium-sized streams with large pools and cover; elevational range of 92–2,000 feet amsl.	Occurs in Gila, Graham, and Yavapai Counties	Possible sites: Tangle Creek, Turkey Creek
Roundtail chub (*Gila robusta*)	TNF: S, SCC	No	No	No	Species prefers cool to warm water in mid-elevation streams and rivers with pools up to 6.6 feet deep near flowing water. Cover consists of boulders, tree roots, deep water, and submerged vegetation. Elevational range of 1,210–7,220 feet amsl.	Occurs in Apache, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pinal, and Yavapai Counties	Possible sites: Tangle Creek, Turkey Creek
Spikedace (*Meda fulgida*)	ESA: E (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Pinal, and Yavapai Counties)	No	No	No	Found in medium-sized to large perennial streams, where it inhabits moderate-velocity to fast waters over gravel and rubble substrates, typically at elevations below 6,000 feet amsl.	Occurs in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Pinal, and Yavapai Counties	Possible sites: Tangle Creek, Turkey Creek
Gila topminnow (incl. Yaqui) (*Poeciliopsis occidentalis*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties)	No	No	No	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.	Occurs in Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties	Unlikely to occur
Colorado pikeminnow (*Ptychocheilus lucius*)	ESA: E (Gila, Maricopa, and Yavapai Counties)	No	No	No	Juveniles prefer slackwater, backwater, and side channels with little or no flow and silty substrates; adults use turbid, deep, and fast-flowing waters. Species was reintroduced at an elevation of 1,960 feet amsl.	Occurs in Gila, Maricopa, and Yavapai Counties	Unlikely to occur
Loach minnow (*Tiaroga cobitis*)	ESA: E (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Pinal, and Yavapai Counties)	No	No	No	Found in small to large perennial creeks and rivers, typically in shallow, turbulent riffles with cobble substrate, swift currents, and filamentous algae at elevations below 8,000 feet amsl.	Occurs in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Pinal, and Yavapai Counties	Unlikely to occur
Razorback sucker (*Xyrauchen texanus*)	ESA: E (Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pinal, Yavapai, and Yuma Counties)	No	No	No	Found in backwaters, flooded bottomlands, pools, side channels, and other slower-moving habitats at elevations below 6,000 feet amsl.	Occurs in Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pinal, Yavapai, and Yuma Counties	Unlikely to occur
Invertebrates							
Netwing midge (*Agathon arizonicus*)	TNF: S, SCC	No	No	No	Confined to areas in the immediate vicinity of rapidly flowing streams.	Occurs in Gila County in Arizona	Unlikely to occur
Parker's cylloepus riffle beetle (*Cylloepus parkeri*)	TNF: : S†, SCC‡	No	No	No	Habitat consists of small, rocky streams.	Occurs in Yavapai County, Arizona	Possible sites: Cave Creek, Tangle Creek

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Parcels
Monarch butterfly (*Danaus plexippus*)	ESA: PT TNF: SCC	Yes, Apache Leap South	No	No	A migratory species found in a variety of habitats; monarch butterflies require milkweed (family Asclepiadaceae) for breeding. During fall migration in Arizona, monarch butterflies for nectar from a variety of native plants and garden plants. Populations in Arizona can migrate either to California or Mexico for winter or may overwinter in the low deserts in California. In the Southwest, migrating monarch butterflies often occur near water sources (e.g., rivers, creeks, riparian corridors, roadside ditches, irrigated gardens). In the low deserts of Arizona, monarch butterflies breed in late August to early September; however, monarch butterfly reproduction in Arizona is more common in higher elevations and is less common in the Sonoran desertscrub (Morris et al. 2015).	Occurs throughout Arizona.	Possible sites: Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek
A mayfly (*Fallceon eatoni*)	TNF: S, SCC	No	No	No		Occurs in Gila County, Arizona	Unlikely to occur
Ancha Mountainsnail (*Oreohelix anchana*)	TNF: SCC	No	No	No	Limestone rock slide, talus	Known from a single slide of limestone rocks on the northeast slope of Center Mountain, in the Sierra Ancha Mountains, Tonto National Forest, Gila County, Arizona (Gregg 1953).	Unlikely to occur
Verde Rim springsnail (*Pyrgulopsis glandulosa*)	TNF: SCC	Yes, Tangle Creek	No	No	Habitat is freshwater, benthic, desert springs at 5,280 feet (1,610 m) amsl.	Nelson Place Spring complex, consisting of two spring separate by 150 meters that form the headwaters of Sycamore Creek, Yavapai County, Arizona	Unlikely to occur
Fossil springsnail (*Pyrgulopsis simplex*)	TNF: S, SCC	No	No	No	Habitat is only present at headsprings and upper section of the outflow, generally found on rocks or aquatic macrophytes in moderate current.	Occurs in Gila and Yavapai Counties, Arizona	Unlikely to occur
Phoenix talussnail (*Sonorella allynsmithi*)	TNF: SCC‡	No	No	No	Species prefers talus slopes in mid-elevation areas of the Sonoran Desert.	Occurs in Maricopa County, Arizona.	Unlikely to occur
Sierra Ancha talussnail (*Sonorella anchana*)	TNF: SCC	No	No	No	Habitat is terrestrial, occurs in rock slides, talus slopes.	Known from several close proximity localities in the Sierra Ancha Mountains: near Reynolds Creek, a rockslide northeast slope of Center Mountain, and on the southwest side of Center Mountain, Tonto National Forest, Gila County, Arizona	Unlikely to occur
Richinbar talussnail (*Sonorella ashmuni*)	TNF: SCC	Yes, Tangle Creek	No	No	Loose talus slopes, rocky hillsides, and cracks and fissures in rock faces.	Widely distributed on Tonto National Forest. Gila, Maricopa, and Yavapai Counties. Occurs at Richinbar, southeast of Prescott at 3,500 feet amsl, to west of the Agua Fria River to 3 miles east of Bubblebee, Arizona; also occurs along Seven Springs Road, near Locust Spring, and near Roundtree Canyon; occurs on northeast slope of Center Mountain in the Sierra Anchas.	Unlikely to occur
Milk Ranch talussnail (*Sonorella micromphala*)	TNF: SCC	No	No	No	Occurs in talus slopes and found in crevices one to several feet below the surface at elevations of 6,000 to 7,000 feet amsl.	Mogollon Rim in vicinity of Pine, Gila County, Arizona.	Unlikely to occur
Roosevelt talussnail (*Sonorella rooseveltiana*) (=*Myotophallus rooseveltianus*) + (*S.r. fragilis*)	TNF: SCC	No	No	No	Loose talus slopes, rocky hillsides, and cracks and fissures in rock faces.	Known from five locations on the Tonto National Forest. Occurrences in Gila County, west and southwest of Roosevelt Dam.	Unlikely to occur
A caddisfly (*Wormaldia planae*)	TNF: S†	No	No	No		Occurs in Gila and Yavapai Counties	Unlikely to occur

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Parcels
Mammals							
Sonoran pronghorn (*Antilocapra americana sonoriensis*)	ESA: EXPN (La Paz, Maricopa, Pima, Pinal, Santa Cruz and Yuma Counties)	No	No	No	Found in Sonoran desertscrub within broad, intermountain, alluvial valleys with creosote (*Larrea tridentata*)–bursage (*Ambrosia* spp.) and palo verde–mixed cacti associations at elevations between 2,000 and 4,000 feet amsl.	Occurs in southwestern Arizona	Unlikely to occur
Mexican gray wolf (*Canis lupus baileyi*)	ESA: E (Apache and Greenlee Counties), EXPN TNF: ENE	No	No	No	Vegetation type not important; species mostly needs sufficient prey such as deer and elk. Reintroduction areas are typically rugged lands in coniferous forest. Elevational range of 3,000–12,000 feet amsl.	Occurs in Apache and Greenlee Counties; reintroductions are occurring in Apache County. All packs are currently located on the Apache-Sitgreaves National Forests (Arizona Game and Fish Department 2025).	Unlikely to occur
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)	TNF: S, SCC	Yes, Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek	No	No	In summer the species is found in caves and mines in elevations ranging from 550–7,520 feet amsl; in winter the species is found in cold caves, lava tubes, and mines in higher elevations than summer.	Occurs throughout Arizona	Possible sites: Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek
Spotted bat (*Euderma maculatum*)	TNF: S [†]	No	No	No	Habitat can vary widely from dry deserts to conifer forest, prefer to roost in crevices and cracks in cliff faces; elevational range of 110–8,670 feet amsl.	Occurs in Yuma and Maricopa Counties and eastern Arizona	Possible sites: Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek
Allen's lappet-browed or big-eared bat (*Idionycteris phyllotis*)	TNF: S, SCC	No	No	No	Found in ponderosa pine, pinyon-juniper, Mexican woodland and riparian areas with cottonwoods, sycamores, and willows; also have records from desertscrub and white fir habitats; elevational range of 1,320–9,800 feet amsl.	Occurs throughout Arizona except for deserts in southwestern Arizona	Possible sites: Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek
Western red bat (*Lasiurus blossevillii*)	TNF: S, SCC	No	No	No	Habitat consists of riparian and wooded areas, typically roosts in cottonwood trees; elevational range of 1,900–7,200 feet amsl.	Occurs south-central to southern and southeastern Arizona	Possible sites: Apache Leap South, Cave Creek, Tangle Creek, Turkey Creek
Western yellow bat (*Lasiurus xanthinus*)	AGFD: SGCN 1B (added in accordance with request from AGFD)	Yes, Apache Leap South	No	No	Species may be associated with palm trees (Arecaceae), sycamores, hackberries (*Celtis* spp.), and cottonwoods. Habitat consists of riparian and wooded areas; typically roosts in cottonwood trees; elevational range of 1,900–7,200 feet amsl.	Occurs throughout Arizona, historically found near Phoenix and Casa Grande.	Possible sites: Apache Leap South, Cave Creek
Ocelot (*Leopardus [Felis] pardalis*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Pinal, and Santa Cruz Counties)	No	No	No	In Arizona, this species has typically been observed in subtropical thorn forest, thornscrub, and dense, brushy thickets at elevations below 8,000 feet amsl and is often found in riparian bottomlands. The critical habitat component is probably dense cover near the ground and complete avoidance of open country.	Occurs in Cochise, Gila, Graham, Maricopa, Pima, Pinal, and Santa Cruz Counties	Unlikely to occur
California leaf-nosed bat (*Macrotus californicus*)	TNF: SCC[‡]	Yes, Apache Leap South	No	No	Species prefers Sonoran desertscrub, roosts in mines, caves, and rock shelters that have large areas of ceiling and flying space; elevational range of 160–3,980 feet amsl.	Occurs south of the Mogollon Plateau and in Mohave County.	Possible sites: Apache Leap South, Cave Creek, Tangle Creek
Fringed myotis (*Myotis thysanodes*)	TNF: SCC	Yes, Turkey Creek	No	No	Ranges from desert to grasslands to woodland and are most frequently captured in oak-pinyon woodlands and other open, coniferous, middle elevation forests; roosts in caves, mine tunnels, large snags, under exfoliating bark, and buildings; may hibernate in lower elevation caves and mines; elevational range of 4,000 to 8,437 feet amsl.	Throughout Arizona, but not known from northeast or southwest corners of state. In winter, their range shifts to the southernmost counties and Mohave County.	Possible sites: Apache Leap South, Turkey Creek
Jaguar (*Panthera once*)	ESA: E (Cochise, Pima, and Santa Cruz Counties)	No	No	No	Variety of habitats, prefers lowland wet habitats but also occurs in drier habitats such as oak-pine woodlands; elevational range of sightings in Arizona were from 5,200–5,700 feet amsl.	Occurs in Cochise, Pima, and Santa Cruz Counties	Unlikely to occur
Brazilian free-tailed bat (*Tadarida brasiliensis*)	AGFD: SGCN 1B (added in accordance with request from AGFD)	Yes, Apache Leap South	No	No	A species that is distributed across much of the southern United States with the largest concentrations residing in the western United States. Preferred habitat is the Upper and Lower Sonoran life zones and commonly roosts in caves, abandoned mines, under bridges, buildings, and hollow trees. Elevational ranges 450–8,475 feet amsl.	Occurs throughout Arizona during summer; only occurs in south half of Arizona during winter.	Possible site: Apache Leap South
Reptiles							
Sonoran Desert tortoise (*Gopherus morafkai*)	TNF: S, SCC	No	No	No	Habitat includes Mojave desert scrub to semi-desert grassland and interior chaparral; elevational range of 510–5,300 feet amsl.	Occurs in the southern and southwestern part of Arizona	Possible sites: Apache Leap South, Cave Creek, Tangle Creek

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Parcels
Northern Mexican gartersnake (*Thamnophis eques megalops*)	ESA: T (All counties except Maricopa and Yuma Counties)	No	No	No	Species prefers cienegas, streams, and rivers in habitats ranging from upland Sonoran desertscrub to montane coniferous forests; elevational range of 1,000–6,700 feet amsl.	Occurs throughout Arizona except Maricopa and Yuma Counties	Possible site: Turkey Creek
Narrow-headed gartersnake (*Thamnophis rufipunctatus*)	ESA: T (Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties)	No	No	No	Species prefers pinyon-juniper and pine-oak woodlands, ranging into ponderosa pine at elevations between 2,440 and 8,080 feet amsl; species needs permanent water source.	Occurs in Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties	Possible site: Turkey Creek
Bezy's night lizard (*Xantusia bezyi*)	TNF: S, SCC	No	No	No	Species prefers rocky slopes in upland Sonoran desertscrub and chaparral vegetation types; elevational range of 2,400–5,800 feet amsl.	Occurs in Gila, Pinal, and Maricopa Counties	Possible site: Apache Leap South

* Status Definitions

Arizona Game and Fish Department (AGFD)

SGCN 1B = Species of Greatest Conservation Need Tier 1B. Vulnerable species.

After publication of the FEIS in 2021, the AGFD updated its state wildlife action plan; however, SWCA Environmental Consultants made no related changes within the tables in this document. The AGFD statuses in this document are based on "Arizona's State Wildlife Action Plan: 2012–2022" (Arizona Game and Fish Department 2012).

Not all species with an SGCN status are addressed as part of these analyses; however, SWCA added Brazilian free-tailed bat (*Tadarida brasiliensis*) and western yellow bat (*Lasiurus xanthinus*) to the analysis at the request of the AGFD, which is a cooperating agency.

Endangered Species Act (ESA):

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.

PT = Proposed Threatened. Any species the U.S. Fish and Wildlife Service has determined is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and the agency has proposed a draft rule to list as threatened.

T = Threatened. Threatened species are those that are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

EXPN = A population of a species designated under Section 10(j) of the ESA that the U.S. Fish and Wildlife Service, based on review of the best available information, believes is not essential for the continued existence of the species. Regulatory restrictions are considerably reduced under an EXPN designation.

Tonto National Forest (TNF):

ENE = Reintroduced populations designated as Experimental - Nonessential, under the ESA.

S = Sensitive. Under the "Tonto National Forest Land and Resource Management Plan" (U.S. Forest Service 1985b), sensitive species are those identified by a regional forester for which population viability is a concern, as evidenced by 1) significant current or predicted downward trends in population number or density or 2) significant current or predicted downward trends in habitat capability that would reduce the species' existing distribution.

SCC = Species of conservation concern. The "Tonto National Forest Land Management Plan" (U.S. Forest Service 2023d) defines SCC as species that are native to and known to occur in the TNF and for which there are substantial concerns about the species' ability to persist within the TNF. These species are listed on the most recently published list of Species of Conservation Concern for the Tonto National Forest (U.S. Forest Service 2021a).

There is substantial overlap between SCC and S. SWCA Environmental Consultants (SWCA) evaluated S and draft SCC for the FEIS, which was published in 2021. After publication of the FEIS, the publication of "Tonto National Forest Land Management Plan" (U.S. Forest Service 2023d) resulted in the need for revision of the FEIS and this table. SWCA deleted no species or statuses from the table and added only species newly designated as SCC.

† SWCA evaluated this species as an S during initial analysis and FEIS publication; however, the species was not included as an SCC in the "Tonto National Forest Land Management Plan" (U.S. Forest Service 2023d).

‡ SWCA evaluated this species as a draft SCC during initial analysis and FEIS publication; however, the species was not included as an SCC in the "Tonto National Forest Land Management Plan" (U.S. Forest Service 2023d).

Bald and Golden Eagle Protection Act (BGEPA):

Yes = A species protected by a U.S. Federal statute that protects two species of eagle.

Table B-3. Special status wildlife species for offered lands under Coconino National Forest jurisdiction

Unless otherwise noted, range or habitat information is from the following sources: Arizona Game and Fish Department (2025); Brennan (2008); eBird (2025); NatureServe Explorer (2025); Tonto National Forest (2000); U.S. Fish and Wildlife Service (2016b); U.S. Forest Service (2017f)

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands
Amphibians							
Arizona toad (*Anaxyrus microscaphus*)	CNF: S	Yes	No	Reptiles of Arizona	Species prefers rocky stream and canyons in pine-oak associations and in lower deserts. Elevation ranges from sea level to 8,000 feet above mean sea level (amsl).	Found in canyons and floodplains south of the Mogollon Rim	Known to occur: East Clear Creek
Chiricahua leopard frog (*Lithobates chiricahuensis*)	ESA: T (All Arizona counties except La Paz, Mohave, Pinal, Yuma)	Yes	No	No	Species is known from mid-elevation wetland communities such as tanks, lakes, reservoirs, streams, and rivers; often surrounded by an arid environment. Elevational range of 3,281–8,890 feet amsl.	Species occurs along the Mogollon Rim and in mountainous areas of southeastern Arizona	Known to occur: East Clear Creek
Northern leopard frog (*Lithobates pipiens*)	CNF: S	Yes	No	Reptiles of Arizona	Range of habitats that includes grasslands, brush land, and forests, usually in permanent water; elevational range of 2,640–9,155 feet amsl.	Found in northern and central Arizona	Known to occur: East Clear Creek
Lowland leopard frog (*Lithobates yavapaiensis*)	CNF: S	No	No	No	Aquatic systems in elevations ranging from 480–6,200 feet amsl; species is found using a variety of habitats, both natural and human made.	Species occurs in central and southeastern Arizona	Unlikely to occur
Birds							
Northern goshawk (*Accipiter gentilis*)	CNF: S	Yes	Yes (WestLand Resources Inc. 2017c)	eBird	Species is found in wide variety of forest associations including deciduous, coniferous and mixed forests; prefers mature forests for breeding in elevations ranging from 4,750–9,120 feet amsl.	Species is found statewide in tall, forested mountains	Known to occur: East Clear Creek
Clark's grebe (*Aechmophorus clarkii*)	CNF: S	No	No	No	Requires large, deep bodies of water for fishing.	Species is present on large reservoirs and along the Colorado River	Unlikely to occur
Golden eagle (*Aquila chrysaetos*)	BGEPA: Yes	No	No	No	Species prefers mountainous areas; nesting occurs at elevations between 4,000 and 10,000 feet amsl.	Species is found throughout Arizona	May occur: East Clear Creek
Western burrowing owl (*Athene cunicularia hypugaea*)	CNF: S	No	No	No	Species is found in open, dry grasslands, deserts, and agricultural lands; elevation ranges from 650–6,140 feet amsl.	Species is found in southern Arizona and in agricultural areas in Maricopa and Pinal Counties	Unlikely to occur
Ferruginous hawk (*Buteo regalis*)	CNF: S	No	No	No	Species is found in open grasslands, scrublands, and woodlands in winter; ranges in elevation from 3,500 to 6,000 feet amsl.	Species is found throughout the state in winter, breeds on Colorado Plateau	Unlikely to occur
Common black hawk (*Buteogallus anthracinus*)	CNF: S	Yes	No	eBird	Species only present during breeding season; riparian obligate found along streams between 1,750 and 7,080 feet amsl.	Breeding range is along streams draining the Mogollon Rim; species can be found throughout the state during migration	Known to occur: East Clear Creek
Western yellow-billed cuckoo (DPS) (*Coccyzus americanus occidentalis*)	ESA: T (all Arizona counties) CNF: S	No	No	No	Typically found in riparian woodland vegetation—cottonwood (*Populus* spp.), willow (*Salix* spp.), or saltcedar (*Tamarix* spp.)—at elevations below 6,600 feet amsl. Dense understory foliage appears to be an important factor in nest site selection.	Species occurs at its highest concentrations in Arizona are along the Agua Fria, San Pedro, upper Santa Cruz, and Verde River drainages and Cienega and Sonoita Creeks.	Unlikely to occur
Southwestern willow flycatcher (*Empidonax traillii extimus*)	ESA: E (all Arizona counties except Navajo County)	No	No	No	Found in dense riparian habitats along streams, rivers, and other wetlands where cottonwood (*Populus* spp.), willow (*Salix* spp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus* spp.), and arrowweed (*Pluchea sericea*) are present. Nests are found in thickets of trees and shrubs, primarily those that are 13 to 23 feet tall, among dense, homogeneous foliage. Habitat occurs at elevations below 8,500 feet amsl.	Species breeds very locally along the middle Gila, Salt, Verde, middle to lower San Pedro, and upper San Francisco Rivers; also, locally around Colorado River near the mouth of the Little Colorado River, the headwaters of the Little Colorado and locations south of Yuma; species can be found in a variety of habitat types during migration	Unlikely to occur
American peregrine falcon (*Falco peregrinus anatum*)	CNF: S	Yes	(WestLand Resources Inc. 2017c)	No	Species is found near cliffs overlooking habitats that support large numbers of birds; range in elevations from 400–9,000 feet amsl.	Species breeds throughout state only on cliffs near abundant prey items	Known to occur: East Clear Creek
California condor (*Gymnogyps californianus*)	ESA: ENE (Apache, Coconino, Mohave, Navajo and Yavapai Counties)	No	No	No	Roosts and nest in steep terrain with rock outcroppings, cliffs, and caves. High perches are necessary to create the strong updrafts the bird requires to lift into flight, and open grasslands or savannahs are essential for searching for food.	Occurs mostly along the Grand Canyon and Kaibab Plateau in northern Arizona	Unlikely to occur
Bald eagle (*Haliaeetus leucocephalus*)	CNF: S BGEPA: Yes	Yes	(WestLand Resources Inc. 2017c)	eBird	Habitat components include large bodies of water with lots of coastline and tall perches above water to allow for hunting.	Found throughout much of the central and northern parts of Arizona, near large bodies of water	Known to occur: East Clear Creek

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands
Abert's towhee (*Melozone aberti*)	CNF: S	No	No	No	Habitat includes woodlands and thickets usually near water, occurs in riparian woods, exotic vegetation such as salt cedar, along agricultural fields and in suburban areas.	Species is found in lower elevation areas of central, southern and western Arizona	Unlikely to occur
Mexican spotted owl (*Strix occidentalis lucida*)	ESA: T (All counties except La Paz and Yuma Counties)	Yes	(WestLand Resources Inc. 2017c)	No	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 (*Pinus ponderosa*)–Gambel oak (*Quercus gambelii*). Nests in live trees on natural platforms (e.g., dwarf mistletoe [*Arceuthobium* spp.] brooms), snags, and canyon walls at elevations between 4,100 and 9,000 feet amsl.	Found throughout the state in summer in forested mountains with steep canyons; found in almost all counties of Arizona; recently species has been found wintering in lower riparian areas such as Tonto Creek and Sabino Canyon	Known to occur: East Clear Creek
Fish							
Longfin dace (*Agosia chrysogaster*)	CNF: S	No	No	No	Habitat varies from intermittent hot low-desert stream to clear, cool streams at higher elevations; prefers medium-sized to small streams with sandy/gravely bottoms and pools with some cover. Species is normally found below 4,900 feet amsl.	Occurs in central, southern, and southeastern Arizona	Unlikely to occur
California floater (*Anodonta californiensis*)	CNF: S	Yes	No	No	Species prefers shallow areas, less than 2 meters deep in unpolluted lakes, reservoirs, and perennial streams with relatively stable water levels of low velocity flow regimes; elevational range of 4,000–8,670 feet amsl.	Occurs in Apache and Greenlee Counties, found in the Black River part of the Gila River Basin System	Known to occur: East Clear Creek
Desert sucker (*Catostomus clarki*)	CNF: S	No	No	No	Species is found in flowing pools of streams and rivers with a gravel substrate; elevational range of 480–8,840 feet amsl.	Found throughout the Gila River basin and in tributaries to the Bill Williams River	Possible to occur: East Clear Creek
Bluehead sucker (*Catostomus discobolus discobolus*)	CNF: S	No	No	No	Species occurs in a variety of habitats from small streams to large rivers ranging from cold clear streams to warm, turbid rivers; elevational range of 2,001–6,759 feet amsl.	Occurs in the Colorado River mainstem and Grand Canyon tributaries	Unlikely to occur
Sonora sucker (*Catostomus insignis*)	CNF: S	No	No	No	Found in a variety of habitats from warm rivers to cool streams, prefers gravelly or rocky pools in elevations ranging from 1,210–8,730 feet amsl.	Found in the Gila and Bill Williams river basins	Possible to occur: East Clear Creek
Little Colorado sucker (*Catostomus* sp.)	CNF: S	Yes	(WestLand Resources Inc. 2017c)	No	Species prefers creeks, small to medium-sized rivers and impoundments most often with abundant cover; elevational range of 2,200–7,100 feet amsl.	Species is endemic to the upper portion of the Little Colorado River and some of its north-flowing tributaries	Known to occur: East Clear Creek
Gila chub (*Gila intermedia*)	ESA: E (Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties)	No	No	No	Normally found in smaller headwater streams, cienegas, and springs or marshes of the Gila River Basin at elevations below 2,720–5,420 feet amsl.	Currently found in the following drainages: Santa Cruz River, Middle Gila River, San Pedro River, Agua Fria River and Verde River	Possible to occur: East Clear Creek
Headwater chub (*Gila nigra*)	CNF: S	No	No	No	Species is found in the middle to headwater reaches of medium-sized streams with large pools and cover; elevational range of 925–2,000 feet amsl.	Current range includes streams in the Verde River basin, Tonto Creek subbasin and San Carlos River basin in Yavapai, Gila and Graham Counties	Unlikely to occur
Roundtail chub (*Gila robusta*)	CNF: S	No	(WestLand Resources Inc. 2017c)	No	Species prefers cool to warm water in mid-elevation streams and rivers with pools up to 6.6 feet deep near flowing water. Cover consists of boulders, tree roots, deep water and submerged vegetation. Elevational range of 1,210–7,220 feet amsl.	Occurs in tributaries to the Little Colorado River, tributaries to the Bill Williams River basin, the Salt River and its tributaries, the Verde River and its tributaries, Aravaipa Creek and Eagle Creek	Known to occur: East Clear Creek
Little Colorado spinedace (*Lepidomeda vittata*)	ESA: T (Apache, Coconino, and Navajo Counties)	Yes	(WestLand Resources Inc. 2017c)	No	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.	Found in East Clear Creek and its tributaries, Chevelon and Silver Creeks, and Nutrioso Creek and the Little Colorado River	Known to occur: East Clear Creek
Spikedace (*Meda fulgida*)	ESA: E (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Pinal, and Yavapai Counties)	No	No	No	Found in medium-sized to large perennial streams, where it inhabits moderate-velocity to fast waters over gravel and rubble substrates, typically at elevations below 6,000 feet amsl.	In Arizona, populations are found in the middle Gila, and Verde Rivers and Aravaipa and Eagle Creeks.	Unlikely to occur
Gila trout (*Oncorhynchus gilae gilae*)	ESA: T (Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties)	No	No	No	Species is found in small mountain headwater streams, which are generally narrow and shallow, and rarely exceed 70 degrees Fahrenheit. Siltation is usually low and cobble is the predominant substrate; Elevational range of 5,446–9,220 feet amsl.	Historically found in Verde and Agua Fria drainages. Species has been introduced to Gap Creek and Dude Creek, but those populations are in jeopardy or have been extirpated. Species could still be present in tributaries to the Verde River such as Oak Creek and West Clear Creek.	Unlikely to occur

Common Name (*Scientific Name*)	**Status***	**HDMS Records within 2 miles**	**Baseline Data Records**	**Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)**	**Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)**	**Geographic Range in Arizona**	**Likelihood of Occurrence in Offered Lands**
Gila topminnow (*Poeciliopsis occidentalis occidentalis*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties)	No	No	No	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	Unlikely to occur
Colorado pikeminnow (*Ptychocheilus lucius*)	ESA: E, ENE (Gila, Maricopa, and Yavapai Counties)	No	No	No	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.	Considered extirpated from the state, two experimental populations have been stocked into Salt and Verde River drainages	Unlikely to occur
Loach minnow (*Tiaroga cobitis*)	ESA: E (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Pinal, and Yavapai Counties)	No	No	No	Found in small to large perennial creeks and rivers, typically in shallow, turbulent riffles with cobble substrate, swift currents, and filamentous algae at elevations below 8,000 feet amsl.	Its range in Arizona is limited to reaches in the East Fork of the White River (Navajo County); Aravaipa, Deer, and Turkey Creeks (Graham and Pinal Counties); San Francisco and Blue Rivers; and Eagle, Campbell Blue, and Little Blue Creeks (Greenlee County). A population was discovered in the Black River in 1996.	Unlikely to occur
Razorback sucker (*Xyrauchen texanus*)	ESA: E (Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pinal, Yavapai, and Yuma Counties)	No	No	No	Found in backwaters, flooded bottomlands, pools, side channels, and other slower-moving habitats at elevations below 6,000 feet amsl.	In Arizona, populations are restricted to Lakes Mohave and Mead and the lower Colorado River below Havasu in the Lower Basin. In the Upper Basin, small remnant populations are found in the Green, Yampa, and main stem Colorado Rivers.	Unlikely to occur
Invertebrates							
A mayfly (*Homoleptohyphes quercus*)	CNF: S	No	No	No	Habitat is primarily lotic depositional, some lentic littoral. Larvae are common in flowing waters ranging from small streams to large rivers, but they occur in areas of slow current. Preferred substrates include silt, fine sand, gravel, woody debris, moss and other plant growth on stones, exposed roots of terrestrial plants, and at the base of rooted aquatic vegetation.	Occurs in Coconino and Pinal Counties	May occur: East Clear Creek
Four-spotted skipperling (*Piruna polingii*)	CNF: S	No	No	No	Habitat includes moist woodland openings with lush vegetation, meadows, ravines, and stream sides in the mountains.	Occurs from central Arizona south to Mexico	May occur: East Clear Creek
Page springsnail (*Pyrgulopsis morrisoni*)	CNF: S	No	No	No	Occurs on firm substrates such as rocks, vegetation, floating algal mats and submerged woody debris in association with slow to moderate flows of head springs, seeps and lateral runs; elevational range of 3,300–3,600 feet amsl.	Occurs in several springs along Oak Creek in the Bubbling Springs complex, the Page Springs complex, and on private land in the Verde Valley	Unlikely to occur
Fossil springsnail (*Pyrgulopsis simplex*)	CNF: S	No	No	No	Habitat is only present at headsprings and upper section of the outflow, generally found on rocks or aquatic macrophytes in moderate current.	Occurs in Gila and Yavapai Counties, Arizona	Unlikely to occur
Nitocris fritillary (*Speyeria nokomis nitocris*)	CNF: S	No	No	No	Occurs in alpine meadows, the species' host plant is *Viola nephrophylla*.	Occurs in eastern Arizona	Unlikely to occur
Nokomis fritillary (*Speyeria nokomis nokomis*)	CNF: S	No	No	No	Occurs in streamside meadows and open seepage areas with an abundance of violets in generally desert landscapes.	Occurs in eastern Arizona	Unlikely to occur
Mammals							
Mexican gray wolf (*Canis lupus baileyi*)	ESA: E (Apache and Greenlee Counties)	No	No	No	Vegetation type not important, species mostly needs sufficient prey such as deer and elk. Reintroduction areas are typically rugged lands in coniferous forest. Elevational range of 3,000–12,000 feet amsl.	Occurs in Apache and Greenlee Counties, reintroductions are occurring in Apache County. All packs are currently located on the Apache-Sitgreaves National Forest (Arizona Game and Fish Department 2025).	Unlikely to occur
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)	CNF: S	No	No	No	In summer the species is found in caves and mines in elevations ranging from 550–7,520 feet amsl; in winter the species is found in cold caves, lava tubes, and mines in higher elevations than summer.	Widespread, documented in almost all counties	May occur: East Clear Creek
Spotted bat (*Euderma maculatum*)	CNF: S	No	No	No	Habitat can vary widely from dry deserts to conifer forest, prefer to roost in crevices and cracks in cliff faces; elevational range of 110–8,670 feet amsl.	Not well known, records from Yuma County, Maricopa County, Kaibab Plateau and some heard-only records from eastern Arizona	May occur: East Clear Creek
Greater western mastiff bat (*Eumops perotis californicus*)	CNF: S	No	No	No	Species prefers lower and upper Sonoran desertscrub near cliffs with lots of crevices; elevational range of 240–8,475 feet amsl.	Year-round and widespread in the state	May occur: East Clear Creek

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Records (eBird, SWCA, or Forest Service Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands
Allen's lappet-browed or big-eared bat (*Idionycteris phyllotis*)	CNF: S	No	No	No	Found in ponderosa pine, pinyon-juniper, Mexican woodland and riparian areas with cottonwoods, sycamores and willows, also have records from desertscrub and white fir habitats; elevational range of 1,320–9,800 feet amsl.	Widespread in Arizona except for deserts in southwestern Arizona, most records from southern Colorado Plateau, Mogollon Rim and adjacent mountain ranges	May occur: East Clear Creek
Western red bat (*Lasiurus blossevillii*)	CNF: S	No	No	No	Habitat consists of riparian and wooded areas, typically roosts in cottonwood trees; elevational range of 1,900–7,200 feet amsl.	South-central to southern and southeastern Arizona, summer resident only; historic records from Sierra Ancha Mountains and Queen Creek	May occur: East Clear Creek
Long-tailed vole (*Microtus longicaudus*)	CNF: S	No	No	No	Occurs in various habitats ranging from dense coniferous forests to rocky alpine tundra, sagebrush semidesert, moist meadows, marshes, and forest-edge habitat; elevational range of sea level to 11,975 feet amsl.	Found in northern and central Arizona	Unlikely to occur
Navajo Mogollon vole (*Microtus mogollonensis navaho*)	CNF: S	No	No	No	Species prefers clear-cut pine flat that is growing back as grassland with scattered oaks, rocky slopes with open uncut ponderosa forest with openings, and pinyon-juniper with scattered ponderosa pine stands.	Occurs in Apache and Coconino Counties, in the Little Colorado headwaters, Canyon Diablo, Lower Little Colorado, and Upper Verde watersheds	Unlikely to occur
Black-footed ferret (*Mustela nigripes*)	ESA: EXPN (Coconino and Yavapai Counties)	No	No	No	Occurs in arid prairies, characterized as Plains and Great Basin Grassland community; elevational range of 5,250–6,234 feet amsl.	Species is reintroduced into the Aubrey Valley in Coconino County	Unlikely to occur
Wupatki Arizona pocket mouse (*Perognathus amplus cineris*)	CNF: S	No	No	No	Found in various types of desert scrub habitats and in some scrub oak habitats; elevational range of 3,900–5,420 feet amsl.	Found only from Echo Cliffs in the north, south and east to the Colorado River and to the Little Colorado River, south of Wupatki National Monument	Unlikely to occur
Plains harvest mouse (*Reithrodontomys montanus*)	CNF: S	No	No	No	Occurs in well-developed grasslands in areas with less than 50% bare soil; elevational range of 275–6,300 feet amsl.	Species occurs in southeastern Arizona	Unlikely to occur
Merriam's shrew (*Sorex merriami leucogenys*)	CNF: S	No	No	No	Sagebrush steppe.	Northeastern Arizona	Unlikely to occur
Dwarf shrew (*Sorex nanus*)	CNF: S	No	No	No	Occupies numerous habitats, including rocky areas in alpine tundra and partly into subalpine coniferous forest, other types of rocky slopes, sedge marsh, subalpine meadow, dry brushy slopes, arid shortgrass prairie, dry stubble fields, and pinyon-juniper woodland.	Occurs along the Kaibab Plateau, San Francisco Peaks, and White Mountains	Unlikely to occur
Reptiles							
Reticulate Gila monster (*Heloderma suspectum suspectum*)	CNF: S	No	No	No	Occurs in Sonoran Desert and extreme western edge of Mohave Desert, less frequent in desert grassland and rare in oak woodland; most common in undulating rocky foothills, bajadas, and canyons.	Occurs in the western and southwestern portion of the state	Unlikely to occur
Northern Mexican gartersnake (*Thamnophis eques megalops*)	ESA: T (All counties except Maricopa and Yuma Counties) CNF: S	No	No	No	Species prefers cienegas, streams, and rivers in habitats ranging from upland Sonoran desertscrub to montane coniferous forests; elevational range of 1,000–6,700 feet amsl.	Species is found along the Mogollon Rim and a few isolated populations in south-central Arizona	Unlikely to occur
Narrow-headed gartersnake (*Thamnophis rufipunctatus*)	ESA: T (Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties) CNF: S	No	No	No	Species prefers pinyon-juniper and pine-oak woodlands, ranging into ponderosa pine at elevations between 2,440 and 8,080 feet amsl; species needs permanent water source.	Species is found along the Mogollon Rim	Unlikely to occur

* Status Definitions

Endangered Species Act (ESA):

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.

T = Threatened. Threatened species are those that are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

EXPN = A population of a species designated under Section 10(j) of the ESA that the U.S. Fish and Wildlife Service, based on review of the best available information, believes is not essential for the continued existence of the species. Regulatory restrictions are considerably reduced under an EXPN designation.

Coconino National Forest (CNF):

S = Sensitive. Species identified by a Regional Forester for which population viability is a concern, as evidenced by: a. significant current or predicted downward trends in population number or density; b. significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Bald and Golden Eagle Protection Act (BGEPA):

Yes = A species protected by a U.S. Federal statute that protects two species of eagle.

Table B-4. Special status wildlife species for offered lands under BLM jurisdiction

Unless otherwise noted, range or habitat information is from the following sources: Arizona Game and Fish Department (2025); Brennan (2008); Bureau of Land Management (2017b); eBird (2025); NatureServe Explorer (2025); Tonto National Forest (2000); U.S. Fish and Wildlife Service (2016b); U.S. Forest Service (2017f)

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (eBird, SWCA or BLM Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in BLM Offered Lands
Amphibians							
Arizona toad (*Anaxyrus microscaphus*)	BLM: S	No	No	No	Species prefers rocky stream and canyons in pine-oak associations and in lower deserts; elevational range from sea level to 8,000 feet amsl.	Found in canyons and floodplains south of the Mogollon Rim	May occur: Dripping Springs
Sonoran green toad (*Anaxyrus retiformis*)	BLM: S	No	No	No	Species is found in rain pools, wash bottoms, and areas near water in semi-arid mesquite-grassland, creosote desert and upland saguaro-paloverde desert; elevational range of 500–3,225 feet amsl.	Found in south-central Arizona, from Organ Pipe Cactus National Monument to 9 miles north of Pima/Pinal County line in Santa Rosa Valley	Unlikely to occur
Great Plains narrow-mouthed toad (*Gastrophryne olivacea*)	BLM: S	No	No	No	Found in mesquite semi-desert grassland to oak woodland near streams, springs, and rain pools; elevational range of sea level to 4,100 feet amsl.	Found from Santa Cruz County north to Maricopa County and west to near Ajo, in Pima County	Unlikely to occur
Plains leopard frog (*Lithobates blairi*)	BLM: S	No	No	No	Found near stream, ponds, reservoirs, marshes, or irrigation ditches in prairies and desert grasslands; elevational range of 4,060–5,880 feet amsl.	Isolated population located on the western side of the Chiricahua Mountains, Cochise County, Arizona	Unlikely to occur
Chiricahua leopard frog (*Lithobates chiricahuensis*)	ESA: T (All Arizona counties except La Paz, Mohave, Pinal, Yuma) BLM: S	Yes, Appleton Ranch	No	Reptiles of Arizona	Species is known from mid-elevation wetland communities such as tanks, lakes, reservoirs, streams, and rivers; often surrounded by an arid environment. Elevational range of 3,281–8,890 feet amsl.	Species occurs along the Mogollon Rim and in mountainous areas of southeastern Arizona	May occur: Appleton Ranch
Northern leopard frog (*Lithobates pipiens*)	BLM: S	No	No	No	Range of habitats that includes grasslands, brush land, and forests, usually in permanent water; elevational range of 2,640–9,155 feet amsl.	Found in northern and central Arizona	Unlikely to occur
Lowland leopard frog (*Lithobates yavapaiensis*)	BLM: S	Yes, Dripping Springs, Lower San Pedro River	No	Reptiles of Arizona	Aquatic systems in elevations ranging from 480–6,200 feet amsl; species is found using a variety of habitats, both natural and human made.	Species occurs in central and southeastern Arizona	Known to occur: Lower San Pedro River, Dripping Springs; possible site: Appleton Ranch
Birds							
Northern goshawk (*Accipiter gentilis*)	BLM: S	No	No	No	Species is found in wide variety of forest associations, including deciduous, coniferous, and mixed forests; prefers mature forests for breeding in elevations ranging from 4,750–9120 feet amsl.	Species is found statewide in tall, forested mountains	Unlikely to occur
Arizona grasshopper sparrow (*Ammodramus savannarum ammolegus*)	BLM: S	Yes, Appleton Ranch, Dripping Springs	No	eBird: Appleton Ranch, Dripping Springs, Lower San Pedro River	Species preferred habitat is open grasslands with some shrubs between 3,800 and 5,300 feet amsl.	Species is found in southern Arizona year-round	Known to occur: Appleton Ranch, Dripping Springs, Lower San Pedro River
Golden eagle (*Aquila chrysaetos*)	BLM: S BGEPA: Yes	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	eBird: Appleton Ranch, Dripping Springs, Lower San Pedro River	Species prefers mountainous areas; nesting occurs at elevations between 4,000 and 10,000 feet amsl.	Species is found throughout Arizona	Known to occur: Appleton Ranch, Dripping Springs, Lower San Pedro River
Western burrowing owl (*Athene cunicularia hypugaea*)	BLM: S	Yes, Appleton Ranch	No	eBird: Appleton Ranch	Species is found in open, dry grasslands, deserts, and agricultural lands; elevation ranges from 650–6,140 feet amsl.	Species is found in southern Arizona and in agricultural areas in Maricopa and Pinal Counties	Known to occur: Appleton Ranch
Ferruginous hawk (*Buteo regalis*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	eBird: Appleton Ranch, Dripping Springs, Lower San Pedro River	Species is found in open grasslands, scrublands, and woodlands in winter; ranges in elevation from 3,500 to 6,000 feet amsl.	Species is found throughout the state in winter, breeds on Colorado Plateau	Known to occur: Appleton Ranch, Dripping Springs, Lower San Pedro River
Western yellow-billed cuckoo (DPS) (*Coccyzus americanus*)	ESA: T (all Arizona counties) BLM: S	Yes, Appleton Ranch, Lower San Pedro River	Yes, Lower San Pedro River (Wilbor 2010)	eBird: Appleton Ranch, Lower San Pedro River	Typically found in riparian woodland vegetation (cottonwood, willow, or saltcedar) at elevations below 6,600 feet amsl. Dense understory foliage appears to be an important factor in nest site selection.	Species occurs at its highest concentrations in Arizona along the Agua Fria, San Pedro, upper Santa Cruz, and Verde River drainages and in Cienega and Sonoita Creeks.	Known to occur: Appleton Ranch, Lower San Pedro River
Gilded flicker (*Colaptes chrysoides*)	BLM: S	Yes, Dripping Springs, Lower San Pedro River	No	eBird: Appleton Ranch, Lower San Pedro River	Habitat includes stands of large saguaros, Joshua trees, and low-elevation riparian groves.	Species is restricted to the Sonoran Desert	Known to occur: Appleton Ranch, Lower San Pedro River; possible site: Dripping Springs

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (eBird, SWCA or BLM Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in BLM Offered Lands
Southwestern willow flycatcher (*Empidonax traillii extimus*)	ESA: E (all Arizona counties except Navajo County) BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	eBird: Lower San Pedro River	Found in dense riparian habitats along streams, rivers, and other wetlands where cottonwood (*Populus* spp.), willow (*Salix* spp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus* spp.), and arrowweed (*Pluchea sericea*) are present. Nests are found in thickets of trees and shrubs, primarily those that are 13 to 23 feet tall, among dense, homogeneous foliage. Habitat occurs at elevations below 8,500 feet amsl.	Species breeds very locally along the middle Gila, Salt, Verde, middle to lower San Pedro, and upper San Francisco Rivers; also, locally around Colorado River near the mouth of the Little Colorado River, the headwaters of the Little Colorado and locations south of Yuma; species can be found in a variety of habitat types during migration	May occur: Lower San Pedro River
American peregrine falcon (*Falco peregrinus anatum*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	eBird: Appleton Ranch	Species is found near cliffs overlooking habitats that support large numbers of birds; range in elevations from 400–9,000 feet amsl.	Species breeds throughout state only on cliffs near abundant prey items	Known to occur: Appleton Ranch; possible sites: Lower San Pedro River, Dripping Springs
Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*)	BLM: S	No	No	No	Species prefers streamside cottonwoods and willows near mesquite bosques; can also be found in dry washes with large mesquite, paloverde, ironwood, and saguaro.	Occurs in Organ Pipe Cactus National Monument and suburban Tucson	May occur: Lower San Pedro River
California condor (*Gymnogyps californianus*)	ESA: EXPN (Apache, Coconino, Mohave, Navajo and Yavapai Counties) BLM: S	No	No	No	Roosts and nest in steep terrain with rock outcroppings, cliffs, and caves. High perches are necessary to create the strong updrafts the bird requires to lift into flight, and open grasslands or savannahs are essential for searching for food.	Occurs mostly along the Grand Canyon and Kaibab Plateau in northern Arizona	Unlikely to occur
Pinyon jay (*Gymnorhinus cyanocephalus*)	BLM: S	No	No	No	Habitat consists of pinyon-juniper woodland, sometimes found in pine forests and in scrub oak or sagebrush areas.	Species is found along and above the Mogollon Rim in northern Arizona	May occur: Dripping Springs
Bald eagle (*Haliaeetus leucocephalus*)	BLM: S BGEPA: Yes	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Habitat components include large bodies of water with lots of coastline and tall perches above water to allow for hunting.	Found throughout much of the central and northern parts of Arizona, near large bodies of water	Unlikely to occur
California black rail (*Laterallus jamaicensis coturniculus*)	BLM: S	No	No	No	Habitat in Arizona consists of shallow water habitat with emergent and shoreline vegetation. Prefers areas where water levels do not fluctuate.	Occurs only in southwestern part of state along the Colorado River in Yuma County	Unlikely to occur
Arizona Botteri's sparrow (*Peucaea botterii arizonae*)	BLM: S	Yes, Appleton Ranch	No	eBird: Appleton Ranch	Species is found in grasslands with scattered mesquite trees.	Occurs in southeastern Arizona	Known to occur: Appleton Ranch
Desert purple martin (*Progne subis hesperia*)	BLM: S	Yes, Dripping Springs, Lower San Pedro River	No	eBird: Lower San Pedro River	Habitat consists of Sonoran Desert with many large saguaros proximal to water.	Species is found in southern and central Arizona	Known to occur: Lower San Pedro River; possible site: Dripping Springs
Yuma Ridgeway's rail (*Rallus longirostris yumanensis*)	ESA: E (Gila, La Paz, Maricopa, Mohave, Pinal, and Yuma Counties) BLM: S	No	No	No	In Arizona, found at elevations below 4,500 feet amsl in freshwater marshes, which are often dominated by cattails (*Typha* spp.), bulrushes (*Isolepis* spp.), and sedges (*Carex* spp.).	Range includes the Colorado River from Lake Mead to Mexico; the Gila and Salt Rivers upstream to the area of the Verde confluence; Picacho Reservoir; and the Tonto Creek arm of Roosevelt Lake. This species may be expanding into other suitable marsh habitats in western and central Arizona.	Unlikely to occur
California least tern (*Sternula antillarum browni*)	BLM: S	No	No	No	Habitat includes seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers.	Species is rarely found in the state, one breeding record occurred in 2009 in Maricopa County but the species has not bred in the state since.	Unlikely to occur
Mexican spotted owl (*Strix occidentalis lucida*)	ESA: T (All counties except La Paz and Yuma Counties) BLM: S	Yes, Appleton Ranch	No	No	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 (*Pinus ponderosa*)–Gambel oak (*Quercus gambelii*). Nests in live trees on natural platforms (e.g., dwarf mistletoe [*Arceuthobium* spp.] brooms), snags, and canyon walls at elevations between 4,100 and 9,000 feet amsl.	Found throughout the state in summer in forested mountains with steep canyons; found in almost all counties of Arizona; recently species has been found wintering in lower riparian areas such as Tonto Creek and Sabino Canyon	Unlikely to occur
Le Conte's thrasher (*Toxostoma lecontei*)	BLM: S	Yes, Dripping Springs	No	No	Flat, open saltbush deserts with a few scattered mesquites or creosote present.	Species is found in the low deserts of southwestern Arizona	Unlikely to occur
Fish							
Gila longfin dace (*Agosia chrysogaster*)	BLM: S	Yes, Appleton Ranch, Lower San Pedro River	No	No	Habitat varies from intermittent hot low-desert stream to clear, cool streams at higher elevations; prefers medium- to small-sized streams with sandy/gravely bottoms and pools with some cover. Species is normally found below 4,900 feet amsl.	Occurs in central, southern, and southeastern Arizona	May occur: Appleton Ranch, Lower San Pedro River

Common Name (*Scientific Name*)	**Status***	**HDMS Records within 2 miles**	**Baseline Data Records**	**Other Occurrence Records (eBird, SWCA or BLM Site Visits, Reptiles of Arizona)**	**Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)**	**Geographic Range in Arizona**	**Likelihood of Occurrence in BLM Offered Lands**
Desert sucker (*Catostomus clarki*)	BLM: S	Yes, Appleton Ranch	No	No	Species is found in flowing pools of streams and rivers with a gravel substrate; elevational range of 480–8,840 feet amsl.	Found throughout the Gila River basin and in tributaries to the Bill Williams River	May occur: Appleton Ranch, Lower San Pedro River
Sonora sucker (*Catostomus insignis*)	BLM: S	Yes, Appleton Ranch	No	No	Found in a variety of habitats from warm rivers to cool streams, prefers gravelly or rocky pools in elevations ranging from 1,210–8,730 feet amsl.	Found in the Gila and Bill Williams river basins	May occur: Appleton Ranch, Lower San Pedro River
Desert pupfish (*Cyprinodon macularius*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Santa Cruz, and Yavapai Counties) BLM: S	Yes, Appleton Ranch	Yes, Appleton Ranch (WestLand Resources Inc. 2004b)	No	Found in shallow waters of springs, marshes and small streams, prefers soft substrates and clear water; elevational range of 1,200–3,450 feet amsl.	No natural populations remaining; populations were reintroduced at sites in Graham, Yavapai, and Santa Cruz Counties	Unlikely to occur
Gila chub (*Gila intermedia*)	ESA: E (Cochise, Coconino, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai Counties) BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Normally found in smaller headwater streams, cienegas, and springs or marshes of the Gila River Basin at elevations below 2,720 and 5,420 feet amsl.	Currently found in the following drainages: Santa Cruz River, Middle Gila River, San Pedro River, Agua Fria River, and Verde River	May occur: Appleton Ranch, Lower San Pedro River
Headwater chub (*Gila nigra*)	BLM: S	No	No	No	Species is found in the middle to headwater reaches of medium-sized streams with large pools and cover; elevational range of 925–2,000 feet amsl.	Current range includes streams in the Verde River basin, Tonto Creek subbasin and San Carlos River basin in Yavapai, Gila, and Graham Counties	Unlikely to occur
Roundtail chub (*Gila robusta*)	BLM: S	No	No	No	Species prefers cool to warm water in mid-elevation streams and rivers with pools up to 6.6 feet deep near flowing water. Cover consists of boulders, tree roots, deep water and submerged vegetation. Elevational range of 1,210–7,220 feet amsl.	Occurs in tributaries to the Little Colorado River, tributaries to the Bill Williams River basin, the Salt River and its tributaries, the Verde River and its tributaries, Aravaipa Creek and Eagle Creek	May occur: Appleton Ranch, Lower San Pedro River
Little Colorado spinedace (*Lepidomeda vittata*)	ESA: T (Apache, Coconino and Navajo Counties) BLM: S	No	No	No	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.	Found in East Clear Creek and its tributaries, Chevelon and Silver Creeks, and Nutrioso Creek and the Little Colorado River	Unlikely to occur
Spikedace (*Meda fulgida*)	ESA: E (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Pinal, and Yavapai Counties) BLM: S	No	No	No	Found in medium-sized to large perennial streams, where it inhabits moderate-velocity to fast waters over gravel and rubble substrates, typically at elevations below 6,000 feet amsl.	In Arizona, populations are found in the middle Gila, and Verde Rivers and Aravaipa and Eagle Creeks.	Unlikely to occur
Gila topminnow (incl. Yaqui) (*Poeciliopsis occidentalis*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties) BLM: S	Yes, Appleton Ranch	No	No	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	Unlikely to occur
Colorado pikeminnow (*Ptychocheilus lucius*)	ESA: E, EXPN (Gila, Maricopa, and Yavapai Counties)	No	No	No	Juveniles prefer slackwater, backwater, and side channels with little or no flow and silty substrates; adults use turbid, deep and fast-flowing waters. Species was reintroduced at an elevation of 1,960 feet amsl.	Considered extirpated from the state, two experimental populations have been stocked into Salt and Verde River drainages	Unlikely to occur
Speckled dace (*Rhinichthys osculus*)	BLM: S	No	No	No	Species prefers rocky areas of riffles, runs, pools, creeks, and small to medium-sized rivers.	Occurs in the Colorado, Bill Williams, and Gila River drainages	May occur: Lower San Pedro River
Loach minnow (*Tiaroga cobitis*)	ESA: E (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Pinal, and Yavapai Counties) BLM: S	No	No	No	Found in small to large perennial creeks and rivers, typically in shallow, turbulent riffles with cobble substrate, swift currents, and filamentous algae at elevations below 8,000 feet amsl.	Its range in Arizona is limited to reaches in the East Fork of the White River (Navajo County); Aravaipa, Deer, and Turkey Creeks (Graham and Pinal Counties); San Francisco and Blue Rivers; and Eagle, Campbell Blue, and Little Blue Creeks (Greenlee County). A population was discovered in the Black River in 1996.	Unlikely to occur
Razorback sucker (*Xyrauchen texanus*)	ESA: E (Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pinal, Yavapai, and Yuma Counties) BLM: S	No	No	No	Found in backwaters, flooded bottomlands, pools, side channels, and other slower-moving habitats at elevations below 6,000 feet amsl.	In Arizona, populations are restricted to Lakes Mohave and Mead and the lower Colorado River below Havasu in the Lower Basin. In the Upper Basin, small remnant populations are found in the Green, Yampa, and main stem Colorado Rivers.	Unlikely to occur

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (eBird, SWCA or BLM Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in BLM Offered Lands
Invertebrates							
Monarch butterfly (*Danaus plexippus* pop. 1)	ESA: PT BLM: S	No	No	No	A migratory species found in a variety of habitats; monarch butterflies require milkweed (family Asclepiadaceae) for breeding. During fall migration in Arizona, monarch butterflies for nectar from a variety of native plants and garden plants. Populations in Arizona can migrate either to California or Mexico for winter or may overwinter in the low deserts in California. In the Southwest, migrating monarch butterflies often occur near water sources (e.g., rivers, creeks, riparian corridors, roadside ditches, irrigated gardens). In the low deserts of Arizona, monarch butterflies breed in late August to early September; however, monarch butterfly reproduction in Arizona is more common in higher elevations and is less common in the Sonoran desertscrub (Morris et al. 2015).	Species is present throughout the state	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Bylas springsnail (*Pyrgulopsis arizonae*)	BLM: S	No	No	No	Species is found in springs ranging from 26–32 degrees Celsius with submergent vegetation.	Found in three springs along the Gila River between Bylas and Pima in Graham County, Arizona	Unlikely to occur
Sonoran talussnail (*Sonorella magdalenensis*)	BLM: S	No	No	No	Species prefers talus slopes of coarse, broken rock; elevational range of 2,750–6,000 feet amsl.	Occurs in Pima and Santa Cruz Counties, Arizona	Unlikely to occur
Arizona cave amphipod (*Stygobromus arizonensis*)	BLM: S	No	No	No	Species prefers aquatic habitat in subterranean caves and mines; found at elevations of 5,245 feet amsl.	Found only at two locations in Cochise County, Arizona	Unlikely to occur
Gila tryonia (*Tryonia gilae*)	BLM: S	No	No	No	Species is found in mildly thermal springs with submergent vegetation; elevational range of 2,600–2,800 feet amsl.	Found in an unnamed spring north of Bylas, also in Cold Springs and Porter Wash in Graham County, Arizona	Unlikely to occur
Mammals							
Sonoran pronghorn (*Antilocapra americana sonoriensis*)	ESA: EXPN (La Paz, Maricopa, Pima, Pinal, Santa Cruz and Yuma Counties) BLM: S	No	No	No	Found in Sonoran desertscrub within broad, intermountain, alluvial valleys with creosote (*Larrea tridentata*)–bursage (*Ambrosia* spp.) and palo verde–mixed cacti associations at elevations between 2,000 and 4,000 feet amsl.	The only extant U.S. population is in southwestern Arizona	Unlikely to occur
Mexican gray wolf (*Canis lupus baileyi*)	ESA: E (Apache and Greenlee Counties) BLM: S	No	No	No	Vegetation type not important, species mostly needs sufficient prey such as deer and elk. Reintroduction areas are typically rugged lands in coniferous forest. Elevational range of 3,000–12,000 feet amsl.	Occurs in Apache and Greenlee Counties, reintroductions are occurring in Apache County. All packs are currently located on the Apache-Sitgreaves National Forests (Arizona Game and Fish Department 2025).	Unlikely to occur
Mexican long-tongued bat (*Choeronycteris mexicana*)	BLM: S	No	No	No	Habitat includes mesic areas in canyons of mixed oak-conifer forests in mountains rising from the desert. Roosts in daytime in caves, abandoned mines, and rockshelters; occasionally in palo verde-saguaro areas. Typically at elevations of 2,540–7,320 feet amsl.	Occurs in southeast Arizona from the Chiricahua Mountains west to the Baboquivari Mountains and as far north as the Santa Catalina Mountains. HDMS unpublished records from Pinal, Pima, Graham, Santa Cruz and Cochise Counties.	May occur: Appleton Ranch
Pale Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	In summer the species is found in caves and mines in elevations ranging from 550–7,520 feet amsl; in winter the species is found in cold caves, lava tubes, and mines in higher elevations than summer.	Occurs throughout Arizona	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Gunnison's prairie dog (*Cynomys gunnisoni*)	BLM: S	No	No	No	Species prefers high mountain valleys and plateaus; elevational range of 6,000–12,000 feet amsl.	Occurs in north-central and northeastern Arizona	Unlikely to occur
Black-tailed prairie dog (*Cynomys ludovicianus*)	BLM: S	Yes, Appleton Ranch	No	No	Habitat is dry, flat, open plains and desert grasslands; elevational range of 2,300–7,200 feet amsl.	Occurs in southeast Arizona where they are reintroduced to the Las Cienegas National Conservation Area	Unlikely to occur
Banner-tailed kangaroo rat (*Dipodomys spectabilis*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Habitat is Great Basin desertscrub, desert grasslands with mesquite, junipers or shrubs; elevational range of 3,500–4,000 feet amsl.	Occurs in Apache County	Unlikely to occur
Spotted bat (*Euderma maculatum*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Habitat can vary widely from dry deserts to conifer forest, prefer to roost in crevices and cracks in cliff faces; elevational range of 110–8,670 feet amsl.	Not well known, records from Yuma, Roll, Maricopa County, Kaibab Plateau, and some heard-only records from eastern Arizona	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Greater western mastiff bat (*Eumops perotis californicus*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Species prefers lower and upper Sonoran desertscrub near cliffs with lots of crevices; elevational range of 240–8,475 feet amsl.	Occurs year-round and is widespread throughout the state	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs

Common Name (*Scientific Name*)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (eBird, SWCA or BLM Site Visits, Reptiles of Arizona)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in BLM Offered Lands
Allen's lappet-browed or big-eared bat (*Idionycteris phyllotis*)	BLM: S	No	No	No	Found in ponderosa pine, pinyon-juniper, Mexican woodland, and riparian areas with cottonwoods, sycamores, and willows; also have records from desertscrub and white fir habitats; elevational range of 1,320–9,800 feet amsl.	Widespread in Arizona except for deserts in southwestern Arizona, most records from southern Colorado Plateau, Mogollon Rim, and adjacent mountain ranges	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Ocelot (*Leopardus* (*Felis*) *pardalis*)	ESA: E (Cochise, Gila, Graham, Maricopa, Pima, Pinal, and Santa Cruz Counties) BLM: S	No	No	No	In Arizona, this species has typically been observed in subtropical thorn forest, thornscrub, and dense, brushy thickets at elevations below 8,000 feet amsl and is often found in riparian bottomlands. The critical habitat component is probably dense cover near the ground and complete avoidance of open country.	In Arizona, there are five recent confirmed sightings of ocelot in Cochise County (2009), the Huachuca Mountains (2011 and 2012), one near Globe (2010), Santa Rita Mountains (2014), and unconfirmed sightings in the Chiricahua and Peloncillo Mountains.	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	Yes, Appleton Ranch (WestLand Resources Inc. 2004b)	Forage plants noted during site visits at Dripping Springs, Lower San Pedro River, and Appleton Ranch	Habitat consists of desert grasslands and shrublands in elevations ranging from 1,190–7,320 feet amsl; present only in summer.	Species ranges from the Picacho Mountains south to the Agua Dulce Mountains, then east to the Chiricahua Mountains. Two records from the Phoenix area.	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
California leaf-nosed bat (*Macrotus californicus*)	BLM: S	Yes, Dripping Springs, Lower San Pedro River	No	No	Species prefers Sonoran desertscrub, roosts in mines, caves and rockshelters that have large areas of ceiling and flying space; elevational range of 160–3,980 feet amsl.	Typically found south of the Colorado Plateau, year-round resident	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Arizona myotis (*Myotis occultus*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Found in ponderosa pine and oak-pine woodlands near water, can also be found in riparian forests along the lower Colorado and Verde rivers; elevational ranges of 150–1,000 feet amsl (lower Colorado River) and 3,200–8,620 feet amsl.	Found in higher elevations of central and eastern counties of Arizona as well as the lower Colorado River Valley	May occur: Appleton Ranch, Lower San Pedro, Dripping Springs
Cave myotis (*Myotis velifer*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	No	Habitat consists of creosote, brittlebush, palo verde, and cacti; roosts in caves, tunnels, mineshafts, under bridges and sometimes in buildings. Elevational range of 300–5,000 feet amsl.	Range is south of the Mogollon Plateau to Mexico, mostly summer resident except for a few that winter in southeastern Arizona	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Jaguar (*Panthera onca*)	ESA: E (Cochise, Pima, and Santa Cruz Counties) BLM: S	No	No	No	Variety of habitats, prefers lowland wet habitats but also occurs in drier habitats such as oak-pine woodlands; elevational range of sightings in Arizona were from 5,200–5,700 feet amsl.	All documented sightings have been from southeastern Arizona	May occur: Appleton Ranch, Lower San Pedro River
Reptiles							
Arizona striped whiptail (*Aspidoscelis arizonae*)	BLM: S	No	Yes, Appleton Ranch (Cogan 2012)	Reptiles of Arizona	Species prefers Semi-desert Grasslands in low valleys and sandy flats.	Species only occurs near Willcox in Cochise County and in Whitlock Valley, Graham County	Unlikely to occur
New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*)	ESA: T (Cochise County) BLM: S	No	No	No	Habitat includes rocks, bunchgrass, and leaf litter in steep rocky canyons in the pine-oak and pine-fir belts at elevations of 5,600–9,000 feet amsl.	Occurs only in the Peloncillo Mountains of Cochise County	Unlikely to occur
Sonoran Desert tortoise (*Gopherus morafkai*)	BLM: S	Yes, Dripping Springs, Lower San Pedro River	No	Reptiles of Arizona	Habitat includes Mojave desert scrub to semi-desert grassland and interior chaparral; elevational range of 510–5,300 feet amsl.	Species occurs across much of the southern and southwest part of the state, ranging from Kingman to Yuma to Tucson	May occur: Appleton Ranch, Lower San Pedro River, Dripping Springs
Sonora mud turtle (*Kinosternon sonoriense sonoriense*)	BLM: S	Yes, Appleton Ranch, Dripping Springs, Lower San Pedro River	No	Reptiles of Arizona	Species prefers rocky stream, creeks, rivers, ponds, cattle tanks, and ditches in habitats ranging from Sonoran desertscrub to woodlands; elevational range of sea level to 6,500 feet amsl.	Occurs in southeastern Arizona and along and below the Mogollon Rim	May occur: Appleton Ranch, Lower San Pedro River
Slevin's bunchgrass lizard (*Sceloporus slevini*)	BLM: S	Yes, Appleton Ranch	Yes, Appleton Ranch (Cogan 2012)	Reptiles of Arizona	Species prefers coniferous forests around bunchgrass in open sunny areas; elevational range of 4,300–9,480 feet amsl.	Found only in the mountains of extreme southeast Arizona	May occur: Appleton Ranch
Desert massasauga (*Sistrurus catenatus edwardsii*)	BLM: S	No	No	No	Species prefers tobosa grasslands in sloping bajadas with surface rocks; elevational range of 4,400–4,700 feet amsl.	Occurs in extreme southeastern Arizona in San Bernardino and Sulphur Springs Valley	Unlikely to occur
Desert ornate box turtle (*Terrapene ornata*)	BLM: S	No	No	Reptiles of Arizona	Species prefers low valleys, plains, and bajadas in semi-desert grassland and Chihuahuan desertscrub habitat types; elevational range of 2,000–7,100 feet amsl.	Species is found in southeast Arizona, ranging as far north as Winkelman	May occur: Appleton Ranch, Lower San Pedro River
Northern Mexican gartersnake (*Thamnophis eques megalops*)	ESA: T (All counties except Maricopa and Yuma Counties) BLM: S	Yes, Appleton Ranch	Yes, Appleton Ranch (Cogan 2012)	Reptiles of Arizona	Species prefers cienegas, streams, and rivers in habitats ranging from upland Sonoran desertscrub to montane coniferous forests; elevational range of 1,000–6,700 feet amsl.	Species is found along the Mogollon Rim and a few isolated populations in south-central Arizona	May occur: Appleton Ranch

Common Name (*Scientific Name*)	**Status***	**HDMS Records within 2 miles**	**Baseline Data Records**	**Other Occurrence Records (eBird, SWCA or BLM Site Visits, Reptiles of Arizona)**	**Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)**	**Geographic Range in Arizona**	**Likelihood of Occurrence in BLM Offered Lands**
Narrow-headed gartersnake (*Thamnophis rufipunctatus*)	ESA: T (Apache, Coconino, Gila, Graham, Greenlee, Navajo, and Yavapai Counties) BLM: S	No	No	No	Species prefers pinyon-juniper and pine-oak woodlands, ranging into ponderosa pine at elevations between 2,440 and 8,080 feet amsl; species needs permanent water source.	Species is found along the Mogollon Rim	Unlikely to occur

* Status Definitions

Endangered Species Act (ESA):

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.

PT = Proposed Threatened. Any species the U.S. Fish and Wildlife Service has determined is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and the agency has proposed a draft rule to list as threatened.

T = Threatened. Threatened species are those that are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

EXPN = A population of a species designated under Section 10(j) of the ESA that the U.S. Fish and Wildlife Service, based on review of the best available information, believes is not essential for the continued existence of the species. Regulatory restrictions are considerably reduced under an EXPN designation.

Bureau of Land Management (BLM):

S = Sensitive. Species that could easily become endangered or extinct in the state (Bureau of Land Management 2017b).

Bald and Golden Eagle Protection Act (BGEPA):

Yes = A species protected by a U.S. Federal statute that protects two species of eagle.

Table B-5. Special status plant species analyzed for the offered lands parcels

Unless otherwise noted, range or habitat information is from the following sources: Arizona Game and Fish Department (2025); Bureau of Land Management (2017b); Natural Resources Conservation Service (2025); SEINet (2025); Tonto National Forest (2000); U.S. Fish and Wildlife Service (2016b); U.S. Forest Service (2017f)

Common Name (Scientific Name)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (SEINet, NatureServe)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Analysis Area
Acuna cactus (*Echinomastus erectocentrus* var. *acunensis*)	ESA: E (Maricopa, Pima, and Pinal Counties) BLM: S	No	No	No	Occurs in valleys and on small knolls and gravel ridges of up to 30 percent slope in the Palo Verde-Saguaro Association of the Arizona Upland subdivision of the Sonoran Desert scrub. Elevation 1,190–3,773 feet amsl.	Found in Maricopa, western Pima, and Pinal Counties	Unlikely to occur
Alamos deer vetch (*Lotus alamosanus*)	TNF: SCC†	No	No	No	This species is a wetland obligate that occurs in wet soils or sand in springs, seeps, and streams in canyons or meadows between 3,500– 5,500 feet amsl.	Found in southern Santa Cruz County and in the Superstition Mountains.	Unlikely to occur
Alcove bog orchid (*Platanthera zothecina*)	CNF: S	No	No	No	Found at bases of alcove face-walls with flowing drip-line or with seepage down wall, shaded seeps, in dense vegetation or under rock debris, and in shaded sites along streams; elevation 3,950–6,400 feet amsl.	Apache, Coconino, and Navajo Counties	Unlikely to occur
Aravaipa woodfern (*Thelypteris puberula* var. *sonorensis*)	TNF: S, SCC BLM: S	No	No	No	Meadows and seeps, wetland-riparian.	Coconino, Graham, Pima, Pinal, and Yavapai Counties	Unlikely to occur
Arizona bugbane (*Actaea arizonica*)	CNF: S TNF: S, SCC	No	No	No	Mixed conifer and high-elevation riparian deciduous forests in deep shade and moist soils with high humus content, near perennial or intermittent streams or seeps, especially along bottoms and lower slopes of steep, narrow canyons; elevation 5,300–8,300 feet amsl.	Coconino, Kaibab, and Tonto National Forests in central Arizona	May occur: East Clear Creek
Arizona cliffrose (*Purshia subintegra*)	ESA: E (Graham, Maricopa, Mohave and Yavapai Counties)	No	No	No	Occurs at four widely separated areas across central Arizona, these sights differ slightly in elevation and associated vegetation. All sites have limestone soils derived from Tertiary lacustrine (lakebed) deposits.	Graham, Maricopa, Mohave, and Yavapai Counties	Unlikely to occur
Arizona eryngo (*Eryngium sparganophyllum*)	BLM: S	No	No	No	Riparian zones and marshes within pinyon-Juniper woodland and Madrean evergreen woodland. Elevation between 3,000 and 8,000+ feet amsl.	Cochise and Pima Counties	Unlikely to occur
Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*)	ESA: E (Maricopa, Pinal, and Gila Counties) BLM: S	Yes, Apache Leap	No	No	Found on dacite or granite bedrock, open slopes, in narrow cracks, between boulders, and in the understory of shrubs in the ecotone between Madrean evergreen woodland and Interior Chaparral. Elevation 3,200–5,200 feet amsl.	In Gila and Pinal Counties of central Arizona. Exact locations are not provided because illegal collecting threatens the species.	Known to occur: Apache Leap South
Arizona leatherflower (*Clematis Hirsutissima* var. *arizonica*)	CNF: S	No	No	No	Limestone-derived soils within ponderosa pine and pinyon pine, and Rocky Mountain juniper communities.	Apache and Coconino Counties	Unlikely to occur
Arizona phlox (*Phlox amabilis*)	CNF: S TNF: S‡	No	No	Yes	Open, exposed, limestone-rocky slopes within pinyon-juniper woodlands and ponderosa pine-Gambel oak communities.	Coconino, Gila, Graham, and Yavapai Counties	May occur: Tangle Creek
Arizona rabbitbrush (*Chrysothamnus molestus*)	CNF: S	No	No	No	Rocky soils, mostly on limestone pinyon-juniper woodlands. Elevation between 5,905 and 7,875 feet amsl.	Only known from Coconino County.	Unlikely to occur
Arizona sneezeweed (*Helenium arizonicum*)	CNF: S	No	No	Yes	Roadsides and clearings in ponderosa forests and in regions of pine forests, especially around wet places such as bogs, ponds, lakes, and roadside ditches.	Known almost exclusively from Coconino County, but also found in southern Apache, Gila, and possibly Navajo Counties	May occur: East Clear Creek, Tangle Creek
Arizona Sonoran rosewood (*Vauquelinia californica* ssp. *sonorensis*)	BLM: S	No	No	Yes	Woodland or forest at base of cliffs, along canyon bottoms and on moderate to steep slopes of the Ajo Mountains. Elevation 2,300–4,800 feet amsl.	Cochise, Gila, Maricopa, Pima, and Pinal Counties	Known to occur: Apache Leap South
Arizona sunflower (*Helianthus arizonensis*)	CNF: S	No	No	No	Open pine woodlands. Elevation 3,935–6,885 feet amsl.	Apache, Coconino, Navajo, and Yavapai Counties	Unlikely to occur
Bartram stonecrop (*Graptopetalum bartramii*)	BLM: S	No	No	No	Sky island species growing on rocky outcrops along arroyos and canyons, often in shade and litter with Madrean evergreen woodland. Elevation 3,900–6,700 feet amsl.	Cochise, Pima, and Santa Cruz Counties	Unlikely to occur
Bebb's willow (*Salix bebbiana*)	CNF: S	No	No	No	Along stream channels, on the edges of drainages, along seeps, and in perched sites that appear to be receiving little water.	Apache, Coconino, Navajo, and Yavapai Counties	Unlikely to occur
Blumer's dock (*Rumex orthoneurus*)	CNF: S TNF: S, SCC	No	No	Yes	Near perennial springs in unshaded meadows or along stream sides in canyons. In organic, moist soils. Elevation 6,490–9,030 feet amsl.	Apache, Coconino, Cochise, Gila, and Graham Counties	Known to occur: East Clear Creek

Common Name (Scientific Name)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (SEINet, NatureServe)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Analysis Area
Bristle-tipped aster (*Dieteria bigelovii* var. *mucronata*)	TNF: SCC†	No	No	No	High open meadows from 7,870–9,840 feet amsl in spruce (Picea spp.) and pinyon-juniper woodlands.	Coconino and Gila Counties.	Unlikely to occur
Broadleaf lupine (*Lupinus latifolius* ssp. *leucanthus*)	TNF: SCC	No	No	No	Occurs along streams and moist soils of dry streambeds, in oak-cottonwood (Quercus-populus), mixed shrub, and ponderosa pine forest communities. Elevational range 4,800–7,000 feet amsl.	Yavapai, Mohave, and Coconino Counties.	May occur: Turkey Creek
Chihuahua breadroot aka scurfpea (*Pediomelum pentaphyllum*)	BLM: S	No	No	No	Sandy, loamy soils.	Cochise and Graham Counties	Unlikely to occur
Chihuahuan sedge (*Carex chihuahuensis*)	TNF: S, SCC	No	No	No	Stream banks, springs, and seeps. Elevation 1,100–8,000 feet amsl.	Cochise, Gila, Graham, Pima, and Santa Cruz Counties. Tonto National Forest: only found along Reynolds Creek.	Unlikely to occur
Chiricahua Mountain alumroot (*Heuchera glomerulata*)	TNF: S, SCC	No	No	No	Found on north-facing shaded rocky slopes, near seeps, springs and riparian areas, often in humus soil. Elevation 4,000–9,000 feet amsl.	Apache, Cochise, Greenlee, Gila, Graham, and Navajo Counties. Tonto National Forest: only found in Pinal Mountains	Unlikely to occur
Clifton rock daisy (*Perityle ambrosiifolia*)	BLM: S	No	No	No	Occurs in fissures and crevices in conglomerate rock near seeps and waterfalls; high desert above and riparian below	Species occurs on cliffs above Eagle Creek and San Francisco River in Greenlee County	Unlikely to occur
Cochise sedge (*Carex ultra*); also (*Carex spissa* var. *ultra*)	CNF: S TNF: S, SCC BLM: S	No	No	No	Stream banks, wet seeps, sometimes on serpentine. Elevation lower than 1,970 feet amsl.	Apache, Cochise, Graham, Pima, Pinal, Santa Cruz and Yavapai Counties	Unlikely to occur
Countess Dalhousie's spleenwort (*Asplenium dalhousiae*)	BLM: S	No	No	No	Moist, rocky ravines, terrestrial among and at bases of rocks. Elevation 4,260–6,570 feet amsl.	Cochise and Pima Counties Only found in the Mule, Huachuca, and Baboquivari Mountains of southern Arizona	Unlikely to occur
Crenulate moonwort (*Botrychium crenulatum*)	CNF: S	No	No	No	Wet, marshy, and springy areas, including marshy meadows, edges of marshes, saturated soils of seeps, bottoms and stabilized margins of small streams. Sites partly to heavily shaded and usually have dense vegetation cover. Elevation 3,930–8,210 feet amsl.	Native, no county data	Unlikely to occur
Davidson sage (*Salvia davidsonii*)	TNF: SCC	No	No	No	In Chihuahuan Desert and acacia (Acacia spp.)-dominated vegetation communities in rocky soils or wooded slopes from 1,600–9,514 feet amsl.	Coconino, Maricopa, Mohave, Cochise, and Greenlee Counties.	Unlikely to occur
Eastwood alum root (*Heuchera eastwoodiae*)	CNF: S TNF: S, SCC	No	No	No	Shaded, rocky slopes. Elevation 4,920–6,250 feet amsl.	Coconino, Gila, Maricopa, and Yavapai Counties	Unlikely to occur
Fickeisen plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*)	ESA: E (Coconino, Mohave, and Navajo Counties) BLM: S	No	No	No	Occurs on gravelly soils of alkaline desertscrub and desert grasslands; elevational range of 3,985–5,940 feet amsl.	Endemic to northern Arizona, found in Coconino, Mohave, and Navajo Counties	Unlikely to occur
Fish Creek fleabane (*Erigeron piscaticus*)	TNF: S, SCC BLM: S	No	No	No	Gravelly and sandy washes. Elevation 2,290–3,940 feet amsl.	Maricopa and Graham Counties	Unlikely to occur
Fish Creek rockdaisy (*Perityle saxicola*)	TNF: S, SCC	No	No	No	Cracks and crevices on very steep cliff faces, large boulders and rocky outcrops in canyons, and on buttes. Steep cliffs with generally east and northeast exposures, with slopes from 50 to 100 percent. Elevational range of 2,000–3,500 feet amsl.	Gila and Maricopa Counties. On Tonto National Forest occurs near Roosevelt Lake Dam and in Sierra Ancha Mountains, suspected to be in Superstition Mountains	Unlikely to occur
Flagstaff beardtongue (*Penstemon nudiflorus*)	CNF: S TNF: SCC	No	No	No	Dry ponderosa pine forests in mountainous regions south of the Grand Canyon. Elevation 4,490–6,990 feet amsl.	Coconino, Navajo, and Yavapai Counties	Unlikely to occur
Flagstaff false pennyroyal (*Hedeoma diffusum*)	CNF: S	No	No	No	Rocky pavement, cliff, and limestone break habitats in the ponderosa pine vegetation type. Elevation 6,000–7,000 feet amsl.	Coconino, Navajo, and Yavapai Counties	Unlikely to occur
Galiuro aka Aravaipa sage (*Salvia amissa*)	TNF: S, SCC BLM: S	No	No	No	Stream banks and moist meadows in full sun or light shade. Elevation 1,509–3,010 feet amsl.	Cochise, Gila, and Graham Counties	Unlikely to occur
Gentry's indigobush (*Dalea tentaculoides*)	BLM: S	No	No	No	Canyon bottoms on cobble terraces subject to occasional flooding, in sandy, gravelly loam Rhyolite parent material. Elevation 3,600–4,600 feet amsl.	Pima, Cochise, and Santa Cruz Counties	Unlikely to occur

Common Name (Scientific Name)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (SEINet, NatureServe)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Analysis Area
Gila rockdaisy (*Perityle gilensis* var. *gilensis*)	TNF: SCC	No	No	No	Occurs in rock crevices and small pockets of soils near vertical cliffs, associated with Arizona upland Sonoran Desert and chaparral just below pinyon pine at elevations ranging from 1,529–4,170 feet amsl.	Gila, Pinal, and Maricopa Counties.	May occur: Apache Leap South
Grand Canyon century plant aka Phillip's agave (*Agave phillipsiana*)	CNF: S TNF: SCC	No	No	No	Sandy to gravelly places with desertscrub. Elevation 2,290–3,610 feet amsl.	Known only from four sites within Grand Canyon National Park	Unlikely to occur
Heathleaf wild buckwheat (*Eriogonum ericifolium* var. *ericifolium*)	CNF: S	No	No	No	Gravelly or rocky slopes of lacustrine silt, mixed grasslands, chaparral and oak-woodlands. Elevation 2,950–3,610 feet amsl.	Coconino, Pima, and Yavapai Counties	Unlikely to occur
Hodgson's fleabane (*Erigeron hodgsoniae*)	TNF: SCC	No	No	No	Occurs on cliff faces and steep canyon walls at elevations ranging from 3,800–4,000 feet amsl among oak, juniper, manzanita (Arctostaphylos), and pine species.	Gila County: Cold Water Canyon, Sierra Ancha Mountains.	Unlikely to occur
Hohokam agave, aka Murphey agave (*Agave murpheyi*)	TNF: S, SCC BLM: S	No	No	No	Mountainous slopes in dry chaparral and desert areas. Near drainage systems in desert scrub. Elevation 1,310–3,280 feet amsl.	Gila, Maricopa, Pinal, and Yavapai Counties	May occur: Apache Leap South, Cave Creek
Huachuca golden aster (Heterotheca rutteri)	BLM: S	No	No	No	Grasslands with mesquite, grassy understory in oak woodlands, grassy floodplains, sandy, loamy soils. Elevation 3,280–4,920 feet amsl.	Cochise, Santa Cruz, and Pima Counties	May occur: Appleton Ranch
Huachuca Mountain milkvetch (*Astragalus hypoxylus*)	BLM: S	No	No	No	Oak woodland with south to southwest exposures. Elevation 5,300–5,500 feet amsl.	Santa Cruz and Cochise Counties	Unlikely to occur
Huachuca water umbel (*Lilaeopsis schaffneriana* ssp. *recurva*)	ESA: E (Cochise, Pima, and Santa Cruz Counties) BLM: S	No	Appleton Ranch (WestLand Resources Inc. 2004b)	No	The majority of this species occur along the San Pedro River, in the Huachuca Mountains, and along Cienega Creek in the San Pedro River and Santa Cruz River watersheds.	Occurs on lands administered by the U.S. Army Fort Huachuca, Forest Service, BLM, U.S. Fish and Wildlife Service, Arizona Parks, Pima County, The Nature Conservancy, and private landowners	Unlikely to occur
James' rubberweed (*Hymenoxys jamesii*)	TNF: SCC	No	No	No	Occurs in ponderosa pine forests at elevations of 5,370–7,500 feet amsl.	Coconino, Navajo, Yavapai, and Gila Counties.	Unlikely to occur
Kearney's blue star (*Amsonia kearneyana*)	BLM: S	No	No	No	Stable alluvial deposits of small boulders and cobbles along a dry wash. Grows in full sun or partial shade in riparian vegetation zone surrounded by Sonoran desertscrub.	Found only in Pima County	Unlikely to occur
Lace-leaf rockdaisy (*Perityle ambrosiifolia*)	BLM: S	No	No	No	In fissures and crevices of north- or east-facing cliffs and canyon walls; conglomerate, sandstone, or rhyolite rock, often near seeps and waterfalls. Found within pinyon-juniper grassland communities. Elevation 1,640–4930 feet amsl.	Greenlee County	Unlikely to occur
Lyngholm's cliffbrake (*Pellaea lyngholmii*)	CNF: S	No	No	No	Rocky slopes and ledges, usually on sandstone. Elevation 3,935–5905 feet amsl.	Coconino and Yavapai Counties	Unlikely to occur
Mapleleaf false snapdragon (*Mabrya acerifolia*)	TNF: S, SCC	No	No	No	Occurs on rock overhangs and in bare rock/talus/scree, cliff, and desert habitats. Elevation around 2,000 feet amsl.	Maricopa and Pinal Counties; all localities occur in the Mesa Ranger District	May occur: Apache Leap South
Marsh rosemary also known as Trans-Pecos sea lavender (*Limonium limbatum*)	TNF: SCC	No	No	No	Found on marshy ground, within cienegas, floodplains, saline wet grasslands, and roadside ditches at elevations between 3,000-6,000 feet amsl.	Gila and Graham Counties. Records on TNF are associated with the Salt River or Salt River Canyon.	Unlikely to occur
Mearns' bird-foot trefoil aka horseshoe deer vetch (*Lotus mearnsii* var. *equisolensis*)	TNF: S, SCC	No	No	No	Desert scrub growing on late Tertiary lacustrine deposits at an elevation of 2,100 feet amsl.	Known only from Horseshoe Reservoir, Maricopa County	Unlikely to occur
Metcalfe's tick-trefoil (*Desmodium metcalfei*)	CNF: S TNF: SCC	No	No	No	Rocky slopes and canyons in grasslands, oak-pinyon-juniper woodlands, and riparian forests. Elevation between 4,000 and 6,500 feet amsl.	Cochise, Coconino, Gila, Pinal, Santa Cruz, and Yavapai Counties	Unlikely to occur
Mogollon thistle (*Cirsium parryi* ssp. *mogollonicum*)	CNF: S	No	No	No	Moist to very moist soils in riparian understory of perennial stream with ponderosa pine, Douglas-fir, and white fir. Elevation 7,200 feet amsl.	Endemic to <1 square mile in Dane Canyon in Coconino County	Unlikely to occur
Mt. Dellenbaugh sandwort (*Arenaria aberrans*)	CNF: S TNF: S, SCC	No	No	No	Oak and pine forests, mixed forests/woodland	Gila and Yavapai Counties	Unlikely to occur

Common Name (Scientific Name)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (SEINet, NatureServe)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Analysis Area
Nichol's Turk's head cactus (*Echinocactus horizonthalonius* var. *nicholii*)	ESA: E (Maricopa, Pima, and Pinal Counties) BLM: S	No	No	No	Found on limestone substrates along dissected alluvial fans, inclined terraces and saddles, bajadas, and debris flow. It grows in open areas and partially to shaded areas underneath the canopy of shrubs and trees, or sheltered next to rocks on steep slopes and within limestone outcrops. Occurs within the Upland Division of Sonoran desertscrub on 0% to 30% slopes with north-, west-, and south-facing exposure. Elevation 2,400–4,000 feet amsl.	Endemic to the Sonoran Desert and occurs on isolated mountain ranges within south-central Arizona in Pima and Pinal Counties	Unlikely to occur
Page Springs agave (*Agave yavapaiensis*)	CNF: S	No	No	No	Rocky, clayey-loamy igneous derived soils, less frequently on limestone soils in semi-arid desert grassland to pinyon-juniper woodland.	Known only from 10 populations occurring near habitation and agricultural and archaeological sites associated with pre-Columbian cultures	Unlikely to occur
Peebles Navajo cactus (*Pediocactus peeblesianus* var. *peeblesianus*)	ESA: E (Navajo County) BLM: S	No	No	No	Weakly alkaline, gravelly soils where the host gravel can occur on a variety of substrates. Elevation between 5,400 and 5,600 feet amsl.	Central Navajo County, near Holbrook, Arizona	Unlikely to occur
Parish's Indian mallow (*Abutilon parishii*)	TNF: S‡ BLM: S	No	No	No	Mountain slopes and desert scrublands. Elevation 3,280 feet amsl.	Found in Maricopa, Gila, Graham, Pima, Pinal, and Yavapai Counties	May occur: Apache Leap South, Dripping Springs
Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*)	BLM: S	No	No	No	Alluvial valleys, mesas, and hillsides in desert, desert grassland, or southwestern oak woodlands. Soils range from shallow to deep, and silty to rocky, with a preference for silty to gravelly deep alluvial soils. Elevation 2,290–4,920 feet amsl.	Pima and Santa Cruz Counties	Unlikely to occur
Pinaleno Mountain rubberweed (*Hymenoxys ambigens* var. *ambigens*)	TNF: SCC†	No	No	No	Occurs in stony soils at elevations from 5,000–7,000 feet amsl.	Maricopa, Graham, and Gila Counties.	Unlikely to occur
Ripley's wild buckwheat (*Eriogonum ripleyi*)	CNF: S TNF: S, SCC	No	No	No	Sandy clay flats and slopes on edges of sandstone outcrops, oak-juniper woodlands. Elevation 3,280–6,235 feet amsl.	Known only from two areas in Arizona: one near Frazier's Well in Coconino County and a second in the Verde Valley area of southeastern Yavapai and extreme northwestern Maricopa County	Unlikely to occur
Rock fleabane (*Erigeron saxatilis*)	CNF: S	No	No	Yes	Shaded canyon walls, moist north-facing slopes, and steep rock outcrops and boulders in the stream beds of shady canyons. Elevation 4,390–6,990 feet amsl.	Coconino, Gila, and Yavapai Counties	Known to occur: East Clear Creek
Round dunebroom (*Errazurizia rotundata*)	BLM: S	No	No	No	Sandy areas or in crevices of rock on rocky hilltops and ledges.	Coconino and Navajo Counties	Unlikely to occur
Rusby's milkvetch (*Astragalus rusbyi*)	CNF: S	No	No	No	Meadows in yellow pine forest or edge of thickets and aspen groves, in dry or temporarily moist basaltic soils; elevational range of 5,400–8,000 feet amsl.	Occurs in the Flagstaff area and the lower slopes of the San Francisco Peaks descending into Oak Creek Canyon, in Coconino County	Unlikely to occur
Rusby's milkwort (*Polygala rusbyi*)	CNF: S TNF: S, SCC	No	No	No	Desert grasslands and juniper woodlands. Elevation 3,000–5,000 feet amsl.	Maricopa, Mohave, and Yavapai Counties	Unlikely to occur
Salt River rock daisy (*Perityle gilensis* var. *salensis*)	TNF: S, SCC	No	No	No	Crevices on cliff faces, ledges and rock outcrops in habitats that are ecotonal between oak-juniper woodland and mountain mahogany (Cercocarpus)-oak scrub. Elevation between 3,000–3,800 feet amsl.	Only two known sites, located along the Salt River Canyon.	Unlikely to occur
San Francisco Peaks groundsel (*Packera franciscana*)	ESA: T (Coconino County)	No	No	No	Talus slopes, rock crevices, above timberline. Elevation 10,500–12,470 feet amsl.	Known only from above timberline in the San Francisco Peaks	Unlikely to occur
San Pedro River wild buckwheat (*Eriogonum terrenatum*)	BLM: S	No	No	No	Clayey slopes and flat, creosote bush communities. Elevation 3,280–3,940 feet amsl.	Pima and Cochise Counties	Unlikely to occur
Sierra Ancha fleabane (*Erigeron anchana*)	TNF: S, SCC	No	No	No	Rock crevices and ledges on boulders or on vertical cliff faces, usually in canyons. Granite cliff faces, chaparral through pine forests.	Found in Gila County in the Sierra Ancha, Mazatzal, and Mescal Mountains as well as Pine Creek	Unlikely to occur
Sunset Crater beardtongue (*Penstemon clutei*)	CNF: S	No	No	No	Volcanic cinder cones, either in open areas or under ponderosa pines in spots without leaf litter. Elevation 6,988 feet amsl.	Near Sunset Crater in Coconino County	Unlikely to occur
Texas purple-spike (*Hexalectris warnockii*)	BLM: S	No	No	No	Shaded slopes and dry, rocky creek beds in canyons, in leaf mold in oak-juniper-pinyon pine woodlands. Elevation 1,965–6,565 feet amsl.	Found in Cochise County	Unlikely to occur

Common Name (Scientific Name)	Status*	HDMS Records within 2 miles	Baseline Data Records	Other Occurrence Records (SEINet, NatureServe)	Habitat Components (Elevation, Soils, Vegetation Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence in Offered Lands Analysis Area
Tonto Basin agave (*Agave delamateri*)	CNF: S TNF: S, SCC	No	No	No	Gravelly places with desertscrub, rarely in chaparral or pinyon-juniper woodlands. Elevation 2,295–5,250 feet amsl.	Gila, Maricopa, and Yavapai Counties	May occur: Turkey Creek
Toumey's groundsel (*Packera neomexicana* var. *toumeyi*)	TNF: S, SCC	No	No	No	Found in oak chaparral and occasionally pine forest; elevation 3,000–9,000 feet amsl.	Cochise and Gila Counties, on Tonto National Forest found in the Pinal Mountains	Unlikely to occur
Tumamoc globeberry (*Tumamoca macdougalii*)	BLM: S	No	No	No	Semi-desert grasslands, sandy washes and gullies, Sonoran desertscrub.	Maricopa, Pima, and Pinal Counties	Unlikely to occur
Verde breadroot (*Pediomelum verdiense*)	TNF: S‡, SCC†	No	No	No	Sonoran desertscrub or scattered juniper communities on Verde limestone or compacted roadsides.	Yavapai County	Unlikely to occur
Verde Valley sage (*Salvia dorrii* ssp. *mearnsii*)	CNF: S	No	No	No	Sandy, rocky, or limestone soil on dry open slopes, and on flats or foothills. Elevation 960–9,800 feet amsl.	Coconino and Yavapai Counties	Unlikely to occur

* Status Definitions

Endangered Species Act (ESA):

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.

T = Threatened. Threatened species are those that are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Tonto National Forest (TNF):

S = Sensitive. Under the "Tonto National Forest Land Management Plan" (U.S. Forest Service 1985b), sensitive species are those identified by a regional forester for which population viability is a concern, as evidenced by 1) significant current or predicted downward trends in population number or density or 2) significant current or predicted downward trends in habitat capability that would reduce the species' existing distribution.

SCC = Species of conservation concern. The "Tonto National Forest Land Management Plan" (U.S. Forest Service 1985b) defines SCC as species that are native to and known to occur in the TNF and for which there are substantial concerns about the species' ability to persist within the TNF. These species are listed on the most recently published list of Species of Conservation Concern for the Tonto National Forest (U.S. Forest Service 2021a).

There is substantial overlap between SCC and S. SWCA Environmental Consultants (SWCA) evaluated S and draft SCC for the FEIS, which was published in 2021. After publication of the FEIS, the publication of "Tonto National Forest Land Management Plan" (U.S. Forest Service 1985b) resulted in the need for revision of the FEIS and this table. SWCA deleted no species or statuses from the table and added only species newly designated as SCC.

Coronado National Forest (CNF):

S = Sensitive. Species identified by a Regional Forester for which population viability is a concern, as evidenced by: a. significant current or predicted downward trends in population number or density; b. significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Bureau of Land Management (BLM): Sensitive species were included from the Gila District Office

S = Sensitive. Species that could easily become endangered or extinct in the state (Bureau of Land Management 2017b).

† SWCA evaluated this species as a draft SCC during initial analysis and FEIS publication; however, the species was not included as an SCC in the "Tonto National Forest Land Management Plan" (U.S. Forest Service 1985b).

‡ SWCA evaluated this species as an S during initial analysis and FEIS publication; however, the species was not included as an SCC in the "Tonto National Forest Land Management Plan" (U.S. Forest Service 1985b).

Table B-6. Noxious and invasive weed species analyzed for the offered lands parcels

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
African rue	*Peganum harmala*	TNF ADA	Favors disturbed and barren areas with moist soil such as roadsides, riparian corridors, and irrigation ditches; will grow in alkaline soils and high saline soils (U.S. Forest Service 2014a). Typically occurs below 4,500 feet above mean sea level (amsl) in elevation; and seeds can germinate under fairly saline conditions.	Maricopa County. Also has been observed in Pima County along I-10 near Vail, but not on the Tonto National Forest.	Unlikely to occur (all). All far from known occurrences.
African sumac	*Rhus lancea*	TNF	Occurs in well-drained sites in woodlands, grassland margins, and riparian communities; occurs in disturbed, degraded, or cultivated sites, typically below 2,000 feet amsl.	The U.S. Department of Agriculture PLANTS database indicates that there are no records in Arizona. There are no records on the Tonto National Forest. However, a recent record occurs in Cave Creek approximately 3 miles downstream of the Cave Creek parcel.	May occur • Cave Creek Nearest occurrence is within 3 miles, and suitable habitat may occur. Unlikely to occur • Tangle Creek • Turkey Creek • Apache Leap South Sites more than 15 miles from known occurrences.
Alligator weed	*Alternanthera philoxeroides*	ADA	Occurs in both aquatic and terrestrial habitats, often where aquatic and terrestrial habitat interface; occurs in riparian areas, canals, rivers, ditches, wetter pastures, and irrigated crops; can tolerate cold winters but cannot withstand prolonged freezing temperatures; prefers eutrophic conditions, but can survive in areas with low nutrient availability.	No record in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Anchored water hyacinth	*Eichhornia azurea*	Federal ADA	Freshwater, perennial, aquatic plant found in permanent water bodies; prefers open, slow-moving water environments.	No record in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Arabian schismus	*Schismus arabicus*	TNF	Occurs in disturbed, degraded, or cultivated sites in desert and semi-desert grassland communities and along roadsides, typically below 4,500 feet amsl.	Has occurrence records in Cochise, Maricopa, Mojave, Pima, and Pinal Counties.	Unlikely to occur (all). Turkey Creek occurs above the typical elevational range of this species. Cave Creek, Tangle Creek, and Apache Leap South are all far from known occurrences and do not occur in areas with high disturbance levels or along roads.
Asian mustard [Sahara mustard]	*Brassica tournefortii*	TNF ADA	Occurs in areas with windblown sediments and disturbed areas within desert grasslands, desert scrub, and roadsides at elevations typically below 2,600 feet amsl (White 2013).	Has occurrence records in Maricopa, Pima, Pinal, and Yuma Counties. Widespread throughout Tonto National Forest.	May occur • Cave Creek • Tangle Creek Contains suitable grassland or desertscrub habitat, has occurrences in vicinity, and is within or just above elevational range Unlikely to occur • Turkey Creek Does not contain suitable habitat and is above typical elevational range. Unlikely to occur • Apache Leap South Does not contain disturbed areas or roadsides and is well above typical elevational range.
Austrian fieldcress [Austrian yellowcress]	*Rorippa austriaca*	ADA	Perennial that occurs in wet soil, on disturbed and cultivated sites, including roadsides, fields, and mud flats; prefers soils that are wet 6–8 months of the year (University of Nevada Cooperative Extension 2004).	No records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Black mustard	*Brassica nigra*	TNF ADA	Occurs in dry disturbed sites such as along roadsides, railroad rights-of-way, pastures, and waste places at elevations below 7,000 feet amsl.	Has occurrence records in Cochise, Coconino, Maricopa, Pima, and Pinal Counties. Occurs along SR 188 through Tonto Basin, and along SR 87 on the Tonto National Forest.	Unlikely to occur • Cave Creek • Tangle Creek • Apache Leap South • Turkey Creek These sites do not contain suitable disturbed areas, and recent occurrences in the project vicinity occur on roadsides.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Blue mustard	*Chorispora tenella*	TNF	Occurs in disturbed sites, including waste places, pastures, roadsides, and railroad rights-of-way, typically below 7,500 feet amsl.	Has occurrence records in Apache, Coconino, Maricopa, Navajo, and Yavapai Counties. Has been found outside the Tonto National Forest along SR 69 between Cordes Junction and Prescott; in Prescott; and north of Holbrook.	Unlikely to occur • Cave Creek • Tangle Creek • Apache Leap South • Turkey Creek These sites do not contain suitable disturbed areas, and occurrences are far from project areas.
Branched broomrape [hemp broomrape]	*Orobanche ramosa*	Federal ADA	Requires relatively high temperatures for optimum germination and growth and occurs mainly in irrigated crops grown under summer conditions in tropical and sub-tropical climates. Adapted to soils of generally high PH and are associated with the crops they attack.	No record in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Buffelgrass	*Pennisetum ciliare*	TNF ADA	Alkaline soils and within arid areas with high nutrients and moisture (Allen 2017). Extremely drought tolerant and reestablishes quickly and expands infestation following fire.	Has occurrence records in Maricopa, Pima, Pinal, and Yuma Counties. Common in Phoenix, and spreading onto Tonto National Forest along SRs 60 and 87, Pima Road in Scottsdale, Cave Creek Road, and others.	May occur • Cave Creek • San Pedro River Near known occurrences and/or are in close proximity to a main road which may serve as a vector for this species or close to a known occurrence Unlikely to occur • Tangle Creek • East Clear Creek • Turkey Creek • Apache Leap South • Dripping Springs Far from main roads that could serve as a vector for this species. Unlikely to occur • Appleton Ranch parcels No records in vicinity.
Bull thistle	*Cirsium vulgare*	TNF ADA	Occurs most often in areas that have been recently or repeatedly disturbed (e.g., overgrazed rangelands, recently burned forests, clear-cuts, and along roads and ditches); prefers soil of intermediate moisture (U.S. Forest Service 2018e). Typically occurs at elevations between 4,500 and 9,100 feet amsl.	Has occurrence records in Apache, Cochise, Coconino, and Navajo Counties. Common from Flagstaff to south of Mogollon Rim.	Unlikely to occur • Tangle Creek • Turkey Creek • Apache Leap South • Dripping Springs • East Clear Creek At least 10 miles from known occurrences. No recent burns, or repeatedly disturbed areas occur in the parcels.
Burclover	*Medicago polymorpha*	ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within meadows, grasslands, woodlands, and forest communities, typically between 4,000 and 8,000 feet amsl.	Has occurrence records in Apache, Cochise, Gila, Maricopa, Pima, Pinal, and Yavapai Counties.	Unlikely to occur • East Clear Creek • Turkey Creek • Apache Leap South • Appleton Ranch • Dripping Springs Far from known records. Unlikely to occur • Cave Creek • San Pedro River • Tangle Creek Recent records in vicinity but well below typical elevational range.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Camelthorn	*Alhagi maurorum*	TNF ADA	Occurs in moist sites that are cultivated, disturbed or degraded; typically found at 4,500–5,000 feet amsl within meadows, grasslands, and riparian communities.	Has occurrence records in Apache, Coconino, Gila, Maricopa, and Navajo Counties. Heavy infestations in northeastern part of state; near Painted Rock Dam; southwest of Phoenix; west of Phoenix near Loop 101; Chandler; U.S. 60 just north of Globe; U.S. 60 north of the Salt River; but, not yet on the Tonto National Forest.	Unlikely to occur (all). All sites are distant from known occurrence records. Does not occur in grassland or meadow habitat; outside of typical elevational range: • Cave Creek • Tangle Creek • Dripping Springs • San Pedro River Do not contain suitable degraded moist habitat: • Apache Leap South • Appleton Ranch parcels Outside typical elevation; habitat not degraded, disturbed, or cultivated: • Turkey Creek • East Clear Creek
Canada thistle	*Cirsium arvense*	TNF ADA	Occurs most commonly in disturbed upland areas (e.g., barrens, meadows, fields, pastures), but can also invade wet areas with fluctuating water levels (U.S. Forest Service 2018e). Typically occurs at elevations at 4,200–8,300 feet amsl.	Has occurrence records in Apache, Coconino, and Yavapai Counties. Occurs in northeast part of state, and near the OW Ranch, west of Canyon Creek on the Tonto National Forest.	Unlikely to occur • Cave Creek • Tangle Creek • Apache Leap South • Turkey Creek • Dripping Springs • San Pedro River • Appleton Ranch Parcels far from known locations. Unlikely to occur • Turkey Creek • East Clear Creek Known occurrence about 10 miles southwest of parcel; however, site not disturbed.
Carolina horsenettle	*Solanum carolinense*	ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within grassland and woodland communities; prefers sandy, well-drained soils at elevations from 4,000–5,000 feet amsl.	In Arizona, known only from one site along Queen Creek.	Unlikely to occur (all). Sites are far from only known occurrence in Arizona.
Common purslane [little hogweed]	*Portulaca oleracea*	ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within meadows, grassland, woodland, and forest communities; can be found in soil containing loam, sand, or gravelly material at elevations from 4,000–8,500 feet amsl; can tolerate heat and drought.	Observed in all Arizona counties except La Paz, Pinal, and Yuma.	Known to occur on Appleton Ranch NE parcel. May occur • Tangle Creek Despite being far from known occurrences, this parcel contains well-used roads and is within typical elevational range: Unlikely to occur • San Pedro River It contains suitable disturbed habitat and is within 10 miles of documented occurrences; however, it is found within the Sonoran desertscrub biotic community and is well below the typical elevation for this species. Unlikely to occur • Cave Creek • East Clear Creek • Turkey Creek • Apache Leap South • Dripping Springs Parcels do not contain suitable disturbed or degraded habitat, and roads within or near the parcel appear to be minor and seldom used.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Common teasel [Fuller's teasel]	*Dipsacus fullonum*	TNF	Prefers open, sunny habitats and commonly occurs in disturbed areas, including roadsides and pastures; grows in both moist and arid soils, but more commonly found in mesic soils (U.S. Forest Service 2014b). Typically occurs at elevations ranging from 4,700–8,700 feet amsl.	Has occurrence records in Coconino County. Occurs at Watson Woods on Granite Creek near Prescott; at Shumway Millsite, south of Payson and at Sharp Creek Campground on the Tonto National Forest.	May occur • Turkey Creek It is within the typical elevational range and is approximately 7 miles north of the nearest occurrence. Unlikely to occur • Cave Creek • Tangle Creek • Apache Leap South • East Clear Creek These sites do not contain suitable disturbed roadsides or pastures and are far from recent occurrences.
Creeping wart cress [Greater swinecress]	*Coronopus squamatus*	ADA	Occurs in disturbed areas, including agricultural fields, orchards, turf, roadsides, banks of ditches; tolerates saline soil (Winston et al. 2014).	No records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Dalmatian toadflax	*Linaria dalmatica*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within meadows, grassland, woodland, and riparian communities at elevations ranging from 4,400–10,000 feet amsl.	Has occurrence records in Coconino and Yavapai Counties. Common around Flagstaff; widespread in ponderosa pine forests on Kaibab, Coconino, and Prescott National Forests; on Tonto National Forest, grows at Hot Shot Base, along SR 87 between Payson and Rye, and near the Verde River 1 mile downstream of Childs.	Unlikely to occur • Cave Creek • Tangle Creek • Dripping Springs • San Pedro River Well below elevational range Unlikely to occur • Apache Leap South • East Clear Creek • Appleton Ranch parcels Known occurrences are at least 15 miles from parcels.
Diffuse knapweed	*Centaurea diffusa*	TNF ADA	Prefers well-drained soils within cultivated, disturbed, or degraded sites along roadsides or within meadows, grassland, woodland, and forest communities at elevations typically below 7,200 feet amsl.	Has occurrence records in Apache County. Common on private lands in Young; on Tonto National Forest occurs at Pleasant Valley airport; Pleasant Valley Ranger Station, along Cherry Creek, and along SR 288 at Board Tree Saddle (south of Young).	Unlikely to occur • Cave Creek • Tangle Creek • East Clear Creek • South Apache Leap • San Pedro River • Appleton Ranch parcels • Dripping Springs Far from known occurrences. Unlikely to occur • Turkey Creek Site is approximately 12 miles southwest of the nearest occurrences and does not contain suitable disturbed or degraded habitat.
Dodder	*Cuscuta* spp. (except for natives)	Federal ADA	Alluvium, sandy soils, desert shrub community. Parasitic annual plant species, some of which infest crops and some of which infest salty marshes, flats, or ponds (University of California Statewide Integrated Pest Management Program 2017).	Has occurrence records in all counties except Apache, Graham, and Greenlee.	May occur (all). *Cuscuta* spp. is widespread; species inhabit a wide variety of habitats and have occurrence records throughout Arizona. Unlikely to occur • East Clear Creek

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Downy brome [cheatgrass]	*Bromus tectorum*	TNF ADA	Occurs from valley bottoms to high mountainous areas; quickly invades disturbed sites. Prefers well-drained soils of any texture but is not well adapted to saline or sodic soil conditions or wet soil.	Has occurrence records in all counties except Cochise, Greenlee, La Paz, Pinal, Santa Cruz, and Yuma.	May occur • Cave Creek • Apache Leap South • Turkey Creek • Tangle Creek • East Clear Creek This species is widespread and does not appear to be limited to paved roadsides or extremely disturbed areas.
Dryer's woad	*Isatis tinctoria*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within grassland or woodland communities; prefers dry rocky or sandy soils at elevations from 4,300–7,000 feet amsl.	No records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Dudaim melon [cantaloupe]	*Cucumis melo*	ADA	Occurs in disturbed areas with abundant moisture, including fields, roadsides, and ditches (Winston et al. 2014).	No records in Arizona (Winston et al. 2014).	Unlikely to occur (all). This species is not known to occur in Arizona.
Field bindweed	*Convolvulus arvensis*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within grassland, chaparral, woodland, forest, and riparian communities at elevations ranging from 3,500–10,000 feet amsl.	Has occurrence records in all Arizona counties.	May occur • San Pedro River • Appleton Ranch parcels • Tangle Creek • Turkey Creek Although some parcels below typical elevational range, they contain suitable disturbed habitat, and there are occurrence records nearby. Unlikely to occur • Cave Creek • East Clear Creek • Apache Leap South • Dripping Springs Far from known occurrences and minimal disturbed habitat.
Field sandbur	*Cenchrus spinifex [incertus]*	TNF ADA	Prefers sandy or gravelly sites that have been disturbed, or degraded sites at elevations between 3,500 and 5,000 feet amsl.	Has occurrence records in all counties except La Paz, Pinal, and Yuma. Occurs east of Tonto National Forest on the Fort Apache Reservation along the right-of-way for U.S. 60 east; Occurs on Tonto National Forest on right-of-way of SR 188, a few miles north of Globe, Arizona.	May occur • Appleton Ranch parcels May contain suitable degraded sandy or gravelly sites, and there are known occurrences approximately 3.5 miles north of the parcels. Unlikely to occur • Tangle Creek • Cave Creek • East Clear Creek • Apache Leap South • Turkey Creek • San Pedro River • Dripping Springs Distant from known occurrences.
Five-stamen tamarisk	*Tamarix chinensis*	TNF ADA	Desert riparian habitats, including seeps, springs, and roadsides; may tolerate saline soil.	Has occurrence records in all Arizona counties except Greenlee, La Paz, Pinal, and Yuma. On the Tonto National Forest, saltcedar occurs along the Verde River and its tributaries; along much of the Salt River; and along Salt and Verde River reservoirs.	May occur • Cave Creek • Tangle Creek • Turkey Creek This species occurs in Cave Creek approximately 3 miles south of the parcel and may occur at Tangle Creek and Turkey Creek, if sufficient water occurs. Unlikely to occur • Apache Leap South • East Clear Creek Lacks riparian habitat or roadsides.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Fountain grass	*Pennisetum setaceum*	TNF ADA	Usually found along roadways or in rangelands. Prefers arid to semi-arid conditions, but can occur in mesic environments; usually occurs in areas with mild winters and summer moisture; prefers open, sunny areas with well-drained soils.	Has occurrence records in Cochise, Maricopa, Pima, and Santa Cruz Counties. Documented in all desert districts on the Tonto National Forest; very abundant along U.S. Route (U.S.) 60 between Superior and mountain tunnel; also occurs along SR 87, along the road to Bartlett and Horseshoe Reservoirs, and in the Salt River Recreation Area.	May occur • Apache Leap South • Cave Creek Contain suitable habitat and have occurrence records within approximately 2 miles. Unlikely to occur • Tangle Creek • Turkey Creek • East Clear Creek These sites are far from known occurrences, and do not contain suitable habitat.
Floating water hyacinth	*Eichhornia crassipes*	ADA	Aquatic, floating plant that occurs in tropical and subtropical freshwater lakes and rivers.	Has occurrence records in Maricopa County.	Unlikely to occur (all). Cave Creek does not contain perennial aquatic habitat. The nearest known occurrence is approximately 14 miles northwest of the Cave Creek Parcel, in the Agua Fria River.
Giant reed	*Arundo donax*	TNF ADA	Occurs in moist areas, including ditches, stream and riverbanks, and floodplains; prefers well-drained soils with abundant moisture; will tolerate a wide variety of conditions, including high salinity; will tolerate a wide range of soil types from clay to sand; typically occurs below 4,000 feet amsl.	Has occurrence records in Cochise, Maricopa, and Navajo Counties. Occurs upstream of the Tonto National Forest on the Upper Verde, with the potential to invade in a large river scouring event.	May occur • Cave Creek If sufficient moisture occurs, as there are occurrence records 3 miles downstream. Unlikely to occur • Apache Leap South • Turkey Creek • Tangle Creek • East Clear Creek Sites are at least 30 miles from the nearest known occurrence and Apache Leap South does not contain suitable moist habitat.
Giant salvinia	*Salvinia molesta*	Federal ADA	Prefers warm, fresh water in temperate and subtropical climates (Chambers and Hawkins 2002).	Found in slow-moving water or still-water canals, ponds, rivers, lakes, and reservoirs (Chambers and Hawkins 2002). Occurrence records from the southwestern portion of Arizona, in and near the Colorado River.	Unlikely to occur (all). All parcels are far from the nearest known location in the Colorado River.
Globe chamomile [stinknet]	*Oncosiphon piluliferum*	TNF ADA	Occurs in disturbed areas, including waste places, pastures, and along roadsides; typically found below 3,500 feet amsl in elevation; this annual is a pioneer species within disturbed sites.	Has occurrence records in Maricopa, Pinal, and Yavapai Counties. Documented along I-17 north of Phoenix, near Skunk Tank Ridge south of Cave Creek on the Cave Creek Ranger District, at the Cave Creek Ranger Station, at the Sonoran Desert National Monument, Pinal City near Superior, along SR 84 west of Casa Grande, Extension Service Demonstration Garden (east Broadway in Phoenix), on Carefree Highway 4 miles east of I-17, and growing in cultivation at the Desert Botanical Garden and Boyce Thompson Arboretum.	May occur • Cave Creek Occurrence records less than 3 miles south of the site. Unlikely to occur • Apache Leap South • Tangle Creek • Turkey Creek • East Clear Creek Known occurrences are more than 10 miles from these sites, and these sites do not contain typical disturbed habitats.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Globe-podded hoary cress [whitetop]	*Cardaria draba*	TNF ADA	Occurs in cultivated, disturbed, or degraded moist sites along roadsides or within meadows, grassland, chaparral, woodland, forest, and riparian communities; prefers alkaline to saline soils but will tolerate a wide variety of soil and moisture conditions; typically found between 3,000 and 8,000 feet amsl.	Has occurrence records in Navajo, Santa Cruz, and Yavapai Counties. *Cardaria* spp. has been recorded in Prescott, Camp Verde, Flagstaff, and Cottonwood, and on the upper Verde River near Perkinsville; on the Tonto National Forest, occurs on the Pleasant Valley Ranger District.	May occur • Appleton Ranch parcels • East Clear Creek • Turkey Creek Known occurrences nearby and suitable moist habitat may be present. Unlikely to occur • Cave Creek • Tangle Creek Far from known occurrences. Unlikely to occur • Dripping Springs • Apache Leap South Far from known occurrences. Unlikely to occur • San Pedro River Far from known occurrences and parcel is below usual elevational range.
Hairy whitetop	*Cardaria pubescens*	TNF	Occurs in cultivated, disturbed, or degraded moist sites along roadsides or within meadows, grassland, chaparral, woodland, forest, and riparian communities; prefers alkaline to saline soils, but can tolerate a wide range of soils and moisture conditions; typical elevation is 3,000–8,000 feet amsl.	*Cardaria* spp. has been recorded in Prescott, Camp Verde, Flagstaff, and Cottonwood, and on the upper Verde River near Perkinsville; on the Tonto National Forest, occurs on the Pleasant Valley Ranger District.	May occur • East Clear Creek • Turkey Creek Known occurrences nearby and suitable moist habitat may be present. Unlikely to occur • Cave Creek • Tangle Creek • Appleton Ranch parcels Far from known occurrences Unlikely to occur • Dripping Springs • Apache Leap South Far from known occurrences and does not contain disturbed or degraded moist sites: Unlikely to occur • San Pedro River Far from known occurrences, and the parcel is below the usual elevational range.
Halogeton [saltlover]	*Halogeton glomeratus*	ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides or within grassland or woodland communities; prefers open areas and alkaline and saline soils, generally at elevations ranging from 4,000–6,500 feel amsl.	Has occurrence records in Apache, Navajo, and Mohave Counties.	Unlikely to occur (all). • San Pedro River • Cave Creek • Tangle Creek Far from known occurrences and below typical elevational range. • Appleton Ranch parcels • Turkey Creek • Dripping Springs • Apache Leap South • East Cave Creek Far from known occurrences
Hydrilla [waterthyme]	*Hydrilla verticillata*	Federal ADA	Found mainly in freshwater aquatic systems but can tolerate low salinity. Sometimes found in upper reaches of estuaries. Found in shallow water, but in clear water can survive down to 49 feet (Chambers and Hawkins 2002).	Has occurrence records in Maricopa County.	Unlikely to occur (all). There are known occurrences in the Phoenix metropolitan area but none in proximity to any parcels.
Iberian starthistle [Iberian knapweed]	*Centaurea iberica*	ADA	Occurs along banks of watercourses and other moist sites, typically below 3,200 feet amsl in elevation.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Japanese brome	*Bromus japonicus*	TNF	Occurs in cultivated, disturbed, or degraded sites along roadsides and within semi-desert grassland and wooded communities at elevations ranging from 4,500–7,200 feet amsl.	Has occurrence records in Apache, Cochise, Coconino, Gila, Greenlee, Maricopa, Pima, and Navajo Counties.	Unlikely to occur • Cave Creek • Tangle Creek • Apache Leap South • Turkey Creek All Tonto National Forest sites are at least 12 miles from a known occurrence, all except Turkey Creek occur below typical elevation, and Turkey Creek contains only minor disturbances.
Japanese knotweed	*Polygonum cuspidatum*	TNF	Riparian areas, including along streams and rivers, low-lying areas, utility rights-of-way; it rapidly colonizes scoured areas and can survive severe floods; can tolerate full shade, high temperatures, high salinity, and drought (U.S. Forest Service 2018e).	No occurrence records in Arizona and is not known from the Tonto National Forest.	Unlikely to occur as it does not occur in Arizona • Cave Creek • Turkey Creek • Tangle Creek • Apache Leap South
Johnsongrass	*Sorghum halepense*	ADA	Occurs in disturbed areas such as roadsides, ditches, and fields.	Has occurrence records in every county in Arizona and has been documented in the TNF.	May occur • Appleton Ranch Parcels • San Pedro River.
Jointed goatgrass	*Aegilops cylindrica*	TNF ADA	Occurs above 4,000 feet amsl in disturbed areas. Occurs in dry sites in grassland or wooded communities and roadsides at elevations ranging from 5,300–7,000 feet amsl.	Has occurrence records in Apache, Cochise, Coconino, Navajo, and Yavapai Counties. Occurs along SR 87 from Payson to Strawberry, and in the Young area.	May occur • East Clear Creek Site may contain suitable habitat and is situated near SR 87. Unlikely to occur • Cave Creek • Tangle Creek • San Pedro River Far from known occurrences and below usual elevational range. Unlikely to occur • Turkey Creek • Apache Leap South • Dripping Springs • Appleton Ranch parcels Far from known occurrences.
Karoo bush [African sheepbush]	*Pentzia incana*	TNF	Occurs in dry, disturbed sites including waste places, pastures, and along roadsides within desert, semi-desert grassland, chaparral oak scrub, and pinyon-juniper woodland communities typically below 5,300 feet amsl in elevation.	Occurrence records in Graham County. Has been documented at one site on the Tonto National Forest, north of the Oak Flat campground on the Globe Ranger District.	Unlikely to occur • Cave Creek • Tangle Creek • Oak Flat Known occurrences are more than 30 miles. Unlikely to occur • Apache Leap South Although the Oak Flat occurrence is within 4 miles of Apache Leap South, this parcel does not contain suitable disturbed habitat for this species.
Kochia	*Kochia scoparia [Bassia scoparia]*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within grassland and woodland communities in well-drained, uncompacted soil, below 8,500 feet amsl; thrives in warm, low rainfall environments; burns easily owing to plant structure.	Has occurrence records in Apache, Cochise, Coconino, Navajo, and Pima Counties.	May occur • Cave Creek Occurrence record approximately 3 miles south. Unlikely to occur • Tangle Creek • Turkey Creek • Apache Leap South Sites are minimally disturbed and are at least 10 miles from a known occurrence.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Leafy spurge	*Euphorbia esula*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within fields, pastures, rangeland, and riparian communities, typically between 4,600 and 9,500 feet amsl.	Has occurrence records in Coconino County. Has been documented in the Coconino National Forest but not on the Tonto National Forest.	Unlikely to occur (all). All are more than 25 miles from nearest known occurrence.
Lehmann's lovegrass	*Eragrostis lehmanniana*	TNF ADA	Occurs in cultivated, disturbed, and degraded sites on sandy flats and on calcareous slopes within desert grassland, semi-desert grassland, and woodland communities and roadsides, generally between 3,500 and 4,000 feet amsl in elevation.	Has occurrence records in Cochise, Coconino, Graham, Maricopa, and Pima Counties. Within Tonto National Forest, seeded extensively along highways, power line corridors, and after fires.	May occur • Apache Leap South • Turkey Creek • Cave Creek • Tangle Creek Although several parcels are below the typical elevation, there are occurrence records within 5 miles, and suitable habitat may be present.
Lens podded hoary cress	*Cardaria chalepensis*	ADA	Occurs in cultivated, disturbed, or degraded moist sites along roadsides and within meadows, grassland, chaparral, woodland, forest, and riparian communities; prefers alkaline to saline soils but can tolerate a wide variety of soils and moisture conditions; elevations typically range from 3,300–6,000 feet amsl.	No occurrence records in Arizona. One isolated record from 1992 occurs more than 30 miles east of the East Clear Creek Parcel.	Unlikely to occur (all). No current records from Arizona.
Lightningweed	*Drymaria arenarioides*	Federal ADA	Prefers dry areas, acidic soils, hills and plains, and stressed rangelands (Scher et al. 2015). It is well adapted to soils and climates within the *Bouteloua-Aristida* type.	Invades rangeland, displacing desired vegetation and his highly toxic to livestock. This species has not been documented in the United States but is spreading northward, reportedly to within 1 mile of New Mexico (Scher et al. 2015). No records in the United States (Natural Resources Conservation Service 2025).	Unlikely to occur (all). This species is not known to occur in the United States.
Malta starthistle	*Centaurea melitensis*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadways and within grassland and woodland communities at elevations below 7,200 feet amsl; is a competitive and aggressive plant.	Has occurrence records in Apache, Cochise, Graham, Maricopa, Mohave, Pima, Pinal, and Yavapai Counties. Widespread on Tonto National Forest at low elevations below 3,000 feet.	May occur • Apache Leap South • Cave Creek • Turkey Creek • Tangle Creek Occurrence records are common on Tonto National Forest, not all of which are along roadways or below 3,000 feet amsl in elevation.
Mediterranean grass	*Schismus barbatus*	TNF	Occurs in roadways and cultivated, disturbed, or degraded sites along roadways and in desert and semi-desert grassland communities, generally below 5,000 feet amsl in elevation.	All Arizona counties except Apache, Cochise, Graham, Greenlee, and Navajo.	May occur • Apache Leap South • Cave Creek Within 5 miles of the nearest known occurrence and occur within the Sonoran desertscrub biome. Unlikely to occur • Turkey Creek • Tangle Creek These sites are at higher elevation than is typical for this species, and neither site contains desert or semi-desert grassland communities; known occurrences are also more than 10 miles from these sites.
Mediterranean sage	*Salvia aethiopis*	TNF	Occurs in roadways and cultivated, disturbed, or degraded sites along roadways and within meadows, grassland, woodland, and riparian communities; prefers well-drained soil; occurs at elevations typically below 8,500 feet amsl.	Has occurrence records in Coconino and Yavapai Counties.	Unlikely to occur • Apache Leap South • Tangle Creek • Turkey Creek • Cave Creek These sites are all at least 50 miles away from the nearest known occurrence.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Mexican paloverde	*Parkinsonia aculeata*	TNF	On the Tonto National Forest, infestation occurred from a single ornamental planting in Camp Creek area; typically invades waste areas at low elevations. Invasive on degraded rangelands; tolerant of drought, waterlogging, and saline conditions.	Has occurrence records in Gila, Graham Maricopa, Pima, Pinal, Santa Cruz, and Yuma Counties where it is a native species. On the Tonto National Forest, a 2-acre infestation occurs from areas burned in the Cave Creek Complex fire near Camp Creek.	May occur • Cave Creek This parcel is 3 miles north of a known recent occurrence. Unlikely to occur • Apache Leap South • Tangle Creek • Turkey Creek These sites are far from known occurrences.
Morning-glory	*Ipomeoea* spp. [all except *I. carnea* and *I. aborescens*] *I. triloba* is a “restricted pest” according to ADA (see below)	ADA	Suitable habitat depends on species. For example *I. hederacea* and *I. purpurea* occur in disturbed areas, *I. tenuiloba* occurs in pinyon-juniper woodlands.	There are 69 species of *Ipomoea*, including native and introduced species, in the PLANTS database, 15 of which have occurrence records in Arizona.	May occur (all). This genus is widespread in Arizona and has occurrence records within 5 miles of each parcel. Disturbed areas occur within each parcel, and most parcels contain drainages or roadsides, which may contain suitable microclimates for many species within this genus.
Musk thistle	*Carduus nutans*	TNF ADA	Grows from sea level up to 8,000 feet amsl in neutral to acidic soils; invades open areas (e.g., meadows or prairies) and spreads rapidly in areas of natural disturbance, including landslides and flooding; does not grow well in conditions that are excessively wet, dry, or shady (U.S. Forest Service 2018e). Typically occurs between 4,200 and 8,100 feet amsl.	Has occurrence records in Apache and Navajo Counties. Grows on Coconino National Forest; found on the Tonto National Forest north and east of Payson in the area of the 1990 Dude Fire.	Unlikely to occur • Cave Creek • Tangle Creek • Turkey Creek • Apache Leap South There is no meadow or prairie habitat on any of the sites. Known occurrences are far from the sites.
Natal grass	*Melinis repens*	ADA	Occurs on rocky slopes and moist canyon bottoms from 2,500–4,500 feet amsl.	Has occurrence records in Maricopa, Pima, Pinal, Graham, Santa Cruz, and Cochise Counties.	May occur • Apache Leap South • Appleton Ranch Parcels • San Pedro River.
Oleander	*Nerium oleander*	TNF	On the Tonto National Forest, has naturalized in Camp Creek and near Boyce Thompson Arboretum; in California has been found in floodplain and riparian zones.	Has occurrence records in Maricopa County. On Tonto National Forest, near Camp Creek and Boyce Thompson Arboretum.	Unlikely to occur • Cave Creek • Tangle Creek • Turkey Creek • Apache Leap South This species is only known from two locations on Tonto National Forest.
Onionweed	*Asphodelus fistulosus*	TNF Federal	In the Sonoran Desert region, it seems to do best at altitudes above the desert floor that receive moderate rainfall during winter. Tends to invade disturbed land, leaving its potential threat to natural areas unclear (Animal and Plant Health Inspection Service 2019). Elevation is 2,000–4,500+ feet amsl (Animal and Plant Health Inspection Service 2019). Occurs in sandy or rocky disturbed sites, including roadsides, railroad rights-of-way, pastures, and waste places; typically occurs below 4,600 feet amsl; drought resistant.	Known in the five southeastern counties (Pima, Pinal, Santa Cruz, Cochise, and Greenlee) and in an area near Sedona in Yavapai County (Animal and Plant Health Inspection Service 2019). Not known to occur on the Tonto National Forest.	May occur • Appleton Ranch parcels Disturbance occurs, and there is an occurrence record less than 1 mile south of the northeastern parcel. Unlikely to occur • San Pedro River • Dripping Springs • East Clear Creek Far from known occurrences.
Oxeye daisy	*Leucanthemum vulgare*	TNF	Occurs in cultivated, disturbed, or degraded sites on well-drained but moist soils along roadsides and within meadows, grassland, woodland, and forest communities at elevations from 5,000–9,500 feet amsl.	Has occurrence records in Apache, Coconino, Gila, and Navajo Counties. Identified growing near Canyon Creek, Pleasant Valley Ranger District, Tonto National Forest; occurs in Flagstaff and Kachina Village, south of Flagstaff.	Unlikely to occur (all Tonto National Forest parcels). All Tonto National Forest Parcels are at least 20 miles away from nearest known occurrence records. Only Turkey Creek is within the typical elevational range.
Perennial sowthistle	*Sonchus arvensis*	ADA	Occurs in cultivated, disturbed, or degraded moist sites along roadsides and within grassland, woodland, and riparian communities; can be found in non-compacted, fine, rich, slightly alkaline to neutral soils at elevations ranging from 5,000–6,000 feet amsl.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Periwinkle	*Vinca major*	TNF	Occurs in highly disturbed areas, including old homesteads, roadsides, and waste places; also occurs in riparian areas, forests, and grasslands; typically occurs below 7,500 feet amsl elevation.	Has occurrence records in Cochise, Coconino, Maricopa, Pima, Santa Cruz, and Yavapai Counties. Occurs on Tonto National Forest adjacent to private lands (e.g., Grantham Homestead off SR 288).	Unlikely to occur (all Tonto National Forest parcels). No Tonto National Forest parcel contains highly disturbed areas, and all Tonto National Forest parcels except Apache Leap South are at least 5 miles from known occurrences.
Plumeless thistle	*Carduus acanthoides*	TNF ADA	Occurs in sites that are dry and well-drained; occurs in cultivated, disturbed, or degraded sites within meadows, grassland, chaparral, woodland, forest, and riparian communities or roadsides at elevations generally ranging from 4,200–8,800 feet amsl.	While the PLANTS database shows no occurrence records in Arizona, other sources indicate occurrence records in Petrified Forest National Park. SEINet (2025) shows no occurrences in Arizona.	Unlikely to occur (all). All parcels are far from potential occurrences in Petrified Forest National Park.
Puna grass	*Stipa brachychaeta*	ADA	Disturbed soils along roadsides; streambanks, and waste places (Agriculture Victoria 2017).	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Puncturevine	*Tribulus terrestris*	ADA	Occurs in cultivated, disturbed, or degraded moist sites along roadsides and within grassland, woodland, and riparian communities; prefers dry, sandy soils but tolerates most soil types; found at elevations below 7,000 feet amsl.	Has occurrence records in all Arizona counties.	May occur • San Pedro River • Cave Creek Sites contain disturbance or roads and are near to known occurrences. Unlikely to occur • Appleton Ranch parcels • Tangle Creek Sites are far from known occurrences. Unlikely to occur • Dripping Springs • Turkey Creek • Apache Leap South • East Clear Creek Sites are far from known occurrences and have limited disturbance.
Purple loosestrife	*Lythrum salicaria*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites in perennial and seasonal wetlands; occurs along marsh and pond edges, streambanks, canals, and ditches at elevations generally from 4,500–6,800 feet amsl.	While the PLANTS database and SEINet show no occurrence records in Arizona, other sources indicate occurrence records on the Apache-Sitgreaves National Forests.	Unlikely to occur (all). All parcels are far from potential occurrences on the Apache-Sitgreaves National Forests.
Purple starthistle	*Centaurea calcitrapa*	ADA	Occurs cultivated, disturbed, or degraded sites with fertile soil; occurs in meadows, grassland, woodland, and forest communities and along roadsides at elevations typically ranging from 3,300–8,000 feet amsl; germination occurs under a broad range of conditions with fewer viable seeds produced in dry years; plants seldom persist under shady conditions.	Has occurrence records in Yuma County.	Unlikely to occur (all). All parcels are far from known occurrence records and do not occur in Yuma County.
Pyracantha	*Pyracantha* sp.	TNF	Not a common invasive in the desert Southwest; on the Tonto National Forest, occurred along Cave Creek. Drought resistant, common landscape plant; prefers dry soil and full sun (Dierking 1998).	Has occurrence records in Maricopa County. On the Tonto National Forest, occurred along Cave Creek.	Unlikely to occur (all Tonto National Forest parcels). All Tonto National Forest parcels are far from known occurrences, and this species is not a common invasive.
Quackgrass	*Elymus repens*	TNF ADA	Occurs in disturbed or degraded sites within grasslands, woodlands, forest communities, or along roadsides at elevations between 6,700 and 8,500 feet amsl; is extremely drought tolerant.	Has occurrence records in Coconino, Gila, and Navajo Counties. Documented near Flagstaff, in Grand Canyon National Park, and on one site on the Tonto National Forest, on Pleasant Valley Ranger District.	May occur • East Clear Creek Occurs near known occurrence and is close to the usual elevational range. Unlikely to occur • San Pedro River • Dripping Springs • Appleton Ranch • Turkey Creek • Apache Leap • Cave Creek • Tangle Creek Far from known recent occurrences and below typical elevational range.
Red brome	*Bromus rubens*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and in meadows, grassland, chaparral, woodland, and riparian communities, generally below 7,200 feet amsl in elevation. Red brome cannot withstand temperatures below freezing.	Has occurrence records in all Arizona counties, except Cochise, Greenlee, La Paz, Navajo, Santa Cruz, and Yuma. Widespread on Tonto National Forest.	May occur (all Tonto National Forest parcels). This species is widespread, occurs in a wide variety of habitats, and occurs within 2.5 miles of Cave Creek, Tangle Creek, and Apache Leap South, and approximately 6.5 miles of Turkey Creek.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Rescuegrass	*Bromus catharticus*	TNF	Occurs in cultivated, disturbed, or degraded soils along roadsides or within desert or semidesert communities generally below 4,500 feet amsl elevation; can tolerate both cold temperatures and drought conditions.	Has occurrence records in all Arizona counties except Pinal and Greenlee. Likely grows on Tonto National Forest; occurs at Montezuma Castle National Monument and in the Tucson Mountains.	May occur • Cave Creek Unlikely to occur • Apache Leap South There is an occurrence within 3 miles, but disturbed areas do not occur. Unlikely to occur • Turkey Creek • Tangle Creek Sites do not contain desert or semidesert communities and are more than 15 miles from the nearest occurrence record.
Ripgut brome	*Bromus diandrus*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within desert and semidesert communities, at elevations typically ranging from 3,200–4,600 feet amsl.	Has occurrence records in Cochise, Coconino, Graham, Maricopa, Mohave, Pima, Pinal, and Yavapai Counties. Occurs on National Monuments near Tonto National Forest, including Tuzigoot, Montezuma Castle, and Tonto National Monuments, and at the Hassayampa River Preserve; also occurs on the Verde where SR 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.	May occur • Cave Creek Although below typical elevational range, it contains desert or semi-desert conditions with some road disturbance and occurs within 3 miles of the nearest occurrence record. Unlikely to occur • Apache Leap South There is an occurrence within 3 miles, but disturbed areas do not occur. Unlikely to occur • Turkey Creek • Tangle Creek Sites do not contain desert or semi-desert communities and are more than 6 miles from the nearest occurrence record.
Rush skeleton weed	*Chondrilla juncea*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within grassland and woodland communities; prefers well-drained sandy or gravely soils below 5,500 feet amsl.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Russian knapweed	*Acroptilon repens*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within meadows, grassland, and riparian communities at elevations ranging from 3,000–8,000 feet amsl; found in variety of soil types; is a very competitive and aggressive species.	Has occurrence records in Apache, Cochise, Greenlee, Maricopa, Navajo, Pima, and Yavapai Counties. Documented in vicinity of Gordon Canyon on SR 260 and at Shumway Millsite on Payson Ranger District, south of Payson.	May occur • Turkey Creek • East Clear Creek Sites are within the usual elevational range, contain some disturbance, and are in the vicinity of known occurrences. Unlikely to occur • Cave Creek • Tangle Creek • Apache Leap • Dripping Springs Sites are more than 20 miles from nearest known occurrence and have minimal disturbance. Unlikely to occur • Appleton Ranch parcels • San Pedro River Nearest known infestation is at least 20 miles.
Russian olive	*Elaeagnus angustifolia*	TNF ADA	Seedlings tolerant of shade, thrives in a variety of soil and moisture conditions, including bare mineral substrates; found in open areas, grasslands, streambanks, lakeshores, roadsides, and urban areas (U.S. Forest Service 2018e). Typically occurs at elevations ranging from 4,000–7,500 feet amsl; can dominate riparian vegetation where overstory cottonwood (*Populus* spp.) have died.	Has occurrence records in Apache, Coconino, and Navajo Counties.	Unlikely to occur (all Tonto National Forest parcels). Far from known occurrences. In addition, Tangle Creek and Cave Creek are below the typical elevational range, and Apache Leap South does not contain suitable habitat.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Russian thistle	*Salsola kali* and *S. tragus*	TNF	*Salsola* spp. occurs on cultivated, disturbed, or degraded sites along roadsides and within grassland and woodland communities; can occur on any type of well-drained uncompacted soil, but is most frequently found in alkaline or saline soil below 8,500 feet amsl; burns easily owing to plant structure.	*Salsola* spp. has occurrence records in all Arizona counties.	May occur • Cave Creek • Tangle Creek • Turkey Creek • Apache Leap South This species is widespread in the vicinity of the parcels.
Saltcedar	*Tamarix ramosissima*	TNF ADA	*Tamarix* spp. occur in moist meadow and riparian communities, in drainage washes of both natural and artificial water bodies, and in other areas where seedlings can be exposed to extended periods of saturated soil conditions; can grow on saline soils with up to 15,000 parts per million soluble salt; occurs below 7,500 feet amsl elevation.	Has occurrence records in Mohave and Pima Counties. On Tonto National Forest, saltcedar occurs along the Verde River and its tributaries; along much of the Salt River; and along Salt and Verde River reservoirs.	May occur • Cave Creek • Tangle Creek • Turkey Creek This species occurs approximately 3 miles south of the Cave Creek. May occur at Tangle Creek and Turkey Creek, if sufficient water occurs. Unlikely to occur • Apache Leap South Lacks riparian habitat or roadsides.
Scotch thistle	*Onopordum acanthium*	TNF ADA	Occurs in cultivated, disturbed, or degraded moist sites within meadows, grassland, woodland, and riparian communities, typically below 7,500 feet amsl; can germinate year-round.	Has occurrence records in Apache, Navajo, and Yavapai Counties. Common in Four Corners area, the Arizona Strip, and along the interstate system near Flagstaff; observed on Tonto National Forest growing in Strawberry at SR 87 bridge.	May occur • East Clear Creek. This site is in the vicinity of known occurrences and occurs along SR 87, and contains riparian areas with some disturbance. Unlikely to occur. • Cave Creek • Tangle Creek • Turkey Creek • San Pedro River • Appleton Ranch • Apache Leap South • Dripping Springs Sites are far from known occurrences of this species, and some parcels contain minimal disturbance.
Serrated tussock	*Nassella trichotoma*	Federal ADA	Grows in a wide range of climatic conditions and soil types, being able to tolerate floods, drought, exposure to salt and repeated frost.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Siberian elm	*Ulmus pumila*	TNF ADA	In Arizona, this species is found in forested areas and high elevations (U.S. Forest Service 2018e). Occurs in cultivated, disturbed, or degraded sites along roadsides and within meadow, grassland, woodland, and riparian communities in well-drained soils, typically below 8,100 feet amsl in elevation.	Has occurrence records in Apache, Maricopa, and Navajo Counties. Isolated records from Coconino National Forest east of Flagstaff and in Verde River/Lynx Lake/Thumb Butte areas of Prescott National Forest.	Unlikely to occur (all Tonto National Forest parcels). Nearest known occurrences are at least 20 miles from parcels.
Sicilian starthistle	*Centaurea sulphurea*	ADA	Occurs in cultivated, disturbed, or degraded sites along roadsides and within grassland and woodland communities at elevations typically below 3,300 feet amsl.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Smallflower tamarisk	*Tamarix parviflora*	TNF ADA	Riparian habitats, along permanent or intermittent streams, lakes, and reservoirs; can grow in a wide variety of soils and can tolerate salinity.	Has occurrence records in Arizona but not county-specific records. On Tonto National Forest, *Tamarix* spp. occur along the Verde River and its tributaries; along much of the Salt River; and along Salt and Verde River reservoirs.	Unlikely to occur (all Tonto National Forest parcels). This species has no occurrence records in the vicinity of the parcels.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Southern sandbur	*Cenchrus echinatus*	TNF ADA	Occurs in cultivated, disturbed, or degraded sites that contain sandy or gravelly conditions; is an aggressive colonizer with rapid growth under moist conditions; usually occurs at elevations between 3,500–4,500 feet amsl.	Has occurrence records in Cochise, Maricopa, Pima, and Yuma Counties. Occurs east of Tonto National Forest on the Fort Apache Reservation along the right-of-way for U.S. 60 east; occurs on Tonto National Forest on right-of-way of SR 188, a few miles north of Globe, Arizona.	Unlikely to occur • Dripping Springs • Appleton Ranch parcels Far from known occurrences. Unlikely to occur. • Cave Creek • Tangle Creek • East Clear Creek • Turkey Creek • Apache Leap South • San Pedro River Far from known occurrences; and outside the typical elevational range.
Spotted knapweed	*Centaurea biebersteinii*	TNF	Found at elevations from sea level to 10,000 feet amsl in areas receiving 8–80 inches of rain a year; prefers well-drained light-textured soils that receive summer rain in a wide variety of open forest, prairie, and rangelands; disturbance promotes rapid establishment and spread (U.S. Forest Service 2018e).	While the PLANTS database shows occurrence records only in Santa Cruz County, other sources indicate occurrence records along SRs 89A and 179 in Sedona, on Northern Arizona University campus, along Lake Mary Road and in the vicinity of Prescott; also north of Grand Canyon in the Arizona Strip, and north of Tonto National Forest above the Mogollon Rim; with an unconfirmed report on the Pleasant Valley Ranger District.	Unlikely to occur (all Tonto National Forest parcels). All Tonto National Forest parcels are distant from known occurrences of this species.
Squarrose knapweed	*Centaurea squarrosa*	ADA	Found on cultivated, disturbed, or degraded rangelands and roadsides, typically below 8,000 feet amsl elevation; is an aggressive, competitive plant; germination can occur under a broad range of environmental conditions.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Sulfur cinquefoil	*Potentilla recta*	TNF	Associated with roadsides, disturbed areas, abandoned agricultural fields, and waste areas within grasslands, shrublands, and open-canopy forests; intolerant of complete shade (Zouhar 2003).	While the U.S. Department of Agriculture PLANTS database shows no occurrence records in Arizona, other sources indicate occurrence records along the Rio de Flag and on the Lake Mary Road on Coconino National Forest.	Unlikely to occur (all Tonto National Forest parcels). The nearest known occurrences are more than 30 miles from the parcels.
Swamp morning-glory	*Ipomoea aquatica*	Federal ADA	Occurs in moist, marshy, or inundated localities, in shallow pools, ditches, or wet rice fields at elevations between sea level and 3,200 feet amsl.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Sweet resinbush	*Euryops subcarnosus*	TNF ADA	In Arizona, occurs in semi-arid grassland, desert grassland, desert shrub, and desert scrub communities below the Mogollon Rim.	Has occurrence records in Graham, Pima, and Yavapai Counties. Occurs on Fry Mesa south of Safford, on the Santa Rita Experimental Range, and several small patches south of the Globe Ranger Station; west of SR 188 in Tonto Basin, north of U.S. 60, north of the Miami cemetery; and east of cemetery and 2 miles down Bloody Tanks Wash toward Miami.	May occur • Apache Leap South • Tangle Creek • Cave Creek The sites are in the vicinity of known occurrences and contain some desertscrub or semi-desert grassland biotic communities. Unlikely to occur • Turkey Creek Does not contain suitable habitat.
Tamarisk	*Tamarix* spp.†	ADA	*Tamarix* spp. occur in moist meadow and riparian communities, in drainage washes of both natural and artificial water bodies, and in other areas where seedlings can be exposed to extended periods of saturated soil conditions; can grow on saline soils with up to 15,000 parts per million soluble salt; occurs at elevations below 7,500 feet amsl.	*Tamarix* spp. has occurrence records in all Arizona Counties except Greenlee, La Paz, Pinal, and Yuma. On TNF, saltcedar occurs along the Verde River and its tributaries, along much of the Salt River, and along Salt and Verde River reservoirs.	May occur • Cave Creek • Tangle Creek • Turkey Creek Suitable habitat occurs at these sites. Unlikely to occur • Apache Leap South • East Clear Creek Lacks riparian habitat or roadsides.
Tansy ragwort [stinking willie]	*Senecio jacobaea*	ADA	Occurs in cultivated, disturbed, or degraded moist sites along roadsides or within meadows, grassland, woodland, and riparian communities; prefers light, well-drained soils at elevations typically below 4,900 feet amsl; this aggressive species is highly poisonous to livestock.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Texas blueweed	*Helianthus ciliaris*	ADA	Occurs in cultivated, disturbed, or degraded moist open sites along roadsides and within meadows, grassland, woodland, forest, and riparian communities; prefers alkaline or saline soils at elevations ranging from 3,000–8,500 feet amsl; thrives in heavily disturbed and cultivated areas.	Has occurrence records in Cochise, Gila, Graham, and Pinal Counties.	Unlikely to occur (all). All sites are at least 10 miles away from nearest known occurrence and no site contains heavily disturbed areas except San Pedro River parcel, which is below the typical elevational range for this species.
Three-lobed morning-glory	*Ipomoea triloba*	ADA	Occurs in cultivated fields, sandy ground, and grassy swamp margins on hedges, in thickets; low to middle elevations.	The PLANTS database shows no occurrence records in Arizona. SEINet (2025) has two records from Arizona, in 1930.	Unlikely to occur (all). This species has no recent records in Arizona.
Torpedo grass	*Panicum repens*	ADA	Occurs in wet places, along the edges of rivers, irrigation channels, and lakes, but does not tolerate long-term submergence; can occur in a variety of soils, sandy to heavy.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Tree of heaven	*Ailanthus altissima*	TNF ADA	Widely distributed in fields, roadsides, fencerows, woodland edges, and forest openings (U.S. Forest Service 2018e). Generally, occurs below 6,200 feet amsl.	Has occurrence records in Cochise, Coconino Gila, Greenlee, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai Counties. Occurrences around Cottonwood, Camp Verde, and Jerome; on Coronado National Forest lands; in Tonto National Forest on Verde River near Childs; in Superior and Globe and on national forest lands nearby; near confluence of Pinal Creek and Salt River; and Payson.	Unlikely to occur (all Tonto National Forest parcels). These parcels are far from known occurrences and do not contain suitable open, disturbed habitat.
Tropical soda apple	*Solanum viarum*	Federal ADA	Occurs in areas that have been frequented by animals or that have received natural materials contaminated by seed, including pasturelands, roadsides, or cattle yards (U.S. Forest Service 2018e).	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Ward's weed	*Carrichtera annua*	ADA	Occurs in grasslands, scrub, and chaparral vegetation communities (California Invasive Plant Council 2025).	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Water-chestnut	*Trapa natans*	ADA	Prefers full sun, and low-energy, nutrient-rich waters; prefers slightly acidic water.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Weeping lovegrass	*Eragrostis curvula*	TNF	Occurs in cultivated, disturbed, or degraded areas along roadsides or within meadows, grasslands, and at the margins of chaparral, woodland, and forest communities, generally at elevations between 6,000 and 8,000 feet amsl; this species has high potential for establishment on burned sites.	Has occurrence records in Cochise, Coconino, Gila, Graham, Maricopa, Pima, and Yavapai Counties. Within Tonto National Forest, seeded extensively along highways, power line corridors, and after fires; seeded in Pinal Mountains after a fire.	Unlikely to occur (all Tonto National Forest parcels). None of the parcels contain meadow, grassland, or roadside habitat, and none are above the 6,000 feet amsl elevation typical of this species.
White bietou	*Dimorphotheca cuneata*	TNF	On the Tonto National Forest, occurs in yards and canyons between Six Shooter Canyon and National Forest lands to the west; no other records of this species being invasive in the United States.	Occurs in an approximately 40-acre patch on the Tonto National Forest between Six Shooter Canyon and National Forest land to the west.	Unlikely to occur (all Tonto National Forest parcels). The only known infestation of this species is far from all Tonto National Forest parcels.
Wild mustard	*Sinapis arvensis*	TNF ADA	Occurs in dry, disturbed sites, including waste places, pastures, roadsides, and railroad rights-of-way, generally below 6,000 feet amsl in elevation.	Has occurrence records in Gila, Maricopa, Pima, and Pinal Counties. Occurs along SR 188 from Punkin Center to Roosevelt, on private lands; is common on Agua Fria National Monument, west of Perry Mesa tobosa grassland in Cave Creek Ranger District.	Unlikely to occur (all Tonto National Forest parcels). The known occurrences of this species are far from all Tonto National Forest parcels.
Wild oats	*Avena fatua*	TNF	Occurs in cultivated, disturbed, or degraded areas along roadsides and within desert, semi-desert grasslands, and woodland communities, typically at elevations between 2,500 and 7,200 feet amsl.	Has occurrence records in all Arizona counties except Graham, Greenlee, La Paz, Navajo, Santa Cruz, and Yuma. Found along most highways in Tonto National Forest.	May occur (all Tonto National Forest parcels). Extremely widespread on the Tonto National Forest and occurs in the vicinity of all Tonto National Forest parcels.
Witchweed	*Striga* spp.	Federal ADA	Parasitic plant that attacks agricultural crops.	No occurrence records in Arizona.	Unlikely to occur (all). This species is not known to occur in Arizona.
Yellow starthistle	*Centaurea solstitialis*	TNF ADA	Prefers full sunlight and deep, well-drained soils where rainfall is 10–60 inches per year; most commonly occurs in disturbed areas (U.S. Forest Service 2018e). Generally occurs below 8,200 feet amsl in elevation.	Although the U.S. Department of Agriculture PLANTS database only shows occurrence records in Yuma County, other sources indicate that this species has become established in central Arizona, within the communities of Flagstaff, Camp Verde, Payson, Star Valley, and Young; on Tonto National Forest, this species occurs mainly on the higher-elevation districts (Payson and Pleasant Valley) but has been documented in the Tonto Basin below 3,000 feet amsl in elevation.	May occur • Clear Creek • Turkey Creek • Cave Creek • Tangle Creek Occurrences in the vicinity, disturbance from dirt roads on-site. Unlikely to occur • Apache Leap South • Dripping Springs Far from nearest known occurrence, minimal disturbance on-site. Unlikely to occur • Appleton Ranch parcels • San Pedro River Far from nearest known occurrence.

Common Name	Scientific Name	Status	Habitat Components (Elevation, Soils, Veg Association, Slope, Aspect, etc.)	Geographic Range in Arizona	Likelihood of Occurrence
Yellow sweetclover	*Melilotus officinalis*	TNF	Occurs in cultivated, disturbed, or degraded areas along roadsides and within meadows, grassland, woodland, and forest communities at elevations typically ranging from 5,000–10,500 feet amsl.	Has occurrence records in all Arizona counties except Greenlee, La Paz, Mohave, and Yuma. This species is widespread in Arizona, and very common in riparian zones of the Tonto National Forest along the Verde River and on the Cave Creek Ranger District.	Unlikely to occur (all Tonto National Forest parcels). Apache Leap South, Cave Creek, and Tangle Creek are below the typical elevational range of this species, and Turkey Creek contains minimal disturbance and is 7 miles northwest of the nearest occurrence record.
Yellow toadflax	*Linaria vulgaris*	TNF	Occurs in cultivated, disturbed, or degraded areas along roadsides and within meadows, grassland, woodland, and riparian communities at elevations typically ranging from 6,400–9,200 feet amsl; germination highest on open sites with compacted soils and little vegetation.	Has occurrence records in Coconino County.	Unlikely to occur (all Tonto National Forest parcels). Known records are far from all Tonto National Forest parcels, and all of the sites are below the typical elevational range of this species.

Unless otherwise noted, range, habitat, or occurrence information is from the following sources: CABI (2018); Natural Resources Conservation Service (2025); SEINet (2025); Tonto National Forest (2018); White (2013).

Unless otherwise noted, occurrence data is from Arizona Game and Fish Department, transmitted on August 13, 2018, or from SEINet (2025).

* Status definitions are as follows:

ADA = Arizona Department of Agriculture; species is listed as a noxious weed by the Arizona Department of Agriculture (2025).

Federal = species is listed as a noxious weed by the U.S. Department of Agriculture (2010).

TNF = Tonto National Forest; species is listed as an invasive species by the Tonto National Forest (2018).

† Tamarix spp. is the listed entity on the ADA list (Arizona Department of Agriculture 2025); this includes *T. chinensis, T. parviflora, and T. ramosissima*, which are also TNF species (Tonto National Forest 2018). Other species, including *T. africana, T. aphylla*, and *T. canariensis,* are shown in the Plants Database (Natural Resources Conservation Service 2025) as occurring in Arizona. SEINet (2025) shows *T. africana* to occur associated with the Phoenix and Tucson metro areas, *T. aphylla* to occur within the analysis area near Boyce Thompson and the MARRCO corridor, and *T. canariensis* to occur in the Phoenix metro area

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