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**D** Environmental  
Statement

**R**

**A** Copper Basin

**F** Land Exchange

**T**

*PH  
man file*

**PRESCOTT National Forest**  
usda, forest service  
southwestern region  
albuquerque, new mexico





COPPER BASIN LAND EXCHANGE

Availability of Draft Environmental  
Statement

Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969, the Forest Service, Department of Agriculture, has prepared a draft environmental statement for the Copper Basin Land Exchange proposal, Prescott National Forest.

Copies are available for inspection during regular working hours at the following locations:

USDA, Forest Service  
So. Agriculture Bldg., Room 3230  
12th & Independence Ave., SW  
Washington, D.C. 20250

USDA, Forest Service  
Southwestern Region  
517 Gold Avenue, SW  
Albuquerque, New Mexico 87102

Prescott National Forest  
344 South Cortez Street  
Prescott, Arizona 86301

A limited number of single copies are available upon request to the Forest Supervisor, Prescott National Forest, 344 South Cortez, Prescott, Arizona 86301; and the Regional Forester, Southwestern Region, 517 Gold Avenue, SW, Albuquerque, New Mexico 87102.

Copies of the environmental statement have been sent to various Federal, State, and local agencies as outlined in the CEQ guidelines.

Comments are invited from the public, and from State and local agencies which are authorized to develop and enforce environmental standards, and from Federal agencies having jurisdiction by law or special expertise with respect to any environmental impact involved for which comments have not been requested specifically.

Comments concerning the proposed action and requests for additional information should be addressed to Forest Supervisor Donald Bolander, Prescott National Forest, P.O. Box 2549, Prescott, Arizona 86301. Comments must be received within 60 days from the date the statement was transmitted to CEQ in order to be considered in the preparation of the final environmental statement.

USDA FOREST SERVICE ENVIRONMENTAL STATEMENT  
COPPER BASIN LAND EXCHANGE

Prepared in accordance with  
Section 102 (2) (C) of Public Law 91-190

Type of Statement: Draft

Date of Transmission to CEQ: MAR 29 1976

Type of Action: Administrative

Responsible Official: John McGuire  
Chief, Forest Service USDA  
South Agriculture Building  
12th and Independence Avenue, S.W.  
Washington, D.C. 20250

Responses should be sent within 60 days to:

Donald H. Bolander  
Forest Supervisor  
Prescott National Forest  
344 South Cortez  
P.O. Box 2549  
Prescott, Arizona 86301

USDA FOREST SERVICE ENVIRONMENTAL STATEMENT  
COPPER BASIN LAND EXCHANGE  
USDA-FS-R3-76-07 DES Adm.

Prepared in accordance with  
Section 102 (2)(C) of Public Law 91-190

SUMMARY SHEET

- I. Draft (X) Final ( )
- II. Name of USDA Agency: Forest Service
- III. Administrative (X) Legislative ( )
- IV. Brief Description of Action: This environmental statement concerns a proposed land exchange on the Prescott, Coconino, and Apache-Sitgreaves National Forests in Arizona. Phelps Dodge Corporation has proposed a land exchange whereby the United States would receive 1,618.29 acres of Corporation land and Phelps Dodge Corporation would acquire 5,976.53 acres of public land. The Corporation land offered to the United States is included within four parcels: 139.42 acres in Yavapai County, Prescott National Forest; 138.87 acres in Yavapai County, Prescott and Coconino National Forests; 520 acres in Coconino County, Apache-Sitgreaves National Forest; and 820 acres in Coconino County, Coconino National Forest. The 5,976.53 acres of public land selected by Phelps Dodge Corporation is located in Yavapai County, Prescott National Forest.

The public land selected by Phelps Dodge Corporation is adjacent to their patented mining claims in Copper Basin. The Corporation plans to utilize the selected land as sites for a mill, waste dumps, tailings dams, ore stock-piles, and related support facilities in conjunction with an open pit copper mine.

The Corporation land offered to the United States is significant to the management of three National Forests. Acquisition of the Corporation lands will consolidate National Forest land ownership, simplify resource management and protection, and enhance productivity of the

V. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There will be no irreversible or irretrievable commitment of resources for the offered land. The offered land could be legally exchanged back into private ownership. Whether or not the selected land could be reconveyed to public ownership is subject to the desires of the property owner. However, for practical purposes, the exchange of the selected land into private ownership will be an irreversible commitment of the selected land to private management.

resources. The authority for the land exchange is under the General Exchange Act of March 20, 1922, as amended.

Throughout this statement, the terms offered and selected lands are used. This refers to the land which is offered by the private landowner in exchange to the United States for National Forest land which is selected by the private landowner. Land exchanges are based on the monetary value of the land rather than on equal numbers of acres. The value of the offered land must be equal in value or of greater value than the selected land.

- V. Summary of Environmental Impacts and Adverse Environmental Effects: Management control over the properties will change; i.e., the four parcels of offered land will be under Forest Service administration and the selected land will be under private control. The exchange of lands will cause a change in revenues to Yavapai and Coconino Counties. Yavapai County will realize a net gain of approximately \$2,100 in revenue annually while Coconino County will lose approximately \$500 annually.

Development of the selected land for mining support facilities could create adverse environmental effects on water quality, vegetation, air quality, wildlife, and natural beauty. Eventual development of a copper mine would substantially improve the economy of surrounding communities in Yavapai County as well as contribute to the economy of the State and the Nation. However, the development of a copper mine by Phelps Dodge Corporation is not contingent upon an exchange of lands as the potential mine area is located on private land and could be developed without a land exchange. Adjacent National Forest land which would be needed for the mill and other support facilities are subject to location and patenting under provisions in the 1872 mining law.

Acquisition of the offered lands will provide public ownership of a perennial spring in a water-scarce area, provide unrestricted public access to the southern entrance of Sycamore Canyon Wilderness, provide for the protection of riparian vegetation, provide public access to 1.8 miles of East Clear Creek, eliminate the need to maintain several miles of property boundary, and consolidate public land ownership to the maximum extent feasible to ensure the most effective economical management of the public lands administered by the Prescott, Coconino, and Apache-Sitgreaves National Forests.



VI. List of Alternatives Considered:

A. Refuse to Make the Exchange

A large portion of the land selected in this proposed exchange is available to Phelps Dodge Corporation under the 1872 mining law at \$5.00 per acre as mill-site claims. The Corporation has chosen to exchange lands rather than acquire through millsite claims in order to expedite their acquisition of the lands. The environmental impacts within Copper Basin would be nearly identical to the proposed action and the United States would gain no replacement for the land lost to the mining use.

B. Authorize Corporation Use of Public Land Under Special Use Permits

Public land could be made available to the Corporation for a fee under special use permits. The fee return to the United States is dependent on the type of development which is largely unknown at this time. The United States would be required to bear additional annual costs of administering the permits. The environmental impacts within Copper Basin would be nearly identical to the proposed action and the United States would gain no replacement for the land lost to the mining use.

C. Approve an Exchange of Less Than the 5,976.53 Acres Requested by Phelps Dodge Corporation

If a smaller amount of land were approved for exchange, the Corporation could acquire the additional land needed for their mining operation through the 1872 mining law or obtain special use permits for use of the land. The environmental impacts within Copper Basin would be nearly identical to the proposed action and the United States would gain no replacement for the land lost to the mining use.

VII. List of Federal, State and Local Agencies from which Comments are Requested:

Federal Agencies

Council on Environmental Quality  
U.S. Department of Interior

Environmental Protection Agency  
Soil Conservation Service, USDA  
Advisory Council on Historic Preservation

State and Local Agencies

Arizona State Clearing House  
Northern Arizona Council of Governments  
Coconino County Board of Supervisors  
Yavapai County Board of Supervisors  
Town of Williams  
Town of Cottonwood  
Town of Clarkdale  
Town of Jerome  
City of Prescott

VIII. Date draft environmental statement made available to the  
Council on Environmental Quality:

MAR 29 1976

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I. DESCRIPTION

A. Proposed Action

Phelps Dodge Corporation proposes to exchange 1618.29 acres of Corporation land (offered land) for 5976.53 acres of Forest Service land (selected land) wholly within Arizona (see Table I). The offered land is included within four tracts: 139.42 acres in Sections 22 and 23, T.13 N., R.3 W., Yavapai County, Prescott National Forest; 138.87 acres in Section 7, 8, and 17, T.17 N., R.3 E., Yavapai County, Prescott and Coconino National Forests; 520 acres in Section 25, T.13 N., R.12 E., Coconino County, Apache-Sitgreaves National Forest; and 820 acres in Section 19, T.14 N., R.12 E. Coconino County, Coconino National Forest. The selected lands are entirely within Copper Basin, Yavapai County, Prescott National Forest.

In April 1970, Phelps Dodge Corporation proposed to exchange 640 acres of Corporation land for 1628.94 acres of Forest Service land within Copper Basin. In April 1972, the Corporation submitted a revised proposal to exchange 704.43 acres of Corporation land in three parcels for 5976.53 acres of Forest Service land and 2880 acres of Bureau of Land Management land. Inasmuch as one of the offered parcels, 426.01 acres, was outside the National Forest boundary and thus not subject to Forest Service acquisition, the apparent value of the offered land without this parcel was less than the value of the land selected by the Corporation. In June 1972, the Corporation made an offer of 798.29 acres of Corporation land for 5976.53 acres of Forest Service land. The Corporation was notified that the offered and selected land were not of apparent equal value, and in October 1972, the Corporation added 820 acres to their offer, bringing the total offered lands to 1618.29 acres.

The land selected by Phelps Dodge Corporation is adjacent to the Corporation's patented mining claims within Copper Basin. According to Phelps Dodge Corporation, acquisition of the selected lands will enable the Corporation to proceed with plans for the development of an open-pit copper mine on their patented claims in Copper Basin. The Corporation proposes to use the

TABLE I

OFFERED LAND

Tract I - Government Springs	-	139.42	acres in Prescott NF in Sections 22 & 23, T.13 N. R.3 W. Yavapai County
Tract II - Packard Ranch	-	138.87	acres in Prescott & Coconino NF in Sections 7, 8, & 17, T.17 N. R.3 E. Yavapai County
Tract III - Part of Section 25	-	520.00	acres in Apache- Sitgreaves NF in Section 25, T.13 N. R.12 E. Coconino County
Tract IV - Section 19	-	820.00	acres in Coconino NF in Section 19, T.14 N. R.12 E., Coconino NF
		1618.29	acres

SELECTED LAND

Copper Basin      5976.53 acres of Prescott National Forest land  
in Yavapai County including all or  
portions of the following sections:

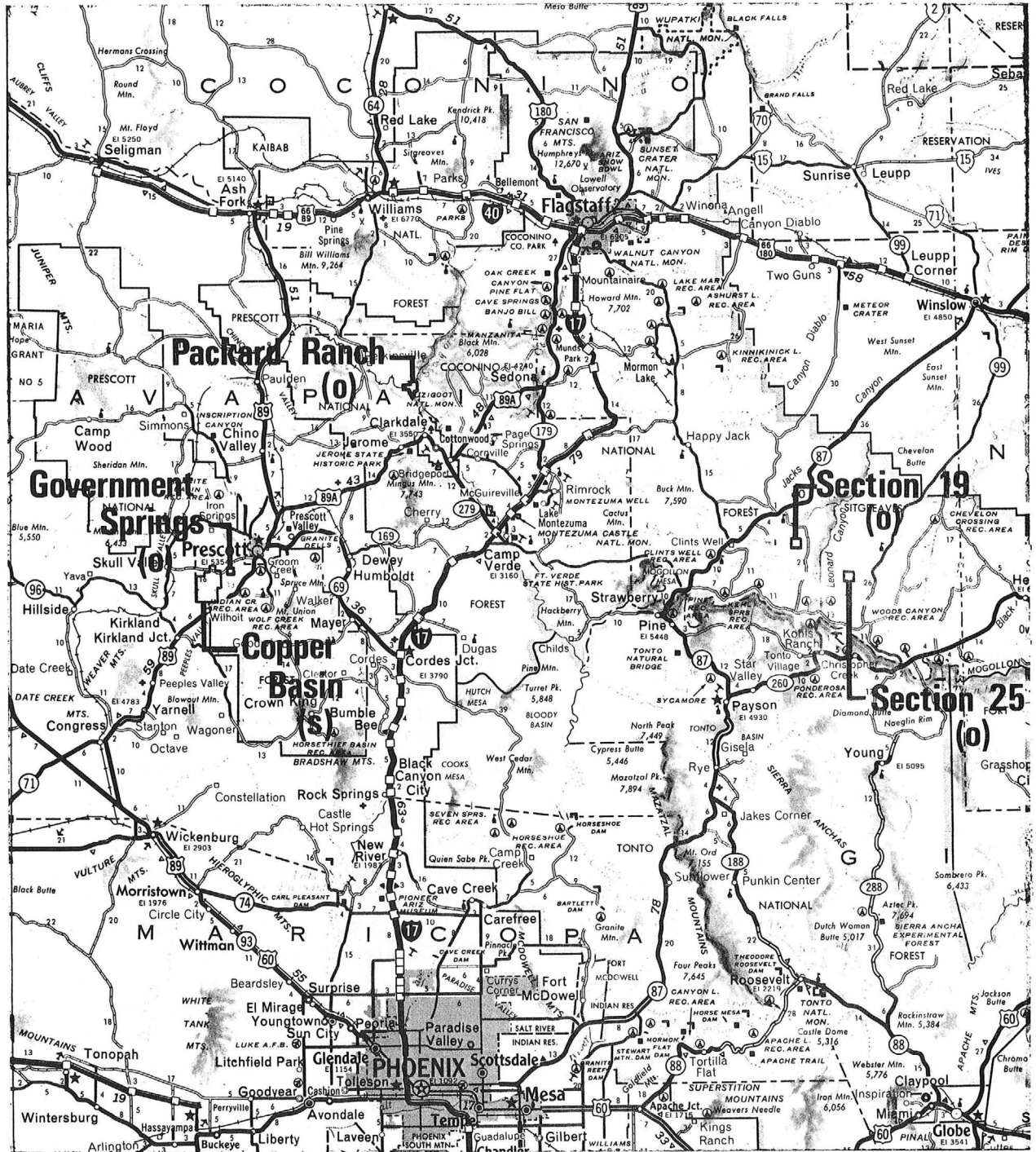
T.12½ N. R.3 W.

Sections 19, 20, 21, 28, 29, 30,

T.13 N. R.3 W.

Sections 17, 19, 20, 21, 28, 29,  
30, 31, 32, & 33

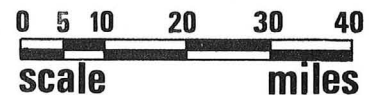




# Proposed Land Exchange

(o) – Offered Land

(s) – Selected Land



selected lands for mining support facilities such as a mill, waste dumps, tailing dams, and ore stockpile areas because the acreage within their patented claims is not sufficient for both the mine and the necessary support facilities.

B. Existing Environment

Selected Lands

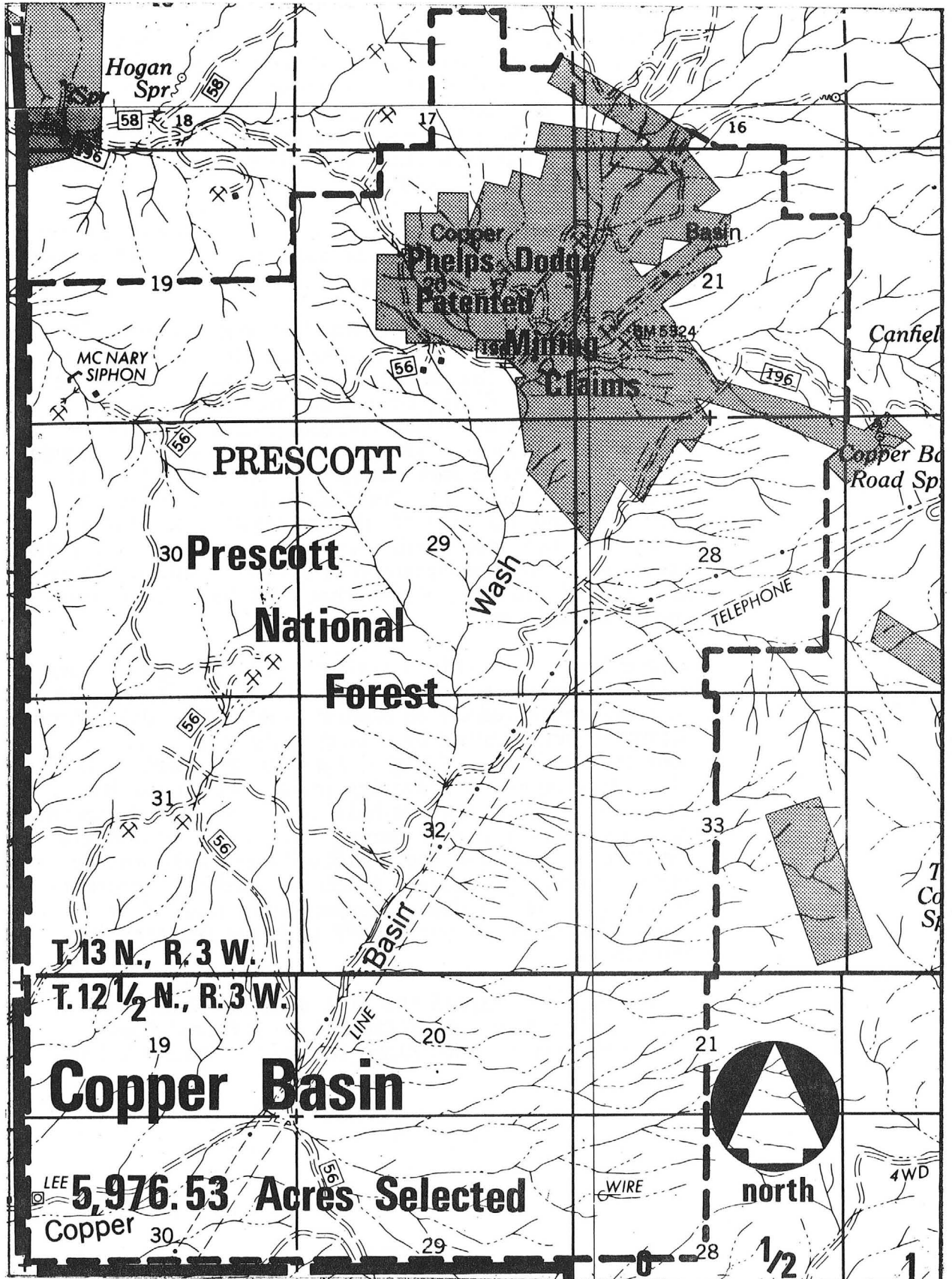
Copper Basin, located approximately five miles southwest of Prescott, Arizona, has been the center of mining activity since the late 1870's when rich deposits of oxidized copper in the conglomerate and surface porphyry were discovered. Although numerous mining claims have been located and explored, only two groups of claims, Chelsea Group - MS 3770 - located in the southwest portion of Copper Basin, and 49 patented claims known as the Commercial Mine located in the center of Copper Basin, have been relatively active.

Little information is known about the Chelsea Group except that the mineral survey was performed June 1 and August 30, 1921 and the patent was issued January 24, 1922. Interviews with long-time miners in the area indicate that at least \$100,000 worth of high grade ore was processed before the mine was closed.

The Commercial Mine, one of the first enterprises of Phelps Dodge, was operated by a subsidiary, Commercial Mining Company, circa 1914-1916. The Commercial Mining Company, under the management of Major A. J. Pickrell, mined and shipped 100,000 tons of 3% copper ore to the Phelps Dodge smelter in Douglas, Arizona.(1)\*

At the beginning of World War II, Mr. Fred Schemmer obtained a lease on the Commercial Mine. From about 1942 until 1950, Mr. Schemmer shipped approximately 83,000 tons of 2 to 2½% copper ore to the Phelps Dodge

\*Numbers in parenthesis refer to literature cited which is listed in Appendix A.



T. 13 N., R. 3 W.  
T. 12 1/2 N., R. 3 W.

**5,976.53 Acres Selected**

scale miles

smelter at Clarkdale, Arizona. Mr. Schemmer was forced to relinquish his lease in 1950 because of increased freight rates, railroad car shortages, and finally the closing of the smelter at Clarkdale. In 1956, Schemmer again leased the property and shipped 14,774 tons of ore to the smelter at Douglas, Arizona. This operation continued until 1962.(2)

The Copper Basin area has had a long history of mining activity which can readily be seen in the old mine dumps, test holes, tunnels, and spoil piles.

There are a number of unpatented mining claims, both lode and placer, which have been located in past years that lie within the selected lands. These claims are held by several different claimants. Phelps Dodge Corporation has also filed mining claims over most of the selected lands. Since land on which a valid mineral discovery has been made cannot be exchanged, it will be necessary for Forest Service mining engineers to determine the validity of all the unpatented claims within the selected land. Any claims that are determined to be valid must be excluded from any exchange. There are approximately 35 claims that will have to be examined for validity.

Copper Basin is within a semi-arid climatological zone with an average annual precipitation of 12 inches per year occurring mainly as summer showers from July through September accompanied by strong gusty winds. Afternoon thunderstorms of high intensity and short duration are common. The average precipitation for May and June is less than one-half inch. A moderate amount of precipitation occurs during the winter from middle latitude storms from the Pacific Ocean which produce light or moderate showers which can continue intermittently for several days. Temperatures range from summertime highs of over 100°F to below freezing in the winter.

Copper Basin is within the Bill Williams Watershed which drains from Copper Creek into Kirkland Creek and southwestward into Alamo Dam on the Bill Williams River.

A water sample taken from Copper Basin Wash on February 27, 1974, showed amounts of hardness, copper, total dissolved solids and sulfates excessive for safe human use. This low water quality may be the result of past mining activity within Copper Basin or may be due to the natural oxidizing process of near surface sulfides.

Copper Basin lies on granite igneous bedrock and related crystalline intrusive rocks. The southern portion consists of old and recent alluvial deposits along Copper Basin Wash, and the northern portion comprises low hills and a large basin for which the area was named. The natural topography has been modified over the years by surface mining activities, resulting in man-made waste dumps and numerous roads. Slopes range from less than 5% on the alluvial deposits to 80% on the rockland. Elevations range from 4700 to 5800 feet.

Soils have formed from primarily granitic rocks, and are coarse-textured, i.e., loams and sandy loams with varying amounts of gravel, stone, and cobble. Upland soil series are predominately Barkerville with a small acreage of Gaddes in sections 30 and 31 along the western edge of the area. The alluvial soil series are predominately Cordes and Lonti. Small areas of unclassified soils - rockland and coarse-textured alluvium - are scattered throughout the western half of Copper Basin.

The majority of the soils in Copper Basin have a high surface erosion hazard and show a presently highly eroded condition. This is true not only for the natural landscape, but also for the many test sites, roads, and waste dumps.

The vegetative cover in Copper Basin is a chaparral type with little herbaceous ground cover. Principal species are shrub live oaks, catclaw, pinyon, alligator juniper, manzanita, crucifixion thorn, desert willow, agave, prickly-pear cactus, spanish dagger, mountain mahogany, ceanothus, lovegrass, mountain laurel, wright silktassel, side oats, blue and black grama, snakeweed, and menodora.



There are numerous disturbances to the soil as a result of past and current mining exploration activities. Soil disturbances consist of roads, exploration pits, and core drilling sites. In its present condition, the watershed has very little potential for an increase in vegetative production.

In 1972 and 1973, vegetative manipulation projects, which consisted of root plowing designed to increase grass production for the Cold Springs livestock grazing allotment were undertaken to change areas of chaparral brush cover to lovegrass, sand-drop seed and clover. The root plow projects are located in Sections 21 and 28, T.12½ N., R.3 W., and Sections 31, 32, and 33, T.13 N., R.3 W. The root plow project in Section 31 was financed by the Cold Springs grazing permittee with the remaining project being financed cooperatively by the permittee and the Forest Service.

There is no evidence that commercial timber species such as ponderosa pine have grown in the basin in quantity to support a harvesting program. The pinyon pine and alligator juniper have, in the past, been harvested for fence posts, fuelwood, and mine timbers on a limited scale. Present use of the scattered pinyon pine and juniper trees is for fence posts.

Recreational use of Copper Basin is limited due to the climate, dense vegetation, and poor access. The area offers hunting for both big and small game, sightseeing for the foot traveler and horseback enthusiast, and rock collecting. These activities account for an estimated 1200 visitor days of recreation use. This is not a significant part of the Prescott National Forest's annual recreation use. There are no developed recreation facilities within the area and no facilities are planned for the future.

The air in and adjacent to Copper Basin is of a relatively high quality. The small amount of pollutants in the air include noise and particulate matter from dust caused by vehicles and blowing winds. The dust from vehicle use is somewhat limited by the inherent nature of the transportation system. Because the roads are in relatively poor condition, large numbers of vehicles do not travel within the area and road dust

remains at low levels. Noise from chain saws and motor vehicles also remains at low levels because of the small amount of people-use within the Basin.

Copper Basin is served by several low-standard roads which enter from the north, east, and south. The roads vary in width from one lane to two lanes, vary in grade to twelve per cent, and have horizontal alignment varying from fair to very poor. Of the two roads on the Forest Development Road System, one road is maintained by the Forest Service and the other is maintained by Yavapai County. Many of the more primitive roads are not maintained at all. There are no Forest Development System trails within the Basin.

Copper Basin Road, Forest Development Road #196, is a one and two lane road maintained by Yavapai County. The surface is native material and varies from gravel to clay. This road is the primary transportation route through Copper Basin. It begins in the City of Prescott, winds west through the Basin, and terminates in Skull Valley. The entire length of the road is maintained to the minimum standard for passenger car traffic.

The McNary Mine Road, Forest Development Road #56, begins at U.S. 89 in Wilhoit, travels north through Copper Basin to its intersection with Copper Basin Road. It is a narrow, single lane road of low standard and is maintained by the Forest Service. The road is not suitable for passenger car traffic.

There are six rough, primitive roads in Copper Basin that total seven miles in length. These roads are not on the Forest Development Road System, are not maintained by anyone, and are suitable for 4-wheel drive vehicles only.

Thirty-four archeological sites were inventoried on the selected land by Dr. George Gumerman, Director, Archeological Survey, Prescott College, Prescott, Arizona, and his staff.(3)

over 100 vertebrate wildlife species live within this chaparral vegetative association all or portions of the year. They contribute recreational, and esthetic value to Copper Basin. This chaparral vegetative association supports several big game species including mule deer, javelina, and mountain lion.

A variety of small game mammals and upland game birds inhabit the area including desert cottontail, Gambel's quail, and mourning dove. Predators, besides the mountain lion, include bobcat, fox, coyote, skunk, golden eagle, hawks and owls. A number of other small mammals, songbirds, and reptiles live within Copper Basin.

#### Offered Lands

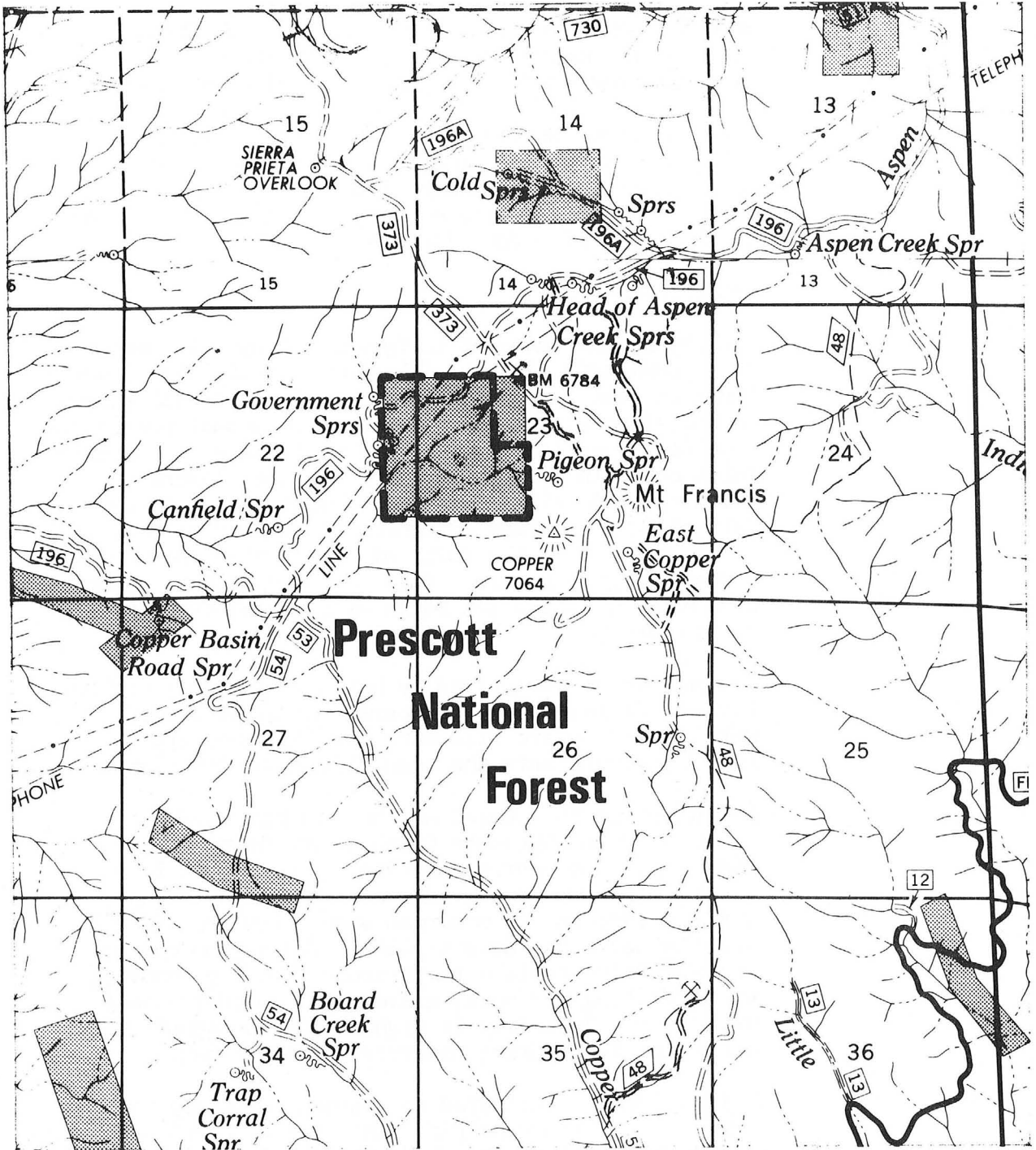
##### GOVERNMENT SPRINGS

Government Springs, located 4 miles southwest of Prescott and within one mile of Copper Basin, has similar climatological characteristics to Copper Basin with the single exception that greater amounts of snow accumulate within the Government Springs area due to its higher elevation which averages approximately 6600 feet.

A perennial spring, from which the tract gains its name, provides water for livestock and wildlife. The spring, initially developed by the U.S. Cavalry in the late 1800's as a watering station for military troops traveling between Phoenix and Fort Whipple northeast of Prescott, is currently in disrepair.

The Government Springs tract lies on granite igneous bedrock and is a part of the smooth mountainous land to the east of Copper Basin. Large granite rock outcroppings are characteristic with ponderosa pine covering slopes that range from 20 to 60 percent.

Soils have developed on granite bedrock and are generally Mirabol gravelly sandy loams. Erosion hazard is considered to be high. The overstory vegetation is ponderosa pine growing on a relatively unproductive site. Understory vegetation includes scrub oak, agave, ceonothus, and mountain mahogany. Very poor grass production severely limits the grazing potential within the area.



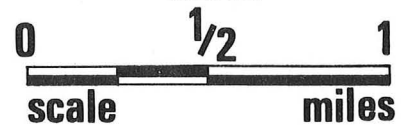
# Government Springs

T. 13 N., R. 3 W.

139.42 Acres Offered



north



Forest Development Road #196, Copper Basin Road, crosses the northwest corner of Government Springs providing access for big game and small game hunting.

The Government Springs tract supports a variety and density of wildlife comparable to the Copper Basin area, although of somewhat different species composition. The availability of water greatly enhances the value of the site for wildlife.

#### PACKARD RANCH

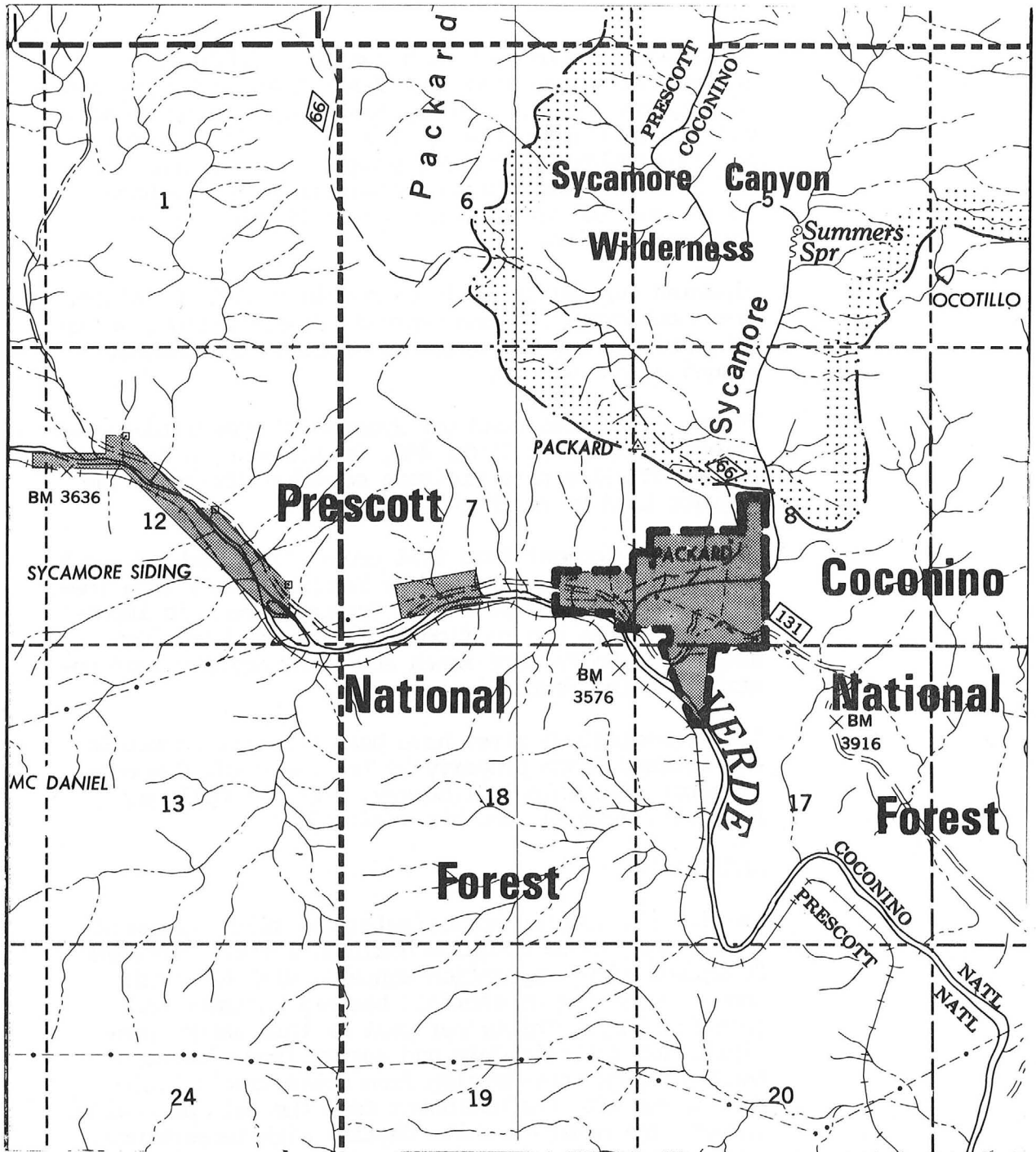
Packard Ranch, adjacent to Sycamore Canyon Wilderness, has a semi-arid climate with annual precipitation varying from less than four inches to an occasional twenty inches of moisture per year. Average annual precipitation is eleven inches. The heaviest and most reliable rains occur in July and August when deep layers of moist tropical air flow into the southwest from the Gulf of Mexico. Many afternoon thunderstorms form in the atmosphere as the moist air rises over the strongly heated, rugged terrain. Only an insignificant amount of winter precipitation falls as snow and even this melts quickly.

Summers are characterized by hot days and cool nights. July and August daytime temperatures often exceed 100°F. Winters are mild with daytime temperatures normally rising into the high fifties or low sixties.

Packard Ranch is located at the confluence of the Verde River and Sycamore Creek at an elevation of 3600 feet. The central portion of the parcel is a flood plain and shows evidence of recent flooding from scarring on the riparian vegetation from debris moved by water and debris piles. The stream channel is moderately stable with periodic flooding removing and depositing sediment, gravel, and boulders along the stream. Turbidity is high in both Sycamore Creek and Verde River during moderate to high flows.

Packard Ranch is situated on a Supai sandstone foundation of sedimentary origin. The eastern portion is on the edge of Duff Mesa, and the remainder is a part of the valley and lower slopes of scarps and canyon land adjacent to the Sycamore Canyon Wilderness. Slopes range from less than five per cent along the stream bottoms to two hundred per cent on the canyon walls.

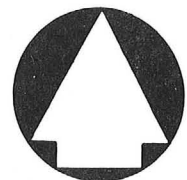




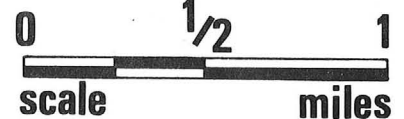
# Packard Ranch

T. 17 N., R. 3 E.

138.87 Acres Offered



north



Soils have developed from sandstone. Tobler fine sandy loams occur along the Verde River and a portion of Sycamore Creek, with adjacent slopes being principally sandstone rockland. The Tobler alluvial soils are rated high for herbage production potential and moderate for revegetation potential. Erosion hazard is low and the area is undergoing little erosion at the present time.

Riparian vegetation includes boxelder, Arizona alder, tree hackberry, Arizona cypress, desert willow, velvet ash, Arizona walnut, sycamore, Fremont cottonwood, mesquite, and willow.

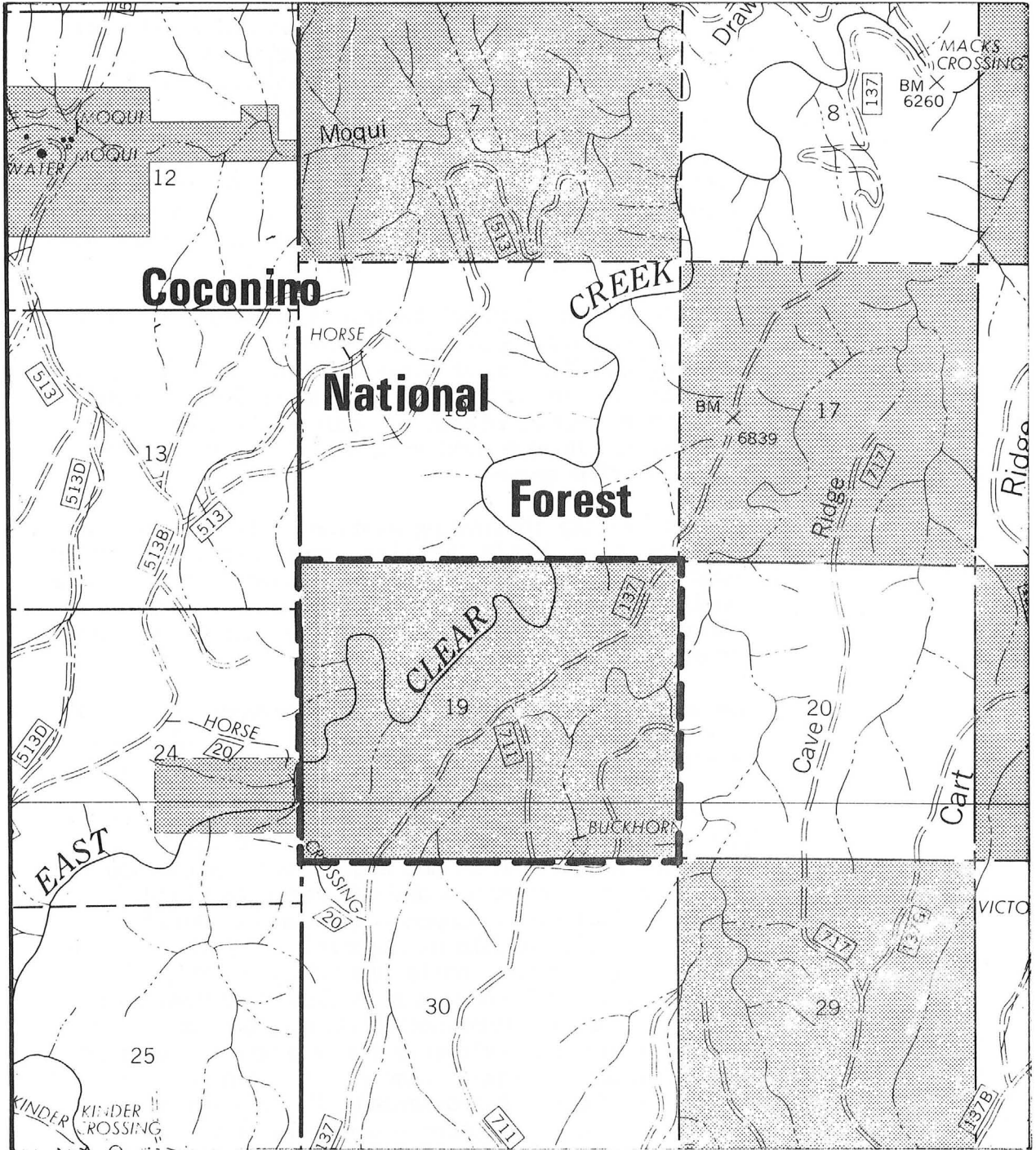
The southern trailhead for Sycamore Canyon Wilderness, Forest Development Trail #66, is adjacent to Packard Ranch and wilderness visitors occasionally cross the private land to reach the wilderness.

Forest Development Road #131 crosses the Packard Ranch property and is maintained by Yavapai County to a low-standard. The access across Sycamore Creek is impassible at times due to flooding. The road provides access to the Packard Ranch and other private land upstream on the Verde River.

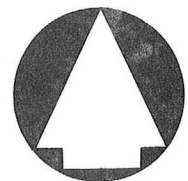
Six archeological sites have been inventoried within the Packard Ranch property by Dr. George J. Gumerman, Director, Archeological Survey, Prescott College, Prescott, Arizona, and his staff.(3)

#### SECTION 19

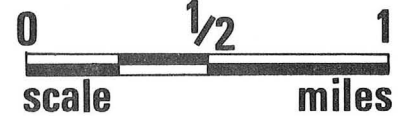
Section 19, located approximately 40 miles southwest of Winslow on the Coconino National Forest, averages 20 inches of precipitation annually with half this amount occurring as snowfall between November and late February. Thirty per cent of this annual precipitation falls in July and August from afternoon thunderstorms that develop from moist tropical air that moves into the southwest from the Gulf of Mexico. Summers are moderate while daytime high temperatures are near freezing from December through February. The elevation ranges from 6400 to 7000 feet.



**Section 19**  
**T. 14 N., R. 12 E.**  
**820 Acres Offered**



north



scale

miles

East Clear Creek flows through Section 19 in the southwest to northeast direction. The major source of water for the creek is water released from the Blue Ridge Reservoir. Blue Ridge Reservoir was built by Phelps Dodge to furnish water for the Salt River Project in exchange for maintaining water on Eagle Creek near the mining town of Morenci, Arizona. An intermittent but significant tributary of East Clear Creek is Barbershop Canyon which flows only after heavy summer storms and during spring runoff.

East Clear Creek channel bottom is moderately stable. Although sediment bedload movement is evidenced by scouring and filling of pools and bars on high flows, turbidity is rarely visible even after large storms. The stream channel bottom of bedrock, boulders, and cobbles, is interspersed with pool bottoms of silt, sand, and fine gravel.

A water quality monitoring station is located on East Clear Creek at Mack's Crossing, approximately 1½ miles downstream from Section 19. Tests show that all water chemical constituents in the stream are within acceptable water quality standards for the support of cold water fisheries habitat.(4)

The water table in the area varies between 500 to 700 feet as evidenced by the well depths at Knoll Lake, Mack's Crossing, and the Blue Ridge Ranger Station.

Soils have formed on sandstone and limestone bedrock. Wildcat gravelly fine sandy loam borders Forest Road #137 through Section 19 and also occurs in the southeast portion. Limestone and sandstone rockland from the East Clear Creek canyon walls contain only sparse pockets of soil capable of supporting vegetation. The well developed timber soils are McVickers very fine sandy loam and McVickers-Hogg soils. The remainder of the section is comprised of Jacks fine sandy loam and Jacks-Tortugas extremely rocky complex. Erosion hazard potential ranges from low to moderate, depending on the slope. Approximately 20 per cent of the soils - Hogg and McVickers - are capable of producing good stands of ponderosa pine.

East Clear Creek flows through a narrow, deep, and steep-sided canyon which is greater than 500 feet deep in the northwestern portion of Section 19. The

upper canyon walls and principally thin, isolated remnants of Kaibab limestone overlying Coconino sandstone. The remainder of Section 19 is hilly to the southwest, ranging in elevation from 6800 feet to over 7000 feet.

Section 19 has approximately 300 acres of accessible ponderosa pine. There are stringers of mixed conifer on the steeper north slopes and other steep slopes of inaccessible ponderosa. The area has been logged within the past two years and reproduction is evident.

Riparian vegetation associated with East Clear Creek includes narrow leaf cottonwood, velvet ash, Arizona walnut, boxelder, willow, Arizona grape, elderberry, Virginia creeper, dogwood, gooseberry, and Arizona rose.

Section 19 is accessible via Forest Development Roads #137 and #711. Both roads are maintained by the Forest Service to a very low standard for high-clearance vehicles only which limits recreational opportunities to hunting and fishing.

Two archeological sites have been inventoried on the east facing slope of East Clear Creek. Charred wood, a rough mat and mud packed walls are characteristic of one cave while the other cave contains charred wood and smoke-blackened ceilings. Both caves are in limestone bluffs high above the creek. Each cave has water formed channels extending in a westerly direction into the slope. One of the caves has two channels that extend 100 feet and 75 feet into the cliff. Both channels are wide enough to allow a person to reach their terminus. The other cave has six channels which are too small for a person to reach their terminus.

Section 19 has been given a high density rating by the Forest Service and the Arizona Game and Fish Department for elk, deer, and turkey. The Little Colorado Spinedace, Lepidometa vittata, a unique species according to the Bureau of Sport Fisheries and Wildlife, inhabits only the north flowing tributaries and upper mainstream of the Little Colorado River. In recent surveys, 1969 and 1972, these fish were found only within the East Clear Creek drainage

above Blue Ridge Reservoir. However, the entire East Clear Creek drainage is considered the habitat for this unique species.

Although two-thirds of Section 19 is considered non-suitable for livestock grazing, the remaining one-third is considered suitable and is in fair condition. A range cabin, one mile of fence, and a stock tank are located in the section.

#### SECTION 25

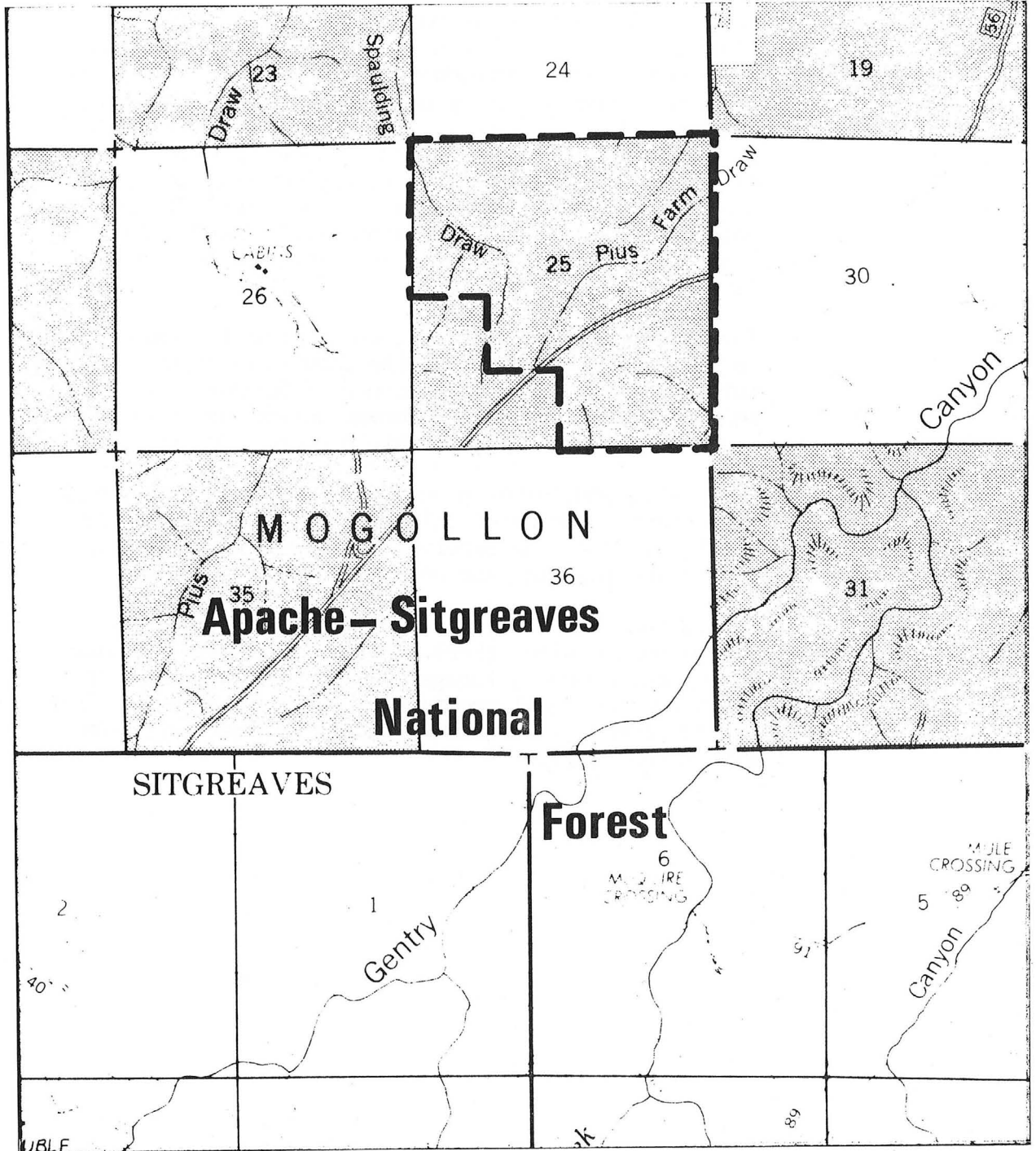
Section 25 is located approximately 50 miles southwest of Winslow on the Apache-Sitgreaves National Forest at an elevation of 7450 feet. The area receives an average of 20 inches of precipitation per year with the majority of precipitation occurring as snow during December and January and from tropical thunderstorms in July and August. Summer temperatures are moderate, near 90°F, while average temperatures are near freezing from November through February.

Section 25 lies on sandstone and limestone bedrock primarily from the Kaibab formation of sedimentary origin on the Coconino Plateau above the Mogollon Rim. Topography ranges from undulating to hilly, with short slopes up to 35 percent. The majority of the slopes, however, are less than 15 per cent. The land surface is relatively free of rock outcroppings and large boulders with large limestone rocks occurring near the eastern edge of the Section.

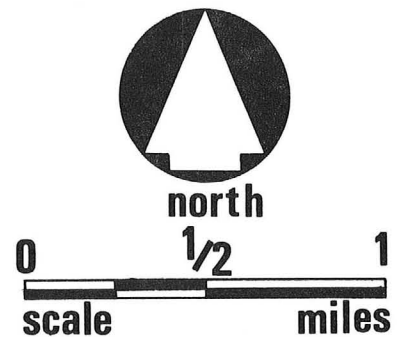
Soils have developed over sandstone and limestone, and have been identified as McVickers gravelly fine sandy loam, McVickers very stony, fine sandy loam, and Hogg-McVickers association. Depth to bedrock ranges from 25 to 54 inches. Erosion hazard is moderate to high for bare soil conditions. Heavy erosion exists on skid trails and spur roads from logging in the early 1960's. These soils are capable of producing good to excellent stands of ponderosa pine, as evidenced by the stumps remaining from past logging operations.

The vegetative overstory is primarily ponderosa pine. The understory is a dense stand of ponderosa pine sapling reproduction. Heavy timber cutting during the





**Section 25**  
**T. 13 N., R. 12 E.**  
**520 Acres Offered**



early 1960's removed approximately 83 per cent of the sawtimber volume. This heavy logging provided access through the dense reproduction and created small openings where the overstory had been relatively thick. No slash disposal work was done following the logging operation. This has resulted in heavy concentrations of fuel on the ground which is estimated to be up to 100 tons per acre in portions of the area. The remaining timber volume is approximately two thousand board feet per acre growing on a relatively productive site.

Forest Development Road #56, which provides access to the southwest corner of the Chevelon Ranger District, cuts across the southeast corner of Section 25. The road is maintained by the Forest Service as a low standard, high clearance vehicle route only.

Deer, elk, and turkey move through Section 25 although the site is considered only poor to fair habitat for wildlife. The area receives relatively heavy hunting use during the big game and small game seasons.

Due to the relatively heavy and dense young timber stands on the site, there is very little forage value. There are, however, forage species growing on the spur roads and the small openings created by logging. There are no perennial streams, springs, or riparian areas within the tract.



## II. ENVIRONMENTAL IMPACTS

### A. Land Exchange

The land exchange per se will cause no change to the physical environment of either the offered or selected land. The control over the properties would change, of course, i.e., the four parcels of offered land would be under Forest Service administration and the selected land would be under private control.

#### 1. Economic Impacts - Both Offered and Selected

The change of land ownership will have a direct effect on county property taxes and on Yavapai and Coconino County's pro rata share of National Forest receipts.

Revenue to Yavapai and Coconino Counties will change. The following sections show the predicted revenue changes based on present day values.

Real estate property taxes paid to Yavapai and Coconino Counties for the offered land were \$519(5) and \$1343(6), respectively, for the 1974-75 tax year. According to the Yavapai County Assessor's Office, the selected land would return approximately \$3190 annually in real estate property taxes to Yavapai County. As a result of the exchange, there would be a gain of \$2671 in real estate property taxes annually to Yavapai County and a loss of \$1343 in real estate property taxes annually to Coconino County.

Twenty-five per cent of all National Forest receipts are returned to the States for the benefit of public schools and roads in counties where National Forests are located. The twenty-five per cent payments to counties are prorated to all counties which are within each National Forest. Yavapai County received \$203,015 from the Prescott and Coconino National Forests in Fiscal Year 1974 and Coconino County received \$773,806 from the Coconino and Apache-Sitgreaves National Forests in Fiscal Year 1974.(7)

National Forest grazing fees are currently \$1.03 per animal month for cattle. The Cold Springs and Board Creek cattle grazing allotments on National Forest system lands within Copper Basin would be reduced by 100 cattle permitted year-long and 40 cattle permitted for six months respectively following the exchange. Based on the revenue loss for these animal months and the adjustment in acreage following the exchange, Yavapai County would lose \$566 annually and Coconino County would gain \$793 annually in the twenty-five percent payment to counties. This does not include the increase in National Forest revenue from grazing the offered land because the grazing capacities are not known. The grazing capacities of these units are, however, relatively small.

Considering the real estate property tax payments and the twenty-five per cent payments to counties, Yavapai County would gain \$2,105 annually and Coconino County would lose \$550 annually if the land exchange is consummated.

Calculation of Real Estate Property Tax Receipts to Counties

(Based on 1974 Fiscal Year Tax Rolls)

<u>Without Exchange</u>	<u>Yavapai County</u>	<u>Coconino County</u>
1. Government Springs	\$384	
2. Packard Ranch	135	
3. Section 19		\$ 141
4. Section 25		<u>1202</u>
	<u>Total</u>	<u>\$1343</u>
	\$519	

With Exchange

5. Copper Basin	**\$3190	
<u>Gain</u> (loss)	<u>2671</u>	(1343)

\*According to the Yavapai County Assessor's Office:

(5976.53 acres) x (\$50 appraised value per acre) = \$298,827

(\$298,827 appraised value) x (18% - assessed value) = \$53,789

(53,789 assessed value) x (\$5.93 tax rate per \$100 assessed valuation) = \$3190 Real Estate Property Tax

Calculation of Return of National Forest Receipts to Counties

(Based on 1974 Fiscal Year Income)

	<u>Yavapai County</u>		<u>Coconino County</u>	
	<u>Prescott NF</u>	<u>Coconino NF</u>	<u>Coconino NF</u>	<u>Apache- Sitgreaves NF</u>
<u>Without Exchange</u>				
1. Acres	1,193,207	426,952	1,404,543	281,404
2. National Forest Receipts to Counties	\$45,941	\$157,074	\$516,726	\$257,080
 <u>With Exchange</u>				
1. Acres	1,187,438	427,022	1,405,363	281,924
2. National Forest Receipts to Counties	\$45,348	\$157,101	\$517,033	\$257,566
<u>Gain (Loss)</u>	<u>(\$593)</u>	<u>27</u>	<u>307</u>	<u>486</u>

Summary of County Receipts with Land Exchange

	<u>Yavapai County</u>		<u>Coconino County</u>	
	<u>Gain</u>	<u>Loss</u>	<u>Gain</u>	<u>Loss</u>
1. National Forest Receipts		\$566	\$793	
2. Real Estate Property Tax	\$2,671			\$1,343
Total	\$2,105			\$ 550

## 2. Resource Impacts - Selected Land

None of the thirty-four archeological sites inventoried on the selected land by Dr. George J. Gumerman, Director, Archeological Survey, Prescott College, Prescott, Arizona and his staff, are listed in the National Register of Historic Places. However, an archeological clearance opinion, July 1974, by Dr. D. F. Green, Regional Archeologist, Forest Service, Albuquerque, New Mexico, recommended that archeological clearance not be given to exchange the archeological sites in Copper Basin as many of the sites " ... are likely to qualify for nomination to the National Register (of Historic Places)".\*

Prior to initiating any Federal action that might affect any property listed in the National Register of Historic Places or proposed for nomination to that Register or sites that seemingly meet the criteria for the National Register as stated in Dr. Green's opinion of the Copper Basin sites, compliance with the requirements of Section 106 of the National Historic Preservation Act of 1966 and Executive Order 11593 of 1971 as detailed in 36 CFR 800.1 through 800.10 is necessary to ensure the protection of America's cultural history values. When Federally owned properties containing cultural history values are proposed for transfer into private ownership, the National Advisory Council on Historic Preservation must be furnished with a preliminary case report of the cultural history values and proposed mitigating actions for their review.

\*Dee F. Green, "An Archeological Opinion of the Phelps Dodge Corporation Land Exchange A-7799 Prescott National Forest, Arizona", (Albuquerque, New Mexico: Forest Service, July, 1974), p.1.

In the opinion of the State Historic Preservation Officer the properties in question are eligible for inclusion in the National Register. Pursuant to 36 CFR 800.4(2) the Secretary of the Interior's opinion respecting the properties eligibility is being sought.

The conditions of adverse effect (35 CFR 800.9(d)) are met since it is proposed to transfer federally owned property. Therefore, Phelps Dodge will provide a preliminary case report detailing proposed mitigation action pursuant to 36 CFR 800.4(2)(f). Upon receipt of the report the Forest Service will request the comments of the State Historic Preservation Officer and the President's Advisory Council.

If the preliminary case report is disapproved by the Forest Service, the transfer of the archeological sites into private ownership cannot be made. If the preliminary case report is approved by the Forest Service, the Corporation must execute a contract with an archeological contractor who will perform the mitigating action and submit a report of archeological findings to the Forest Service. Upon Forest Service approval of the proposed mitigation action, clearance for the exchange of lands can be issued.

Public lands as administered by the Forest Service are available for use, under the appropriate controls and regulations, by all people for pursuits such as camping, picnicking, hunting, hiking, and off-road vehicle use. By exchanging public land into private ownership, access and use of 5,976.53 acres of land in Copper Basin could be restricted as desired by Phelps Dodge Corporation.

The proposed land exchange will have predictable direct and indirect effects if consummated on two grazing allotments, Cold Springs and Board Creek. The two grazing allotment permittees currently hold Forest Service grazing permits which are renewed on a 10-year term basis. Phelps Dodge Corporation has offered to negotiate lease arrangements with the two allotment permittees for their continued grazing operations on the selected land

if the land is exchanged into Corporation ownership,(8)(9) Historically, Phelps Dodge Corporation's lease arrangements have been for a one-year term, renewable annually until the land is needed by the Corporation.

The impacts of the proposed land exchange will include the following:

#### Cold Springs Allotment

The Cold Springs allotment has been progressing toward a more intensive level of management, through range development and a pasture management system. Within recent years, forage has been increased by the rootplowing of 800 acres of chaparral and seeding and by a rest-rotation system of use. The seeded areas have made it possible to rest native range and thereby increase native forage. Eight miles of fences have been built and two springs have been developed to make the application of an intensive grazing system feasible.

The exchange, if accomplished, could eliminate the management system now being practiced by removing a major management unit. The management options left open would be seriously curtailed. However, it is possible that grazing use under the present management system could continue should Phelps Dodge Corporation allow the leasee to continue operating his livestock under the management system.

The proposed management and development program is outlined in a Stage I Multiple Use Survey and Report prepared in 1970. The report states that the increasing recreation impact in one management unit near Prescott would eventually make the unit of limited or no use for livestock grazing. This loss would be offset by the rootplowing, seeding, and water development work, a large part of which lies in the Copper Basin lands selected by Phelps Dodge Corporation.



The proposed exchange would directly reduce the National Forest grazing capacity a total of 100 head of cattle grazed yearlong. Clipping studies and range production-utilization studies show a capacity of 60 head for the rootplowed and seeded areas affected. The grazing capacity of the native range included in the proposal is approximately 40 head. The proposal would, thus, eliminate the 60 head temporary permit granted due to forage increase, plus 40 head of reduction in the 10-year permit. In addition, there would be a further reduction due to the indirect effect imposed by the loss of a management unit encompassing additional acreage, plus the foregone opportunity of improving the allotment further and thereby permitting an additional 40 or more cattle. This increase was envisioned in the Stage I Multiple Use Survey and Report, wherein an increase of 100 cattle over the term permit was considered feasible and attainable.

#### Board Creek Allotment

The proposed exchange would have a direct and detrimental effect upon the management options of the Board Creek allotment as the selected lands include 33% of the acreage within the allotment. By removing 33% of the acreage, the opportunity for implementing a pasture management system on National Forest system lands would be eliminated. The remaining acreage would be too small to divide into management units. Its location makes it unfeasible to combine with other allotments, therefore accomplishments of the exchange as proposed would result in a sub-marginal allotment receptive only to minimal management. The allotment provides adequate forage for 120 cattle on a six-month seasonal permit. All of the acreage involved as selected is classified as suitable for grazing by livestock. The transfer of ownership would require reducing the term permit by one-third, 40 cattle. However, grazing could continue on the selected land under lease agreement with the Corporation until the land is needed by the Corporation for other uses.

3. Resource Impacts - Offered Lands

GOVERNMENT SPRINGS

Acquisition of the 139 acre Government Springs tract would help to consolidate National Forest ownership and eliminate the need to maintain approximately two miles of boundary line between public and private land. Acquisition of this tract would permit the Forest Service to rehabilitate the spring which was first developed by the U.S. Cavalry in the late 1800's as a watering station for troops traveling between Phoenix and Fort Whipple northeast of Prescott. Acquisition will make the tract available for public use and prevent the probable development of summer cabins with their resulting impacts on environmental quality.

If Government Springs remains in private ownership and is later developed as a summer home subdivision, the wildlife impacts will expand beyond the 139 acres due to human activities in the surrounding sections. This disturbance will be through direct manipulation of the habitat such as gathering fuel wood and cutting trees. The presence of humans is also a factor which causes a reduction in wildlife species diversity and density.

PACKARD RANCH

Packard Ranch is the southern trailhead into Sycamore Canyon Wilderness. Sycamore Canyon and Packard Ranch receive extensive use by wilderness visitors which has required camping restrictions be imposed along the lower four miles of Sycamore Creek to reduce environmental damage and stream pollution. Should Packard Ranch be developed by the private sector, the Verde River and Sycamore Creek would receive increasing amounts of pollutants from yearlong residents, increase the fire hazard on adjacent National Forest land, and detract from the visitor's first impression of a Sycamore Canyon Wilderness experience.

Private development of the Packard Ranch would increase the need for a higher standard access road. An improved, moderate speed access road to the entrance of Sycamore Canyon Wilderness would increase the number of wilderness visitors to an area that now receives heavy use in the first four miles of wilderness.

Packard Ranch is considered a key wildlife area due to the uniqueness of the riparian vegetative type in the Southwest. This area, as most river bottomlands, supplies wildlife species with the three essential elements for survival: food, water, and shelter.

Private development of this land could have a cataclysmic effect on the riparian vegetation, the wildlife species it supports, and the aquatic life of the Verde River. In nearly all instances of riparian habitat manipulation, a strong correlation exists between the degree of manipulation and/or destruction of habitat and the depletion of wildlife population densities and species diversity. Houses and resident humans on this tract will cause habitat destruction, solid waste disposal problems, water pollution if a sewage plant is not built, and loss of wildlife species and numbers on an acreage far greater than 139 acres.

#### SECTION 19

Acquisition of section 19 would consolidate National Forest ownership and eliminate the need to maintain four miles of property boundary between National Forest and private land.

The proposed Mogollon Rim Project, Wilkens Dam located approximately 13 miles downstream from section 19, has been proposed by the Bureau of Reclamation as a potential source of water for domestic and industrial purposes for the water-scarce metropolitan area of Flagstaff, Arizona. Location of the proposed dam is within the SE  $\frac{1}{4}$  SE  $\frac{1}{4}$ , Section 31, T.15 N., R.13 E., on Clear Creek just below its confluence with Willow Creek.

Maximum storage capacity of the proposed dam is 48,371 acre feet with a surface area of 650 acres. At maximum capacity, the dam would store water on East Clear Creek for a distance of 7.1 stream channel miles which will be 6 stream channel miles from Section 19.

While a portion of the private lands will be inundated by the proposed reservoir, other private lands will be suitable for recreational development as second home subdivisions. Portions of Section 19, two relatively flat areas within the canyon bottom, may be suitable for subdivision development which could add sediment to East Clear Creek through home and road construction. In addition, sewage disposal within the canyon bottom would add to the deterioration of the water quality within East Clear Creek.

Section 19 is considered key wildlife habitat due to the riparian vegetation in East Clear Creek. The area has a high density for deer, elk, and turkey. Acquisition of this area would preserve the habitat of the resident wildlife populations by protection from future development.

#### SECTION 25

The acquisition of Section 25 would consolidate National Forest ownership and eliminate the need to maintain four miles of property boundary between National Forest land and private land.

Section 25 is capable of producing a vigorous stand of timber due to deep fertile soils and favorable climatic conditions. Acquisition of the tract would permit the Forest Service to manage that timber resource for maximum production commensurate with other resource values.

#### B. Mine Development

Phelps Dodge Corporation has proposed the land exchange in order to acquire the lands necessary for support facilities for a potential open pit copper mine. If the land exchange is not consummated, the

mine could be developed on Corporation land and the selected land could be utilized for the related mine support facilities under provisions in the existing mining law, or under authority of Forest Service Special Use Permits, or a combination of these two authorities. The environmental effects of a mine development would be nearly identical no matter what authority is used to permit the development. Federal and State standards relating to air and water quality would apply to mining activities regardless of the land ownership or authority used to permit the mine development.

Development of the selected land for mining support facilities would create both favorable and adverse environmental effects. These environmental effects have not been discussed in the text of this environmental statement because they would be little influenced by the land ownership or authority used to permit the mine development. However, many people are interested in the nature of the mine contemplated and the probable effects of the mine. Because of this public interest, the Environmental Analysis of a Proposed Land Exchange Between Phelps Dodge Corporation and the Government of the United States, by Woodward-Envicon, Inc., Environmental Consultants, Scottsdale, Arizona, has been included in the appendix to this environmental statement. This analysis, commissioned by Phelps Dodge Corporation, presents the best available information on the size and type of mining operations which the Corporation anticipates in Copper Basin. The probable environmental and economic effects of the mine development are evaluated. Only a few specific comments concerning the Woodward-Envicon, Inc., report are deemed necessary. They are:

1. The Woodward-Envicon, Inc., report includes an analysis of a proposed land exchange with the Bureau of Land Management for Phelps Dodge Corporation land adjacent to Tuzigoot National Monument. The Forest Service Environmental Statement is limited to an analysis of the Corporation's proposed exchange for National Forest lands.

2. The Forest Service Regional Archeologist does not agree with the statement in the Woodward-Envicon, Inc., report, "None of these (archeological sites) is deemed qualified for the National Register of Historic Places".\*(10)

\*Environmental Analysis of a Proposed Land Exchange Between Phelps Dodge Corporation and the United States, Woodward-Envicon, Inc.  
(Scottsdale, Arizona: May, 1973), p. 46.

III. SUMMARY OF PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Selected Lands

Public access and other current public uses of National Forest land such as camping, picnicking, hunting, and hiking would be permitted only as the Corporation desires.

The removal of 5,976 acres from the Cold Springs and Board Creek range allotments will eliminate from Forest Service control the range management options for both allotments, and the permittees could be placed in a sub-marginal economic situation should the Corporation grazing leases not be issued.

Offered Lands

Coconino County would lose approximately \$550 in revenue annually.



IV. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

If the offered land becomes a part of the National Forest System, the protection and enhancement of its long-term productivity of various resources is assured. If the offered land is not acquired, there is a high probability that the parcels will be subdivided at some future time due to the imbalance of costs and returns on the investment. Should this assumption be accurate, natural resource productivity of the offered land would be traded to subdividing interests.

The exchange of the selected land into private ownership will result in a long term commitment of the land to Phelps Dodge Corporation management. The land management options available to the public through Forest Service administration will be lost.

VI. ALTERNATIVES TO PROPOSED ACTION

A. Refuse to Make the Exchange

By authority of the Mining Law of 1872, Phelps Dodge Corporation can elect to locate and patent as many millsite claims as they need for mine support facilities at a cost of \$5 per acre. Thus, if the Forest Service should decide not to make the exchange, the Corporation could acquire the land via the mining laws.

Because there would be no exchange and no offered land under this alternative, the United States would receive only \$29,880 (5,976 acres at \$5 per acre) instead of the public benefits from the acquired ownership of the offered lands. The environmental impacts in Copper Basin resulting from mine development under this alternative are nearly identical to the proposed action. Because there would be no exchange of lands in Coconino County, real estate property taxes derived from the two offered parcels of Corporation land would continue to be a revenue source to Coconino County. Should the Corporation acquire the public land they need through the mining laws or by exchange, there would be additional assessed valuation to the Yavapai County tax base and the County's revenues would increase.

B. Authorize Corporation Use of Public Land Under Forest Service Special Use Permits

Public land could be made available to the Corporation for a fee under special use permits. The fee return to the United States is dependent on the type of development which is not fully known at this time.

The United States would bear the added annual expense of administering the permits. The environmental impacts in Copper Basin resulting from mine development under this alternative are nearly identical to the proposed action. Because there would be no exchange of lands in Coconino County, real estate property taxes derived from the two offered parcels of Corporation land would continue to be a revenue source to Coconino County.

C. Approve an Exchange of Less Than the 5,976.53 Acres  
Proposed by Phelps Dodge Corporation

The Corporation has made studies as to their eventual land needs for mine support facilities. If less than the proposed acreage were exchanged, the United States would have to issue special use permits for roads, powerlines, and other necessary mining facilities, and/or the Corporation could acquire, through the 1872 mining law, millsite claims at \$5 per acre for the additional land needed for their operation. The United States would bear the added annual expense of administering the permits and the acreage and corresponding public benefits of offered land would be reduced proportionately to the reduced acreage of the selected land. The environmental impacts in Copper Basin resulting from mine development under this alternative are nearly identical to the proposed action. Coconino County property tax revenues would not be affected if no land were exchanged in Coconino County. Yavapai County real estate property tax revenues would increase depending on the number of acres of public land becoming private land in an exchange.

VII. CONSULTATION WITH OTHERS

- A. The following were consulted during the preparation of the Draft Environmental Statement:

Yavapai Citizens Association, Prescott, Arizona  
Yavapai College, Prescott, Arizona  
Izaak Walton League of America, Prescott Chapter  
Yavapai County Assessor  
Board of Supervisors, Yavapai County  
Prescott Board of Realtors  
Coconino County Assessor  
Mr. Eddie Balmes, National Forest Grazing Permittee  
Mr. William Dumont, National Forest Grazing Permittee

- B. The following agencies, organizations, and individuals were sent the Draft Environmental Statement for comment:

U.S. Senators and Representatives  
Arizona State Legislators  
Council on Environmental Quality  
U.S. Department of Interior  
Environmental Protection Agency  
Soil Conservation Service, USDA  
Advisory Council on Historic Preservation  
Arizona State Clearing House  
Northern Arizona Council of Governments  
The Wilderness Society  
Tucson Audubon Society  
Maricopa Audubon Society  
Colorado Plateau Environmental Advisory Council  
Western Forest Industries Association  
Arizona Cattle Growers' Association  
Arizona Wool Growers' Association  
Society for Range Management  
Society of American Foresters  
National Wildlife Federation  
Arizona Habitat Association  
Sierra Club  
Arizona Wildlife Society  
Arizona Outdoor Writers' Association  
Arizona Wildlife Federation  
University of Nevada, MacKay School of Mines  
Kennecott Copper Corporation  
Phelps Dodge Corporation  
Cypress-Bagdad Copper Company

Four Corners Environmental Research Institute  
Arizona State University  
Southwest Environmental Service  
Mr. John C. Hughes  
Shimmel, Hill & Bishop, P.C.  
Mr. Albert H. Mackenzie  
Evans, Kitchel & Jenks, P.C.  
Grimm Oil Company  
Northern Arizona University  
Museum of Northern Arizona  
City of Flagstaff  
Coconino County Board of Supervisors  
Flagstaff Chamber of Commerce  
Town of Williams  
Williams Chamber of Commerce  
Williams News  
Town of Cottonwood  
Town of Clarkdale  
Town of Jerome  
Verde Valley Chamber of Commerce  
Verde View  
Verde Independent  
Arizona Republic  
Phoenix Gazette  
Arizona Daily Star  
Cocopai Resource Conservation and Development Council  
Izaak Walton League, Prescott Chapter  
Yavapai College Library  
Prescott Public Library  
Prescott Center for Alternative Education  
Yavapai Citizens Association  
Yavapai Cattle Growers' Association  
Yavapai County Agent  
Yavapai County Board of Supervisors  
City of Prescott  
Prescott Chamber of Commerce  
Prescott Courier  
The Paper  
Mr. Thomas Horobik  
Mr. Richard Denton  
Mr. Richard Rowe  
Ms. Patricia Sparks  
Miss Rennie Anderson  
Mr. Todd Sargent  
Mr. Harold H. Block

Mr. Fred Gibbs  
Mr. Charles Bagby  
Mr. Larry Peter  
Mr. L. B. White  
Mr. Eddie Balms  
Mr. William Dumont

## APPENDIX A

### Literature or Information Source Cited

- (1) Dunning, Charles and Edward Peplow, Jr., Rock to Riches. Phoenix: Southwest Publishing Company, Inc., 1959.
- (2) Information in a personal interview with Mr. Fred Schemmer, March, 1974.
- (3) Gumerman, George, John Thrift, and Robert Miller. An Inventory and Assessment of the Archeological Inventory of Phelps Dodge Selected and Offered Lands: Copper Basin and Parts of the Verde Drainage System. Prescott, Arizona: Prescott College, 1973.
- (4) McKee, Jack and Harold Wolf, eds. Water Quality Criteria. 2d ed. Sacramento, California: California State Water Resources Control Board, 1963.
- (5) Yavapai County Tax Assessor's Records, 1975.
- (6) Coconino County Tax Assessor's Records, 1975.
- (7) Forest Service News Release. "Arizona Shares in Record National Forest Income". Albuquerque, New Mexico: Forest Service, September 5, 1974.
- (8) Phelps Dodge correspondence to Mr. Eddie Balmes, Cold Springs grazing allotment permittee, November 1, 1974.
- (9) Information in a personal interview with Mr. William Dumont, Board Creek grazing allotment permittee, April, 1975.
- (10) Green, Dee. "An Archeological Opinion of the Phelps Dodge Corporation Land Exchange A-7799 Prescott National Forest, Arizona". Albuquerque, New Mexico: Forest Service, 1974.



APPENDIX B

Environmental Analysis of a Proposed Land Exchange Between  
Phelps Dodge Corporation and the Government of the  
United States, Woodward-Envicon, Inc., 1973.

ENVIRONMENTAL ANALYSIS  
OF  
A PROPOSED LAND EXCHANGE  
BETWEEN  
PHELPS DODGE CORPORATION  
AND  
THE GOVERNMENT OF THE UNITED STATES

May 25, 1973

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## 1. INTRODUCTION AND DESCRIPTION

### 1.1 Introduction

Phelps Dodge Corporation has proposed an exchange of land with the Government of the United States\*. In order to act on this proposal, relevant government officials must have a reasonably clear picture of present conditions, and of the effects the exchange, and subsequent exchange dependent actions, might have on the people and "natural environment" of the affected areas. Obviously no environmental impact will result directly from the land exchange. However, changes in land use, made possible by the exchange, will bring about substantial changes in the natural environment, human activities, and living patterns.

The purpose of this report, prepared by Woodward-Envicon, Inc., is to provide integrated basic information and analytical judgment, that will facilitate understanding the effects of the exchange decision. It has been prepared in accordance with Section 102 (2) (c) of the National Environmental Policy Act (NEPA) of 1969<sup>1</sup>. Format and content of the report are generally in accordance with the guidelines of both the United States Forest Service (USFS), and the Bureau of Land Management (BLM) for Environmental Statements<sup>2,3</sup>.

### 1.2 Description and Purpose of the Proposed Exchange

#### 1.2.1 The Land Exchange

The lands which Phelps Dodge Corporation proposes to acquire (hereinafter referred to as the "Selected Lands") are peripheral to a current Phelps Dodge Corporation holding in the Copper Basin, southwest of Prescott in Yavapai County, Arizona. Most of these lands, totalling 9,016 acres, are now under the jurisdiction of the Forest Service, and the remainder is under the jurisdiction of the Bureau of Land Management (Figure 1).

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\*Since the lands which Phelps Dodge Corporation proposes to acquire are all within an area of the State of Arizona known as the Copper Basin, for the purposes of this report, the proposed land exchange and related projects will be referred to as the Copper Basin Project.

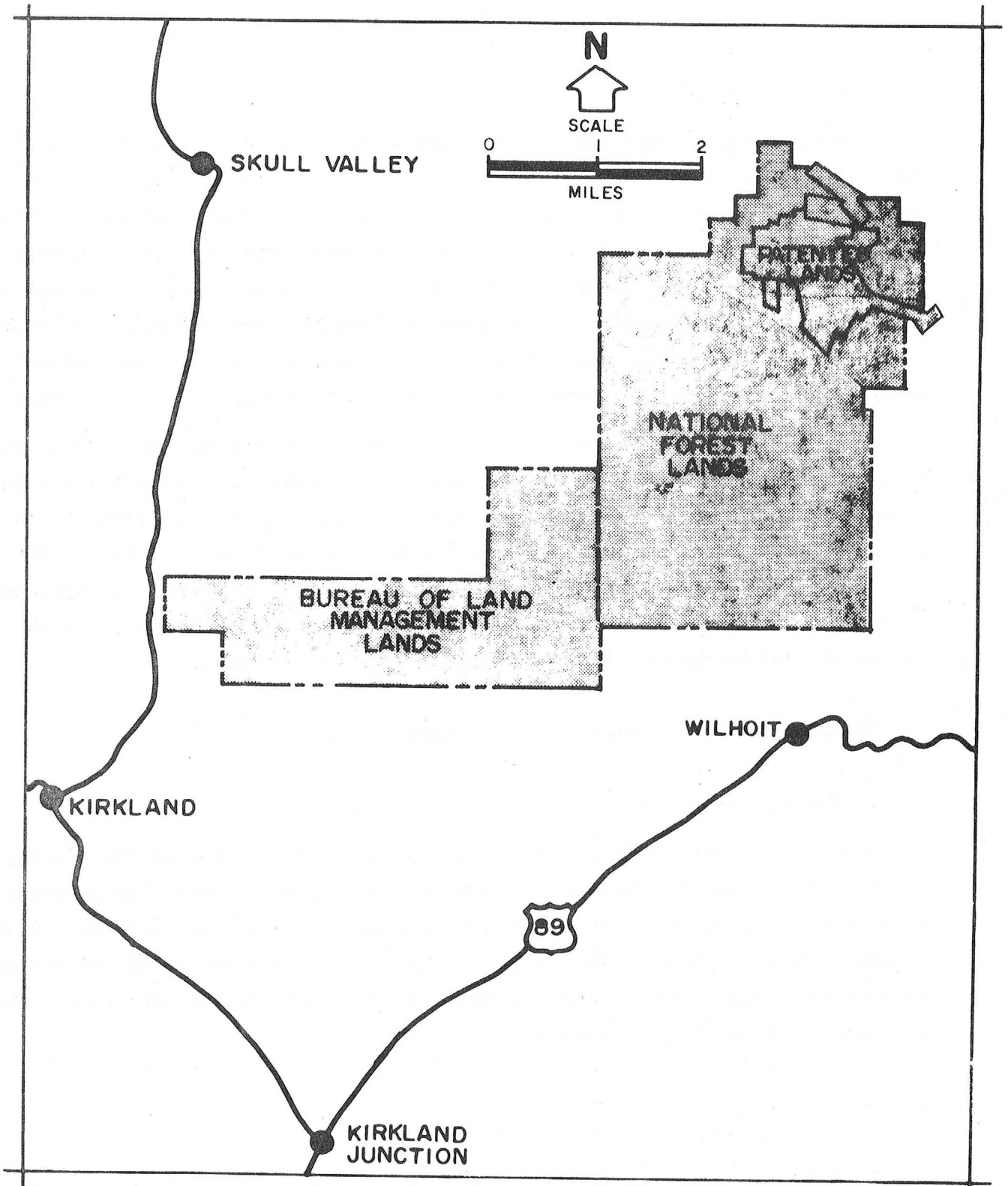


Figure 1: Locations of Patented and Selected Lands in the Proposed Copper Basin Land Exchange.



In exchange for the Selected Lands, Phelps Dodge Corporation has offered five parcels of land (Figure 2), totalling 1,836 acres, to the Forest Service and the National Park Service. These lands (hereinafter referred to as "Offered Lands") are:

- The Government Springs tract. 139 acres between Copper Basin and Prescott. Offered to the Forest Service for inclusion in the Prescott National Forest.
- The Sycamore Springs tract. 139 acres at the confluence of Sycamore Creek and the Verde River, also known as the Packard Ranch. Offered to the Forest Service for inclusion in the Prescott National Forest.
- The Aztec Lands. Two tracts totalling 1,341 acres: one tract on the Mogollon Rim, east of Blue Ridge Reservoir in the Coconino National Forest; the other about eight miles southeast of the first, in the Sitgreaves National Forest. Offered to the Forest Service for inclusion in the respective National Forests.
- The Tuzigoot Lands. 217 acres surrounding the Tuzigoot National Monument. Offered to the National Park Service.

Comparative figures on acreages and values, as appraised by Mr. Robert L. Blake<sup>4</sup>, a Valuations Engineer who is registered by the State of Arizona as a Professional Civil Engineer, are shown in Table 1.

Consummation of the proposed land exchange will enable Phelps Dodge Corporation to proceed with plans for the development of an open-pit copper mine on their patented claims in Copper Basin. These claims were operated by Phelps Dodge Corporation as a copper mine earlier in this century. The operation was terminated because it was economically infeasible to mine ore of Copper Basin quality with technology available at that time. Preliminary indications are that improvements in technology may now allow an economically feasible mining operation, provided that sufficient land immediately adjacent to these patented claims can be made available. Patented acreage is not sufficient to accommodate both the mine and the support facilities required by a modern mining operation. Since there are no known deposits of Copper ore, worthy of extraction, on the Selected Lands, the only purpose of the proposed land exchange is to make them (the Selected Lands) available for the support facilities, should the proposed mining operation prove to be feasible.

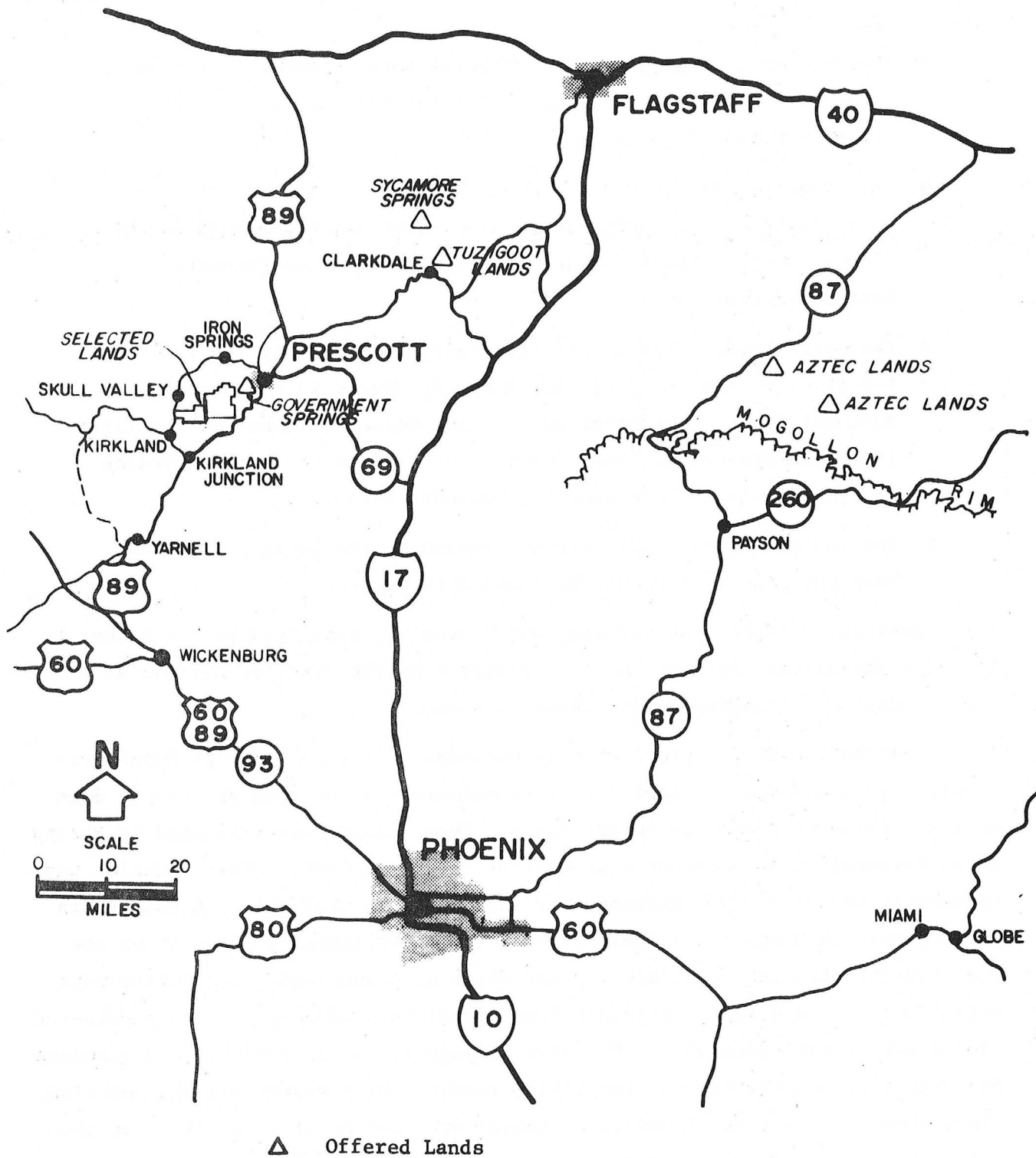


Figure 2: Locations of Offered and Selected Lands in the Proposed Copper Basin Land Exchange.

TABLE 1

ACREAGES\* AND VALUATIONS\*\* OF LANDS  
 UNDER CONSIDERATION FOR EXCHANGE  
 BY PHELPS DODGE CORPORATION AND THE FEDERAL GOVERNMENT

	<u>Acreages</u>	<u>Appraised Values</u>
Selected Lands		
From Forest Service	5,976	\$464,900
From Bureau of Land Management	<u>3,040</u>	<u>236,500</u>
Total	9,016	\$701,400
Offered Lands		
To Forest Service		
Government Springs	139	\$146,000
Sycamore Springs	139	174,000
Aztec Lands	1,341	335,200
To National Park Service		
Tuzigoot Lands	<u>217</u>	<u>222,900</u>
Total	1,836	\$878,100

\*Acreages are rounded to the nearest acre.

\*\*The valuations were made by Mr. Robert L. Blake, a Valuations Engineer who is registered by the State of Arizona as a Professional Civil Engineer.

Although the land exchange proposal was initiated by Phelps Dodge Corporation, it should be recognized that several benefits could accrue to the public as a result of this exchange.

● A new domestic source for copper to partially replace depleted sources, thereby reducing the need for copper imports, which are expected to be considerable before the turn of the century. This is very important from at least seven viewpoints.

- a. The United States has a significantly increasing need for copper.
- b. National defense. It is dangerous for the United States to be dependent upon foreign sources for any material which is vital to our defense posture.
- c. Foreign relations. Dependence upon foreign sources for such a vital mineral places significant constraints on the United States in negotiating trade, political and other agreements with other countries. Present dependence on Middle-Eastern oil sources is a case in point. The following quotation from the Arizona Republic<sup>5</sup> illustrates the reality and serious nature of this problem.

"Four Arab nations stopped pumping oil briefly yesterday in a gesture of support for the Arab struggle against Israel.

"Their slowdown, while only symbolic, underscored the increasing talk among Arabs about using their oil as a political tool.

"Libya suspended pumping for 24 hours, the official Libyan News Agency reported, as 'an expression of support to Arab rights in Palestine and rejection of the usurpation of Palestine with imperialist support.'

"Algeria, Iraq and Kuwait said they suspended pumping for one hour, complying with an agreement by the Federation of Arab Trade Unions in Cairo earlier this month.

"Western oil company officials claimed supplies were not affected.

"'Maybe a couple of guys took a break for an hour or two, but there has been no halt in shipments,' said an oil man in Tripoli, the Libyan capital.

"Although Arab militants have talked of mixing oil and politics since the first Arab-Israeli war, the conservative regimes that control much Arab oil have been reluctant to gamble with their enormous incomes.

"The flow of Arab oil has been seriously interrupted only twice - during brief periods of war in 1956 and 1967.

"Over the week-end, President Moammar Khadafy of Libya said: 'No doubt the day will come when oil will be used as a weapon by the Arabs in the Middle East.'

"The Libyan oil minister, Ezzedin Mabruk, went to Lagos, Nigeria, to deliver a message from Khadafy threatening action against Western oil companies if they reject demands for higher prices.

"If the companies fail to comply 'they must get out immediately,' the note stated.

"Libya apparently was seeking Nigerian support for possible reprisals against foreign companies following inconclusive oil price talks in Tripoli..."

- d. By reducing copper imports, the outflow of American dollars will also be reduced. At best, payments for foreign copper can be expected to be significant to the international economic position of the United States.
- e. Foreign copper may very well be significantly more expensive, with the obvious reflection in increased costs to American citizens.
- f. International competition, trade and political agreements, and local problems may cause the total foreign supply to be sold to countries other than the United States, or to just not be available to all. For example, according to the January 1973 issue of "Copper, Quarterly Industrial Report,"<sup>6</sup> Zambia stopped shipping an important part of its copper, which was traveling by rail through Rhodesia to a port in Mozambique, because of political problems between Zambia and Rhodesia.

g. Foreign copper sources development may also not keep pace with demands.

- Additions to National Forests of presently privately owned lands which are imbedded within those National Forests.
- Government protection of especially desirable Offered Lands from industrial and housing development.
- Government protection of special biotic environments and antiquities which are presently found on the Offered Lands.
- Room for expansion of the Tuzigoot National Monument.
- Additional recreational facilities for public use.
- Economic benefits to the National, State, County, and City governments, and to businesses and individuals outside of Phelps Dodge Corporation, as well as jobs for those who work for the Corporation.

These possible advantages, as well as potential undesirable impacts are addressed later in this report.

#### 1.2.2 The Importance of New Copper Sources to the United States

"The use of copper and its alloys is universal."<sup>7</sup> Copper is a good conductor of heat and electricity, is relatively non-corrosive, is not brittle at low temperatures, and has a fairly high melting point in comparison to the other commercially available metals. Thus, it has many and diverse applications. It is used in electrical equipment and supplies, construction, communications, automobiles, appliances, utensils, pollution control equipment, jewelry, and in a multitude of other ways. The largest use of copper is in electrical equipment and supplies, which alone accounted for nearly half of the 1968 demand. The manufacture of electric motors, power generators, fans, blowers, industrial controls, and many other devices requires the use of copper for the best electrical performance.

Although the physical and chemical properties of copper are necessary and irreplaceable in some applications, in other instances materials such as aluminum, plastics, steel, and glass, can be used instead. However, these substitutes are often compromises which have certain additional restrictions placed on their applications, do not do the job quite as well, or perhaps don't last as long.

In any event, according to a report of the Secretary of the Interior of March 1972,<sup>8</sup> the United States demand for primary copper is going up faster than production capability. Primary copper is copper which has been extracted from ores as opposed to being reclaimed from scrap. Tables 9 and 10 of the Secretary's report gave the following statistics for actual and projected United States demand for and production of primary copper.

<u>Thousands of Short Tons</u>	<u>Year</u>		
	<u>1970</u>	<u>1985</u>	<u>2000</u>
Demand	1,572	2,900	5,400
Production	<u>1,720</u>	<u>1,910</u>	<u>2,380</u>
Production-Demand	+ 148	- 990	-3,020
 <u>Millions of 1970 Dollar Equivalence</u>			
Demand	1,820	3,360	6,260
Production	<u>2,000</u>	<u>2,200</u>	<u>2,760</u>
Production-Demand	+ 180	-1,160	-3,500

The Secretary further stated that "Development of the Mineral Resources of the United States is not keeping pace with demand." This certainly seems to be true in the case of copper, since it has been estimated that by 1985 about one-third of the primary copper used in the United States will be imported, with a resultant outflow equivalent to a billion one-hundred sixty million 1970 American dollars. Considering the inflationary record, the actual number of dollars may well be twice this amount. The report further projects a possible deficit of 900,000 tons annually by 1980, with a possibility of an outflow of about 5 billion dollars in the preceding 9 years, and perhaps the loss of 10,000 jobs.

In discussing "the need for a national minerals policy, attuned to encouragement of private enterprise to meet our mineral and fuel demands," the Secretary emphasized, by making them section headings, several statements which are particularly germane to the issues being discussed in this report.



- "Expropriations, confiscations, and forced modifications of agreements in foreign countries already have severed the flow to the United States of some foreign materials produced by United States firms operating abroad and have made other materials more costly." The seizure of Kenncott's El Teniente mine in Chile is an example.
- "United States Industry is encountering far greater competition for foreign mineral supplies." For example, a developing Africa could use up the entire African copper production.
- "Increasing dependence on foreign sources for important mineral supplies places increasing constraints upon the conduct of the United States foreign policy and at the same time threatens the stability of the United States economy." For example, a country or group of countries "can threaten the United States economy with severe dislocation by suddenly embargoing shipments to the United States." The present petroleum products supply problem illustrates this point.
- "Investment in development of domestic mineral properties is falling behind."
- "Environmental regulations threaten major disruptions of some domestic mineral production."
- "Actual and prospective withdrawals of land available for prospecting and exploration may adversely affect domestic mineral development."
- "The trend toward increasing importation of processed materials of mineral origin increases balance-of-payments problems and further reduces employment and investment possibilities in the domestic mining and mineral processing industries."

Thus, it seems obvious that from the viewpoints of the need for the United States to maintain a strong international position (National defense and foreign relations), a stabilized economy, and a standard of living even approaching the present level, domestic development of copper production should receive all reasonable encouragement. It must also be recognized and accepted that the development of a new source of primary copper is not like a spigot to be turned on and off at will, but requires years of effort before the new mine can be a significant producer.

### 1.2.3 A Description of a Possible Mining Complex at Copper Basin

According to present indications, mining operations will not begin in less than 5 to 10 years from now. Consequently, plans for the development and operation of the mine complex are still somewhat general, rather than specific. It is, however, possible to consider a realistic possible mining complex that will allow approximate estimates of potential environmental impacts.\* For emphasis let it be reiterated that the mine proper will be contained within the boundaries of the present Phelps Dodge Corporation patent, with the Selected Lands being used only for support facilities and activities.

A typical complex for mining the ore in Copper Basin would consist of a mining plant and concentrating plant. There may also be a company town not too far distant for housing the employees.

The method of mining a low grade ore body, such as at Copper Basin, would most likely be by open-pit. Within a pre-designed pit, ore and waste material would be broken by drilling and blasting. Holes 10 inches to 12 inches in diameter would be drilled by large rotary drills, then loaded with explosives and detonated, thus breaking the material into sizes suitable for handling. Electric shovels would then load the broken material into large trucks which would haul it either to the concentrator, if ore, or to the waste dumps, if waste. In addition to the drills, shovels, and trucks, there would be bulldozers for cleaning benches and dumps, road graders, water trucks for suppressing road dust, small drills for drilling and blasting boulders, lubrication trucks, pickup trucks for the supervisory force, etc.

Ore for the concentrator would be trucked to the coarse crusher where it would be reduced to minus 6-inch size. It would then be transported by conveyor to the fine crushers where it would be reduced to minus 1/2-inch size. From the fine crushers, it would go to ball mills where it would be pulverized in water to possibly minus 200 mesh. Suitable flotation reagents would then be added and the pulp (water and pulverized ore) passed to the flotation cells where it would be concentrated, or upgraded by froth flotation. The reagents which were added would cause a froth to develop when air is passed through the

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\*Throughout this report, the term "environmental impact" will be used in a general sense to include effects on man as well as on the lands, and the biota other than man.

pulp with agitation. The copper minerals will cling to the bubbles of the froth and overflow into a launder. The gangue material remaining would be passed to a separate launder. The ore concentrate would then pass to thickeners where the froth would be depressed and the concentrate allowed to settle. Water would then be decanted off and the concentration pulp, now containing 45% to 50% water, would be drawn off the bottom of the thickener and piped to the railroad head. There it would be further dewatered by filters and then loaded into railroad cars for transporting to a smelter.

The low grade gangue material remaining after the copper concentrate has been removed, called tailings, would pass to a thickener, much like the concentrate thickener, where it would be dewatered to a slurry of 45% to 50% solids. The tailings would then be transferred either by launder or pipe to a tailings dam for disposal.

Water will be used in the pit to suppress dust in the drilling, loading, and hauling operations. The majority of this water is lost through evaporation. However, a small amount may be retained in the ore which goes to the concentrator.

The greatest user of the water will be the concentrator. In the neighborhood of 28% of the water used in the concentrating process will be lost through evaporation, retained in the tailings and in the concentrate. This water will need to be made up from the water source on the BLM land. At the Phelps Dodge mine at Tyrone, New Mexico, the total amount of water used is 666 gallons per ton of new feed into the concentrator. This per ton water requirement is obtained by recycling 357 gallons from the thickeners and 125 gallons from the tailings dam, and by adding 184 gallons of new, "make-up" water to replace the losses. This amounts to 28% new water and 72% recycled water. To conserve water, it is imperative that no water be lost from the concentrator except through evaporation and retention of moisture in the tailings and concentrates.

Water will be needed for domestic use at the townsite and for sanitation purposes around the plant and administration buildings. The end product of this water is sewage, which will be collected in ponds of suitable design where it will be oxidized and purified by the action of algae. Discharge from the ponds is by evaporation only. Seepage into the ground will be prevented by sealing the bottoms and gunniting the sides of the ponds, as was done at Tyrone, New Mexico. It will probably be necessary to have separate sewage systems for the plant and townsite.

Three types of solid waste will be generated by the mining complex.

1. Overburden waste and waste rock associated with the orebody.
2. Tailings consisting of minor mineral bearing waste material resulting from the upgrading of copper bearing ore by physical/chemical processes.
3. Common refuse from residents and commercial activities in the new town and from miscellaneous activities at the mine and plant site.

Overburden and waste rock associated with the orebody will be hauled to a suitable area downgrade from the mine, where it will be dumped. These waste dumps will be large. Although the Copper Basin orebody is not fully delineated, waste to ore ratios in similar ore bodies may be from 1:1 up to 3:1 or more, so it can be expected that the waste dump tonnage will be at least as large as the orebody, and could cover in the neighborhood of 1,000 acres.

Tailings will be disposed of in tailings dams which essentially are large decantation impoundments. The initial dam is usually constructed of the earth and rock available locally, and is in the vicinity of 20 feet high. The tailings are transported to the dam site either by open launder or by pipeline, and are distributed around the periphery of the dam by pipeline. The tailings are spilled inside the dam from a number of spigots located in the main line or its subsidiaries. The tailings flow toward the center of the impoundment and begin to classify as soon as released, the coarse sand fraction settling near the point of discharge and progressively finer material being deposited as it flows toward the center. A slope toward the center is established in this manner and is near 0.7%. When the initial dam is filled, another dam 10 to 12 feet high is raised by dragline or dozer on top and offset to the inside of the first, using the coarse sands which have settled out at the dam. When this dam has been filled, the process is repeated. Each time the new berm is offset toward the inside so that the overall slope of the dam will be around 23 degrees. At the center of the impoundment, there is a decant chimney which is connected by gravity pipeline from its base to a pumping plant located outside the dam. The chimney has holes at various elevations for decanting the clear water and regulating the water level of the pond, which accumulates in the center when the solids settle out. Regulation of the water level is very important, so that only coarse sands settle out at the outer berm and the fine material settle near the center.

The tailings dams may reach nearly a square mile in area and may be as much as 250 feet high. They will be located downgrade from the concentrator and away from any washes so as to be free from floodwaters. Downgrade from the dam, dikes will be constructed for controlling the erosion from the dam and for control in case of dam failure. In operation, tailings dams are constantly patrolled to guard against broken pipelines and to control the water level in the dam. A series of monitor wells may also be located downgrade to verify that there are no effects on groundwater quality.

Solid waste from the townsite and plant will be disposed of in a sanitary landfill. It will be located in a remote area away from any human habitation.

There are no present plans for constructing a local smelter for refining the ore from Copper Basin or for any leaching operations. Therefore, the assumption was made in this study that no smelter would be constructed and that there would be no leaching operations in Copper Basin.

It is very doubtful that a smelter would ever be constructed for this operation, since the production is not expected to be of sufficient volume to support the construction of a smelter. It will be less expensive to transport the concentrates to other existing smelters. However, there are factors which could change this situation such as: the possibility of another mineral discovery being made and a mine subsequently being developed in the area which, with the Copper Basin production, could justify the smelting of the concentrates locally; a substantial change in the cost or availability of transportation of the concentrates to existing smelters; the closure of those existing smelters; and the development of smelter technology which could make a smaller smelter economical solely for the Copper Basin production.

There are no present plans for any leaching of the ores from Copper Basin, because those ores consist primarily of the mineral chalcopyrite which, under present technology, is not susceptible to copper extraction by leaching methods. Again, however, it should be understood that changes in circumstances or leaching technology could in the future justify a leaching operation.

### 1.3 Description of Present Environments

#### 1.3.1 Selected and Patented Lands

Both the Patented and Selected Lands are wholly located within Copper Basin, which is an area of rolling terrain surrounded by rugged mountains and hills. The terrain is particularly imposing to the north and northeastward of the Patented Lands, where the Sierra Prieta Ridge rises sharply above its surroundings. In general, the basin slopes downward from northeastward to southwestward. The Patented Lands and the Selected Forest Service Lands range in elevation from 4,600 feet to 5,600 feet above mean sea level (MSL). Selected Bureau of Land Management Lands are at an elevation between 4,000 and 4,600 feet MSL.

The first mining claims in Copper Basin date back to 1882 and mining activities in the Basin appear to have been going on at varying levels since that time. With the already existing substantial visible evidence of these considerable and frequently intensive mining activities (including diggings, dumps, shafts, cabin remnants, and roadways) Copper Basin cannot be regarded as a virgin landscape.

Temperature and precipitation information was taken from the records of the nearest long-term weather station, located at Prescott, elevation 5,410 feet MSL.<sup>9</sup> Wind and stability information are from Prescott Airport. Prescott climatology can be considered to only roughly approximate the Copper Basin climate. From the viewpoint of air pollution dispersal, it is highly probable that both low level wind and atmospheric stability conditions at Copper Basin are significantly different from those at the Prescott Airport because of terrain influences.

Temperatures are moderate in comparison to Arizona extremes. Means for summer months average between 65°F and 70°F. Daily minimum temperatures are usually in the upper forties and low fifties, and daily maximum temperatures are usually in the middle to upper eighties. Mean monthly winter temperatures average between 35°F and 40°F, with daily maximum temperatures most frequently in the fifties, and daily minimum temperatures most frequently in the twenties.

Precipitation occurs during the summer months (early July through mid-September) in the form of numerous rainshowers and thunderstorms. Occasionally, large amounts of precipitation may result from the remnants of a dissipated tropical storm. Precipitation is more limited during the remainder of the year. Average annual precipitation is approximately 19 inches.



Apparently only two air monitoring stations have been operated in Yavapai County: a particulate monitor (no longer active) near a cement plant in Clarkdale; a particulate monitor near Montezuma Caslte. The data from neither of these two sites can be considered to be representative of Copper Basin.

Air Quality Control Region (AQCR) classification,<sup>10</sup> assigned by the Administrator (EPA), assumes that pollutant concentrations over entire regions are within specified limits. Classification of the Four Corners Air Quality Control Region, of which Yavapai County is a part, was based on the existence of a single large point source and urban population. Copper Basin is far removed from any large point source and is obviously and definitely rural in character. Thus, neither existing air quality data nor AQCR assignment provides a reasonable basis for fully describing Copper Basin air quality. However, even on this basis the AQCR classification indicates relatively low ambient concentrations of carbon monoxide, oxidants and hydrocarbons.

It is understood that AQCR designations are presently under official scrutiny. Changes could result in an AQCR assignment which more accurately corresponds to Copper Basin air quality conditions.

By applying the area model presented in Appendix A of the August 14, 1971 Federal Register,<sup>10</sup> to estimated emissions for Yavapai County for 1969 (Table No. 2)\* estimates of existing ambient air pollutant concentrations could be derived. However, this model simply defines a procedure for averaging ambient concentrations in space and time, assuming that the average emission density applies to all locations within the region. For this application, resulting ambient concentrations would be assumed to be the same at all times within the year and at all locations within the 20,956 square kilometer area of Yavapai County. It would be further assumed that Yavapai County is a discrete entity, with no pollutants supplied from any external sources, and it would be necessary to estimate a representative wind speed, and to estimate changes in emission levels since 1969. Further, the dependence of the validity of this model on terrain patterns is not clear.

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\*Arizona Air Pollution Control Implementation Plan!<sup>1</sup>



TABLE 2  
 POLLUTANT EMISSIONS INVENTORY SUMMARY  
 YAVAPAI COUNTY - 1969

(Tons/Year)

<u>Source Category</u>	<u>Pollutant</u>				
	<u>Carbon Monoxide</u>	<u>Hydrocarbons</u>	<u>Nitrogen Dioxide</u>	<u>Sulfur Dioxide</u>	<u>Particulates</u>
Fuel Combustion					
Stationary Sources	2	1	497	28	49
Process Losses	N	266	N	1,562	5,029
Solid Waste					
Disposal	3,596	154	227	N	897
Transportation	23,506	3,614	2,008	183	548
Miscellaneous	279	2,200	9	N	11,552
Grand Totals	27,383	6,235	2,741	1,773	18,075

N= Negligible (less than 1 ton/year).

Because of these several uncertainties it is felt that calculations of acceptable and known validity from this model are not a reasonable possibility. Further, there seems to be no other rationale which can be expected to provide dependable quantitative estimates. In a qualitative way, it should be recognized that there is moderately heavy truck and passenger car traffic on Highway 89, from Kirkland Junction through Wilhoit, into Prescott. One would expect that moderate concentrations of nitrogen oxides, carbon monoxide, and hydrocarbons frequently exist along this highway.

Because of the amount of precipitation, its sporadic and frequently showery nature, and surface soil types found throughout the area, runoff and absorption are rapid and little surface water is available. Runoff from Selected and Patented Lands flows down the many normally dry gullies into the Copper Basin Wash, which, in turn, empties into the Skull Valley Wash about 1-1/2 miles above the town of Kirkland (Figure 3).

There are no lakes or other bodies of standing surface water in the area except for a few scattered livestock ponds. There are a few springs located in the hilly areas above Copper Basin, but none on the Patented or Selected Lands. These springs are all quite small (generally less than 10 gallons per minute) and tend to be seasonal.

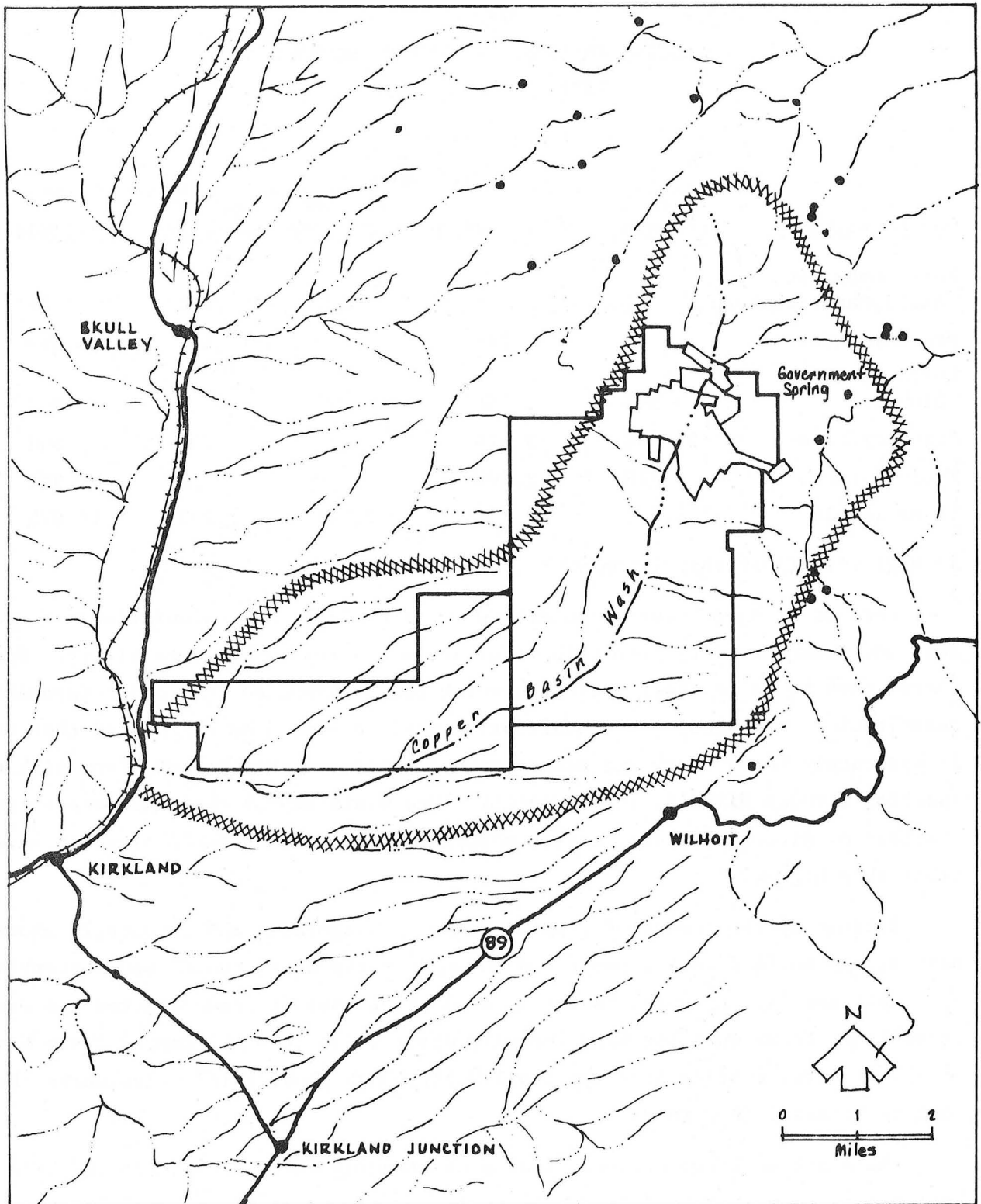


Figure 3: Watershed Tributary to Copper Basin Wash

A substantial quantity of water will be needed for the Copper Basin mining complex. Although the size of the mining operation has not yet been determined, 4,000 gpm has been assumed as a figure for the quantity of water to be used.

An area in the BLM Selected Lands appears to have potential for a water source. The surface of these lands is comprised of terraced gravels dissected by gullies, forming gravel ridges and sandy washes with a general northeast-southwest pattern. The terraced gravels are separated from the granitic rocks of the Bradshaw complex on the northeast and east by a large sinuous fault. On the northwest they are bounded by Skull Valley Wash and on the west and southwest by a series of basaltic and tuffaceous flows which dip gently to the northeast under the gravels.

Prospect drilling indicates that the thickness of the gravels in more or less the central part of the water basin is from 200 feet to over 1,000 feet. These gravels contain a moderate amount of water and are the aquifer for the majority of the stock wells of the area and the irrigation wells of Skull Valley. These wells are relatively shallow. A few are 400 to 500 feet deep, but the majority of depths are from 100 feet to 200 feet.

Exploration drilling to date indicates that at the base of the gravels is an aquitard and below that a series of basaltic and tuffaceous flows which is known by drilling to be over 1,000 feet thick and saturated with water. Pump tests indicate that the water in the upper gravels is sealed off from the water in the lower volcanic flows by the aquitard at the base of the gravels. Because of high costs of drilling and pumping, water from the lower aquifer is not economically available for domestic uses, stock water or irrigation.

From tests to date, it appears that sufficient water can be developed in the volcanic aquifer at depths of from 1,500 to 2,000 feet, and that, initially at least, pumping of the volcanic aquifer will not have an adverse effect on the water in the gravel or alluvial aquifer. To be certain of this, a system of monitor wells has been set up and will be checked periodically both for depth of the water table and quality of the water. Some of the monitor wells were drilled by the Phelps Dodge Corporation for that purpose and others are stock wells of the various ranchers who gave permission for monitor work. The monitor work and study are in cooperation with the U.S. Geological Survey and the Arizona Water Commission. It is expected that this study will benefit the entire Skull Valley-Kirkland area as far as water use planning is concerned.

In general, vegetation of the Copper Basin is an interior chaparral type, dense, shrubby, and generally of uniform height (3-6 feet), occasionally broken by a taller shrub or short tree. However, the western portion of the Selected Lands (under Bureau of Land Management jurisdiction) is a broad ecotone from the interior chaparral to a Mesquite (Prosopis juliflora) invaded plains-grassland type. The dominant perennial plant species found on the Patented and Selected Lands are identified in Tables 3 and 4.

Little riparian influence is found on the Patented Lands or in the Forest Service-controlled portion of the Selected Lands. Only a few Cottonwood (Populus fremonti) and a single Box Elder (Acer negundo) are found along the Copper Basin Wash. Further down the wash, riparian development becomes more evident with added presence of Tree Hackberry (Celtis reticulata) and Desert Willow (Chilopsis linearis).

The overall lack of riparian habitat on the Selected Lands decreases the avifaunal diversity specifically, and the biological diversity in general. The most evident member of the area's fauna is the Mule Deer (Odocoileus hemionus), which is dependent on the presence of such highly palatable shrubs as Mountain-mahogany, Wright's Silk-Tassel, and Cliff-rose. Carrying capacity of Arizona chaparral for Mule Deer has been estimated to be ten animals per square mile.<sup>13</sup> Long term human habitation in the Copper Basin has undoubtedly reduced the figure for this area. None of the Selected Lands are included in the recently revised Antelope (Antilocapra americana) range map for Arizona.<sup>14</sup> Cottontail Rabbits (Sylvilagus audubonii) are present but are seldom hunted because of the dense shrub cover.

For the same reason the Gambel Quail (Lophortyx gambelli) found in the area are also seldom hunted. Band-tailed Pigeons (Columba fasciata) have been the object of an experimental hunt in the southwest in recent years. The populations are seasonal and the hunter take for the entire Copper Basin management unit was only 10 to 25 birds.<sup>15</sup>

None of the wildlife species known to be present in the Copper Basin area are listed as rare or endangered in the 1966 edition of Rare and Endangered Fish and Wildlife of the United States (United States Fish and Wildlife Service),<sup>16</sup> or in the Federal Register pertaining to the Endangered Species Importation Act of 1969.<sup>17</sup>

TABLE 3

DOMINANT PERENNIAL VEGETATION OF SELECTED FOREST SERVICE LANDS

Arctostaphylos sp.	Manzanita
Cercocarpus breviflorus	Mountain-mahogany
Garrya Wrightii	Wright's silk-tassel
Juniperus deppeana	Alligator juniper
Nolina microcarpa	Bear-grass
Pinus monophylla	Single-leaf pinyon
Quercus emoryi	Emory oak
Quercus ambelii	Gambel oak
Quercus turbinella	Shrub live oak
Rhus trilobata	Skunk-bush

\*All scientific and common names as published by Kearney and Peebles.<sup>1,2</sup>

TABLE 4

DOMINANT PERENNIAL VEGETATION OF SELECTED BUREAU OF LAND MANAGEMENT LANDS\*

Aristida sp.	Three awn
Atriplex canescens	Four-wing salt-bush
Berberis trifoliolata	Algerita
Bouteloua curtipendula	Sideoats gramma
Bouteloua gracilis	Blue gramma
Bouteloua filiformis	Slender gramma
Canotia holacantha	Canotia
Cercocarpus breviflorus	Mountain-mahogany
Cowania mexicana	Cliff-rose
Ephedra sp.	Joint-fir
Mimosa biuncifera	Wait-a-minute bush
Prosopis juliflora	Mesquite
Quercus turbinella	Shrub live oak
Rhus ovata	Sugar sumac
Rhus trilobata	Skunk-bush
Trichachne californica	Arizona cottongrass
Yucca baccata	Bananna yucca

\*All scientific and common names as published by Kearney and Peebles.<sup>12</sup>

All of the Selected Lands are currently subject to grazing. The Cold Springs and Board Creek allotments, on the Forest Service Lands, are seasonally (6 months) grazed at a rate of seven animal units per section per month. In the past two years, the Cold Springs lessee has seeded two, 200 acre areas with love grass (Eragrostis lehmanniana) to increase the carrying capacity for cattle. Three separate operators lease grazing rights on the Bureau of Land Management Lands with allotments of ten animal units per section per month.

With the exception of the grazing and limited hunting, neither of which is an intensive use, the Selected Lands are used very little. There may be some hiking, but the Basin is not unique aesthetically, and drinking water is not readily available. There are many other areas in this region which are at least as attractive for recreational purposes, and some with better facilities.

### 1.3.2 Offered Lands

#### 1.3.2.1 Government Springs

The Government Springs tract lies along the Copper Basin Road, one mile east of Copper Basin and is a privately owned island within the Prescott National Forest. At an elevation of 6,500 feet MSL, (above the Selected and Patented Lands) the area has elements of chaparral and transition forest. The dominant flora present are identified in Table 5. The mature Ponderosa pines are scattered and have little commercial value. Their presence does provide valuable nesting and/or roosting habitat for a variety of wildlife. Populations of Band-tailed Pigeons and Abert's squirrel (Sciurus aberti) are known to occur in the area. Presence of the springs is a valuable asset, providing water for wildlife and fostering a mixed stand of Walnut (Juglaus major) and Choke Cherry (Prunus virginiana). Public accessibility, the spring, and the flora and fauna combine to make this a particularly desirable recreation area.

#### 1.3.2.2 Sycamore Springs

The Sycamore Springs tract includes the confluence of Sycamore Creek and the Verde River at an approximate elevation of 3,500 feet MSL. This parcel is located 1-1/4 mile downstream from the Sycamore Canyon Wilderness area, and controls access to both southern trailheads into this Wilderness Area. Biologically, this parcel contains a valuable habitat type. The perennial stream flow produces extensive stands of riparian vegetation along the stream banks (Table 6).



TABLE 5

DOMINANT PERENNIAL VEGETATION AT GOVERNMENT SPRINGS\*

Arctostaphylos sp.	Manzanita
Cercocarpus breviflorus	Mountain-mahogany
Juniperus deppeana	Alligator juniper
Pinus ponderosa	Ponderosa
Quercus emoryi	Emory oak
Quercus gambeli	Gambel oak
Rhamnus crocea	Red-berry buck-thorn
Rosa sp.	Rose

\*All scientific and common names as published by Kearney and Peebles.<sup>1,2</sup>

TABLE 6

DOMINANT RIPARIAN VEGETATION OF SYCAMORE SPRINGS\*

<i>Acer negundo</i>	Box elder
<i>Alnus oblongifolia</i>	Arizona alder
<i>Celtis reticulata</i>	Tree hackberry
<i>Cupressus arizonica</i>	Arizona cypress
<i>Chilopsis linearis</i>	Desert willow
<i>Fraxinus velutina</i>	Velvet ash
<i>Juglans major</i>	Walnut
<i>Platanus wrightii</i>	Sycamore
<i>Populus fremontii</i>	Fremont cottonwood
<i>Prosopis juliflora</i>	Mesquite
<i>Salix</i> sp.	Willow

\*All scientific and common names as published by Kearney and Peebles.<sup>1,2</sup>

The riparian vegetation in turn provides a wildlife habitat which is relatively rare in Arizona. The wildlife and aesthetic values of riparian habitat in the southwest have long been recognized by local and national conservation groups. Riparian habitat is particularly valuable since there is so little of it in the southwest, and existing natural riparian habitat is rapidly disappearing through development.

Historically, the Verde River and presumably Sycamore Creek were the habitat of fish species now considered endangered. Should future management plans consider reestablishment of these species, or management for new or existing species, government ownership of this land could be critical. Archaeological remains on these lands could be made available for public observation and education with reasonable effort.

#### 1.3.2.3 Aztec Lands

Offered Aztec Lands are made up of two tracts which are privately owned islands within the Conconino and Sitgreaves National Forests. Both are susceptible to recreational housing development, such as trailer parks, temporary housing, etc., and are in an area where such development is taking place. The Aztec Lands, at elevations between 6,500 and 7,500 feet MSL, are timbered, and were logged in the early 1960's. The timber is predominately Ponderosa pine. Less than 5% of the trees are Douglas fir (Pseudotsuga menziesii) or White fir (Abies concolor).

The Aztec Lands are seasonal range for Mule Deer, Elk (Cervus canadensis) and possibly Turkey (Meleagris gallopavo). Abert's squirrel is the major small game species present. Wildlife values of this timber land are enhanced by its proximity to winter range and migration routes. The parcels include small meadows and steep canyon slopes which provide summer forage for wildlife. Carrying capacity for domestic stock is estimated to be 10 head per section over a five to six month grazing period.

#### 1.3.2.4 Tuzigoot Lands

The Tuzigoot Lands, east of Clarkdale, Arizona, are adjacent to the Coconino National Forest, and completely surround Tuzigoot National Monument. Recognition of the archaeological significance of the Tuzigoot area by the public and technical community is emphasized in the following quotes from an article which appeared recently in the Phoenix Gazette:<sup>18</sup>

"Tuzigoot National Monument offers an excellent example of the ancient communal pueblos inhabited by the Indians who populated the Salt River Valley and its environs centuries ago, according to the Arizona Highway Department.

"Known as the 'pueblo of the crooked waters,' Tuzigoot is rated by archaeologists as an excellent example of pueblo-type Indian ruins, inhabited from about 1,000 to 1,400 A.D...."

"The site features (sic.) self-guiding trails and the museum is open 8 A.M. to 5 P.M."

The Offered Lands are a requirement for any significant expansion of the Monument, with the Offered Lands themselves containing significant archaeological remains. Part of these Offered Lands is an old tailings dump which has little biological interest. The remainder of this tract, however, includes an area of unusual biological interest.

The north bank of the Verde River, and the area known as "Tavasci Marsh", including Shea Springs, combine to form an ecological situation which has considerable potential as a bird watching and/or nature education facility. Vegetation varies from large cottonwood trees to cat-tail stands (Table 7).

The area is of sufficient interest to have attracted the attention of the Arizona Game and Fish Department. R.L. Todd<sup>19</sup> has made seven trips to the area, compiling an observed bird list of 77 species, and feels that the list could be expanded considerably with further trips. Todd also believes that, from a bird watcher's viewpoint, this ecological opportunity is the equal of the Nature Conservancy's Sanctuary at Patagonia (excepting wandering Mexican species). Presence of Nesting sora (Perzauu carolinensis) and Virginia rails (Rallus limicola) indicates the quality of this habitat, as both have highly restrictive nesting distributions in Arizona.

The area is presently leased for grazing purposes. However, long-term grazing of the succulent aquatic vegetation and Bermuda grass would probably reduce the habitat in size and quality. Water fowl are plentiful in the marsh, but the area is not large enough to support quality duck hunting.

### 1.3.3 The Community

The population of Yavapai County in 1970 was 36,850 with 10,071 family units averaging 3.66 people each. The towns and villages most likely to be directly

TABLE 7

DOMINANT PERENNIAL VEGETATION AT TAVASCI MARSH\*

Acacia greggii	Catclaw
Baccharis glutinosa	Seep-willow
Carex sp.	Sedge
Celtis reticulata	Tree hackberry
Cynodon dactylan	Bermuda grass
Cyperus sp.	Flat-sedge
Eleocharis sp.	Spike-rush
Lycium sp.	Wolf-berry
Populus fremontii	Fremont cottonwood
Scirpus sp.	Bullrush
Salix sp.	Willow
Typha sp.	Cat-tail

\*All scientific and common names as published by Kearney and Peebles.<sup>12</sup>

and significantly affected by a new mining operation in Copper Basin are Prescott, Wilhoit, Kirkland Junction, Kirkland, Skull Valley and Iron Springs. In 1970, the combined populations of these entities was in the vicinity of 15,000 people. These figures include 2,367 high school students and 5,724 elementary students. The Selected Lands are located in the Kirkland School District. This district has an average daily attendance in its one elementary school of 39 students. Prescott High School has an average daily attendance of 1,593 students.

In 1971, annual average employment in Yavapai County was 10,800. The public sector of employment (government, transportation, and utilities) accounted for 2,825 jobs. The three types of private industry classified as the basic sectors of the "private" economy (agriculture, manufacturing, and mining) accounted for 2,100 jobs. The remaining 5,875 jobs were in service-oriented "secondary" sectors of the economy. Substantial income is provided by the tourist industry and expenditures of the many retirees in the Prescott area. Perhaps as many as 1,000 service type jobs are at least partially supported in this manner, and should therefore be included in the basic economy sectors.

## 2. ENVIRONMENTAL IMPACTS

Obviously no environmental impact will result directly from the land exchange itself. However, changes in land use, made possible by the exchange, will bring about substantial changes in the natural environment, human activities, and living patterns.

### 2.1 Air Quality

#### 2.1.1 Potential New Sources

The exact number and kinds of vehicles, with respective pollution emission characteristics, which will be used in such a mine in 1978 and beyond, can only be roughly estimated at best. One can feel confident, however, that air pollution control technology will improve in the interim. With a mine of the type described in section 1, no major point source should result from the potential mining operation. Possible primary new air pollution sources would be: mine vehicles; space heating of mine buildings and the new town; and dust from roads, blasting, and crushing operations.

Although the potential mining operation has not been planned in detail, the following assumptions seem reasonably realistic.

1. Vehicles consuming 300 gallons of diesel fuel per day each.
  - a. 30 large dump trucks.
  - b. 4 track bulldozers.
  - c. 2 rubber-tired bulldozers.
  - d. 2 road graders.
  - e. 2 water trucks.

Total diesel vehicles 40.

2. Vehicles consuming 30 gallons of gasoline per day each.
  - a. 25 pickup trucks.
  - b. 6 company cars.

Total gasoline vehicles 31.

Calculated emissions for the assumed vehicle arrangement are provided in Table 8. These are based upon the projected state of the technology for 1975 and should be a considerable overestimate of actual emissions because of reasonably expected improvements in vehicle emission technology before the mine gets into operation.

TABLE 8

ESTIMATED VEHICULAR EMISSIONS<sup>20</sup>

<u>Pollutant</u>	<u>Each Diesel Engine (lbs/day)</u>	<u>Each Gasoline Engine (Stop &amp; Go Operation) (lbs/day)</u>	<u>Total 40 Diesel and 31 Gasoline Engines (lbs/day) (grams/sec.)</u>	
Particulates	3.90	.08	158.48	.83
Sulfur Oxides (as Sulfur Dioxide)	8.10	.15	328.65	1.73
Carbon Monoxide	67.51	49.6	4238.00	22.25
Hydrocarbons				
Evaporation		1.16		
Crankcase		.18		
Exhaust		4.96		
Total	11.10	7.30	670.30	3.52
Nitrogen Oxides (as Nitrogen Dioxide)	111.02	4.05	4566.35	23.97



In order to estimate air contamination from space heating, it was assumed that an accompanying new-town of 250 heated buildings would be built, and that there would be the equivalent of 50 heated buildings for mine operations. It was assumed that each of the 300 buildings would require an average of 15,000 cubic feet of natural gas per month\* (over the whole year). Estimated emissions under these assumptions are presented in Table 9.

Estimated data for the respective parameters (Tables 8 and 9) indicate that total vehicular emissions are 56 to more than 3,600 times as great as total emissions from space heating for the assumed buildings, using natural gas to heat the buildings.

Additional dust is the remaining possible new source of air contamination. It is expected that dust will be controlled by watering when it is at all practicable. Blasting appears to be the only operation for which dust control by watering is not feasible, and after the initial phases of construction, blasting will be confined to the pit. In general, it can be expected that the dust from blasting will settle out rapidly and be limited pretty well to the mine area.

#### 2.1.2 Changes in Ambient Air Quality

Changes in ambient concentration levels in surrounding communities will depend upon the rates of emission, the dispersion characteristics of the atmosphere, and wind directions. Dispersion characteristics of the atmosphere are a function of atmospheric stability.

The only wind and stability information available for this area are for the Prescott Airport. Topographical considerations are such that this information can be considered to only very roughly represent the Copper Basin environment for wind speeds and stability categories. It seems quite likely that low level wind directions at Copper Basin differ significantly from those at Prescott Airport.

The fact that about 13% of the hourly wind speeds for Prescott Airport (1967-1971) were 3 mph or less and 32% were equal to or less than 6 mph is a fairly reliable indication that light winds and stable conditions are not uncommon in the Copper Basin area. Similarly, an estimated annual frequency

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\*Source: Telephone communication - Mr. Church, Southern Union Gas Company, Prescott, Arizona, February 15, 1973.

TABLE 9  
ESTIMATED SPACE HEATING EMISSIONS<sup>20</sup>

<u>Pollutant</u>	<u>Each Building (lbs/day)</u>	<u>All 300 Buildings (lbs/day)</u>
Particulates	.0094	2.82
Sulfur Oxides (as Sulfur Dioxide)	.0003	.09
Carbon Monoxide	.0099	2.97
Hydrocarbons	.0039	1.17
Nitrogen Oxides (as Nitrogen Dioxide)	.0247	7.41

(1967-1971) for Prescott of about 45% for stable (E,F, and G) Pasquill Stability Classes,<sup>21</sup> also strongly indicates that stable atmospheric conditions are not infrequent in Copper Basin and environs. Further, the fact that these estimated frequencies (Table 10) are relatively high for all seasons suggests that stable conditions in the Copper Basin are not seasonally restricted.

On the other hand, using Prescott data for the assignment of specific frequencies for wind speeds and stabilities, contingent upon wind directions, for Copper Basin would be improper because of significant differences in local terrain influences. The resulting values would not represent the Copper Basin environment. Since the average annual wind speed is a relatively conservative parameter, the annual average of 8.4 mph for Prescott Airport is probably a good approximation for the Copper Basin annual average wind speed.

Since it would provide specific numbers for comparison with standards, there is a temptation to apply the Pasquill-Gifford equation for ground level sources<sup>22</sup> to obtain an estimate of expected ambient concentrations. However, these equational relationships are based upon data collected over relatively flat terrain and under limited circumstances. The results could significantly misrepresent the truth. There is no way of knowing whether this is so without an extensive measurement program, after the mine is in operation. Thus the temptation to apply assumed emission patterns and assumed meteorological data to questionable equations was rejected.

There are, however, some statements that can be made with reasonable confidence.

1. Vehicle emissions will be from an area rather than a point source. Thus, there is an initial dilution from the dispersion of sources. It can be expected that effluents from different sources will sometimes join as they drift away from their sources. However, maximum point ambient concentrations should not even approach maximum point ambient concentrations possible from a point source with an emission rate equal to the sum of the emission rates from the assumed vehicles. Examination of terrain features suggests that, in general, the effluents from the diverse sources will not be channelled into a single identifiable stream. Instead, it is expected that the contamination pattern will usually expand as it moves away from its source.

TABLE 10

ESTIMATED FREQUENCIES OF PASQUILL STABILITY CLASSES\*<sup>21</sup>

PRESCOTT, ARIZONA (1967-1971)

<u>Stability Class</u>	<u>Winter</u> %	<u>Spring</u> %	<u>Summer</u> %	<u>Fall</u> %	<u>Annual</u> %
A (Very Unstable)	.28	2.26	4.65	1.79	2.25
B	4.56	8.66	11.01	9.45	8.44
C	9.00	16.23	17.80	11.92	13.77
D	32.47	33.38	26.69	28.32	30.21
E	28.02	23.20	23.87	25.66	25.17
F&G (Inversion Conditions)	25.67	16.28	15.98	22.86	20.16

\*Provided by the National Climatic Center of the National Oceanic and Atmospheric Administration.

2. Air Quality of the City of Prescott will not be directly affected by the mine operation per se because of the intervening mountains.

3. Because of terrain roughness, with wind speeds of perhaps 5 mph or even less, effluent patterns should undergo vertical expansion, even during stable circumstances.

4. Highest concentrations are expected to occur when the lower atmosphere is generally stable, with light winds. During such circumstances, downslope drainage at night and upslope motion by day (if such conditions actually persist through daytime hours) seem to be the most probable wind patterns.

Topographical patterns indicate that night drainage would be to the southwestward, roughly toward Kirkland, and that the terrain itself would not resist horizontal expansion with translation. Terrain roughness would contribute to vertical dispersion, which would be augmented somewhat by the source being higher than the destination. Indeed, inversions may occur first over the lower elevations, thereby providing a shield from any downward drifting effluent. Since, during such periods, there should be considerable sunshine, upslope winds in the daytime would be accompanied by some instability in the ground layers. Upslope motion probably would not be in a path exactly the reverse of downslope drainage. The result would be further dispersion.

It therefore seems doubtful that, in general, drainage-upslope patterns during persistent stable circumstances would result in an additive accumulation of pollutants over a matter of days. It is possible that under some circumstances the effluent could be held against the mountains in the daytime and then flow downhill the following night. It is believed that this would be an uncommon situation, if indeed it happens at all.

Numbers are obviously highly desirable for anticipating changes in ambient air quality resulting from the potential mining operation. However, considering the assumptions that would be required, calculations by any model would constitute only a best guess of unknown reliability, and should not be used as a basis for judgment. For example, the mine is still only in the planning stage, the state of the air pollution control technology that will be available is not known in detail, atmospheric dispersion patterns are not known, etc. A qualitative statement does, however, seem reasonable.

It appears that changes in ambient air quality levels resulting from the potential mining activities will not violate official standards, nor are they expected to be significant to human health and/or welfare. In general, there should be very little reflection of mining activities, per se, on the ambient air quality of the surrounding communities. Insignificant increases in automotive pollution, because of the increase in the traffic that will accompany any sizable new industrial activity are expected.

This judgment is based primarily on the following:

1. Vehicles will be the primary air pollution source.
2. The state of vehicle emission control technology by the time this mine could go into operation is expected to reduce emissions to very low levels. The total amount of emission is expected to be much less than the 1969 emission estimate for Yavapai County.
3. The vehicles will be dispersed over a considerable area and, in general, will be well removed from locations available to the public.
4. Blasting dust is expected to be pretty well confined to the immediate mine area.
5. Other dust is to be controlled by watering.
6. Terrain features do not seem to favor the accumulation of contaminants at near-ground levels over long periods of time.

## 2.2 Water

As previously indicated, a substantial quantity of water will be needed for the Copper Basin mining complex. Although the size of the mining operation has not yet been determined, a requirement for 4,000 gallons per minute (gpm) has been assumed.

Present plans call for the procurement of about 72% of the necessary water by recycling and the other 28% from wells into the lower of the two aquifers. From present tests, it appears that sufficient water can be developed in this volcanic aquifer at depths of 1,500 to 2,000 feet, and that the upper aquifer will not be affected. However, a system of monitor wells has been set up and will be checked periodically to determine the behavior of the water table level

and the quality of the water. The information from these monitor wells will be of obvious value to the surrounding communities for water use planning.

It is possible that tapping the lower aquifer for 4,000 gpm may result in reducing the quantity of water present in that aquifer. However, the water from that aquifer is not presently being used. Further, it is possible that recharge via the sinuous fault on the east side of the groundwater basin will mitigate this effect to some extent. Estimated average rainfall for the area of about 19 inches per year would give a total of 29,199 acre feet for the watershed per year. How much of this will go as recharge water is not known, but it could amount to a considerable percentage of that total which is removed.

Tailings ponds will be new bodies of water in the area. Although they do not provide feed, they are used as a haven of rest for migrating water fowl. Both ducks and geese have taken advantage of the many tailings ponds of Phelps Dodge concentrators as a place to rest during migration.

Tailings pond water is also used as drinking water by the local fauna, and increased water availability and spillage around the premises may actually result in more total forage than was available before the mining operation. Indeed, the New Mexico Department of Game and Fish has stated that the "increased operation at the Tyrone facility has not proved detrimental to deer and other wildlife populations in that immediate area."<sup>23</sup> They further indicate that all of their "data would suggest that deer populations have significantly increased in that area over the past several years."<sup>23</sup>

A potential exists for groundwater contamination from seepage of the water from the tailings ponds and the oxidation ponds. Seepage from the tailings ponds should be slight, if any, since the solids in the pulverized tailings will seal the ground. Groundwater in the vicinity of the tailings ponds will be monitored and if contamination is found to be severe, corrective measures can be taken, such as sealing the ground or removing the contaminated water by pumping.

The oxidation ponds will be sealed either by gunniting the sides and sealing the bottoms with soil cement such as was done at Tyrone, New Mexico or by other suitable means so that no seepage into the groundwater basin is expected. There is no effluent from these ponds. Discharge is by evaporation. There should be no groundwater contamination from the oxidation ponds.



With the exception of water used for dust control and domestic and sanitation uses, the water in the mining complex is in a closed system. It is recovered at various stages in the operation and recycled. Water used for dust control in the pit and on the haul roads evaporates or is retained in the broken rock. There is no effluent from the oxidation ponds. Consequently no pollution of the surface waters is expected from these sources.

Runoff from graded or paved areas during rainstorms will contain minor amounts of pollutants from the pavement, per se, and from vehicles. These sources are expected to be negligible, and have been considered only in the interest of completeness.

Oxidation ponds for sewage disposal will be located in an area remote from habitation. There are no odors or effluents from properly designed ponds.

### 2.3 Solid Wastes

The principal impact associated with solid waste disposal would reflect directly the change in the use of the Selected Lands. In all, perhaps 1,000 to 2,000 acres could be changed from their present condition (shrub covered slopes and arroyos) to piles of broken rock and tailings. This could result in the local destruction of the flora and a displacement of some of the faunal population of the area.

Large waste dumps of broken rock and tailings dams will cause a distinct change in the area's visual appearance, and will be seen from U.S. Highway 89. However, as noted in Section 1, previous mining activities and roads have already left their marks on the landscape.

This effect will be somewhat diminished by revegetation of the dumps and tailings dams. Revegetation and increased surface water availability is expected to reestablish the faunal population in parts of the area, possibly in even greater abundance than was there previously.

Assuming 1,000 new residents, the accompanying new town, if it becomes a fact, would generate solid wastes at the rate of about 4,000 - 5,000 lbs. per day. No landfill site has as yet been selected, but it probably would cover several acres. The climate and the availability of gullies are conducive to an effective, obscured, and relatively innocuous sanitary landfill system.



## 2.4 Noise

Existing noise levels at Wilhoit, Skull Valley, Copper Basin proper, and Prescott were measured. Conservative estimates of new noise sources from the potential open-pit copper mining operation were based on measurements made at the Bisbee mines. Noise levels at each of the Copper Basin communities, which might occur if the mine were to materialize, were estimated by combining recorded existing levels with calculated additional ambient noise from the potential mining operation. Additions to ambient noise levels were calculated by applying selected equations to mine noise source data and distances between potential noise sources and Copper Basin communities.

Additional measurements were taken in the Bisbee-Lowell-Warren area to get a measure of the community effect of the Bisbee mines operations. Even at short distances from the mines, local road traffic noises were predominant, and levels were less than those recorded in downtown Prescott.

It is expected that contributions to ambient noise levels resulting directly from potential mining activities will cause little change in ambient noise levels in the communities near Copper Basin. The differences do not appear to even approach significance from the viewpoint of human annoyance or health.<sup>24</sup> Additions to the ambient noise levels in Prescott directly from mining activities are not expected because of the intervening mountains as well as distance.

It is also expected that traffic increases will in some areas, increase the frequency of noise levels which can interfere with radio and TV enjoyment and sleep in houses immediately adjacent to the road. These locations are already subject to substantial traffic noise. Potential traffic noise levels should not even approach levels which are significant from the viewpoint of pain and health. Traffic noise should be a consideration in site selection and lay-out of any new town.

## 2.5 Biological Impacts

The chaparral type flora presently growing on these lands would gradually be destroyed over an area of as much as 1,000-2,000 acres. This effect would be diminished somewhat by any revegetation of dumps and tailings ponds. These flora are well represented elsewhere in Arizona. The loss of the vegetation will cause some alteration of wildlife and grazing habitat. At first, reduction of the Mule deer population is expected, but as previous mentioned, the increase in the availability of surface water, and water spillage, may actually result in an increase

in the number of animals. Some of the graze for the cattle will be lost. The grazing loss will be linked to the mine's development and operation and will therefore be somewhat gradual. On the other hand, again the availability of surface water and spillage may actually result in an increase in the total amount of forage suitable for cattle.

Reductions in wildlife population due to human habitation, noise and vehicular traffic are difficult to assess, as behavioral data under similar conditions are not well documented. For safety reasons, it could be expected that hunting on the Selected Lands would at least be considerably restricted, if not eliminated altogether.

No rare or endangered species would be involved.

The Offered Lands are of unique biological interest. The Tuzigoot Lands include a wildlife habitat in the Tavasci Marsh which is rarely equaled in Arizona. The Sycamore Springs tract controls both of the southern trailheads into a Wilderness Area and has a sizable riparian habitat which is uncommon in Arizona. The Aztec Lands are near natural wildlife migration routes. Government Springs is natural virgin forest and a pleasant recreation area.

Government ownership of these lands, as a result of the proposed exchange, would assure that they are not used for the development of housing, cabins, trailer courts, executive retreats, and the like, and thus would remain available to the public.

## 2.6 Economic Considerations

Development of a mine complex in the Copper Basin will bring with it a greatly expanded economy. Tables 11 and 12 indicate estimates of increased personal income and tax base in the county during the development and actual mining phases, respectively. Estimates of employment levels in the secondary sectors of the economy are made on the basis of:

- An estimate of average annual employment in the mine complex (basic sector) of 400 workers.
- Present ratio of basic sector employment to total private sector employment.

TABLE 11

POTENTIAL ECONOMIC EFFECTS OF DEVELOPMENT PHASE IN COPPER BASIN MINE COMPLEX<sup>2 5</sup>

Employment:

		<u>Arizona Income Tax</u>
New Basic Employment	400 <sup>a</sup>	
Average Annual Wage	\$20,000 <sup>b</sup>	
Annual Wage Bill	\$8,000,000	Estimated tax per worker (joint return) \$400. Total \$160,000
New Secondary Employment	300 <sup>c</sup>	
Average Annual Wage	\$6,500 <sup>d</sup>	
Annual Wage Bill	\$1,950,000	Estimated tax per worker (joint return) \$55. Total \$16,500

Public Revenues:

Sales Tax (for each \$100,000 spent on items subject to tax.)

State (3% rate) <sup>e</sup>	\$3,000
Prescott (1% rate)	\$1,000

Property Tax (ad valorem - for each \$1,000,000 of assessed value)

Rates	Yields <sup>f</sup>
Arizona (0.015500)	\$15,500
Yavapai Co. (0.017470)	17,470
Prescott (0.011610)	11,610
Prescott H. S. (0.026693)	26,693
Prescott Elem. S. (0.033966)	33,966
Kirkland Elem. S. (0.029631)	29,631
Community College (0.009823)	9,823

Notes: a Estimated

b Based on information concerning mine development costs

c A low estimate based on assumptions concerning basic employment.

d Estimate of average annual wage for secondary employment.

e The state rate applies to all sales subject to tax. Prescott rate applies only to sales in Prescott.

f Yields are not additive because all land parcels are not in all districts

TABLE 12

POTENTIAL ECONOMIC EFFECTS OF ACTUAL MINING PHASE IN COPPER BASIN MINE COMPLEX<sup>2 5</sup>

Employment:

New Basic Employment	400 <sup>a</sup>		<u>Arizona Income Tax</u>
Average Annual Wage	\$10,000 <sup>b</sup>		Estimated tax per
Annual Wage Bill		\$4,000,000	worker (joint return)
			\$140.
			Total \$56,000
New Secondary Employment	480 <sup>c</sup>		Estimated tax per
Average Annual Wage	\$7,000 <sup>d</sup>		Worker (joint return)
Annual Wage Bill		\$3,360,000	\$70.
			Total \$33,600

Public Revenues:

Sales Tax (for each \$100,000 spent on items subject to tax.)	
State (3% rate)	\$3,000
Prescott (1% rate)	\$1,000
Property Tax (ad valorem - for each <sup>e</sup> \$1,000,000 of assessed value)	Yields
	Rates
Arizona (0.015500)	\$15,500
Yavapai Co. (0.017470)	17,470
Prescott (0.011610)	11,610
Prescott H.S. (0.026693)	26,693
Prescott Elem. S. (0.033966)	33,966
Kirkland Elem. S. (0.029631)	29,631
Community College (0.009823)	9,823
Severance Tax (2% applied by state to gross proceeds of copper sales).	
For each \$1,000,000 of copper sold.	\$20,000

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- Notes: a Estimated  
 b Based on current estimate of miners' wages, then generalized to all employees  
 c Derived by application of basic employment multiplier of 2.2  
 d Estimated annual wage from secondary employment  
 e Now that all construction has been completed and assessed, the assessed valuation will be higher than during development phase

- Estimates are conservatively adjusted during the development phase to account for the semi-transient nature of construction employees and the fact that, because of the transient nature of their employment, a lesser portion of the incomes will remain in the local economy.

The private economy should enjoy a peak period during the development phase, then plateau, at a level which is considerably higher than the pre-construction level, throughout the period of mining operations.

The different types of governmental revenues will fluctuate in different manners. State income taxes should follow the private economy quite closely. Sales tax revenues may rise even further during the operational phase than during the development phase for the same reasons that secondary sector employment levels will rise. Property tax revenues should reach their peak at the end of the development phase. There should then begin a gradual decline since assessed values of mining properties are based on projected net revenues. Three additional taxes which, combined, are called a severance tax, will produce revenues during the mine's operating life. These taxes are akin to what is known as "value added" taxes, and are applied to gross income from copper sales.

At the end of the mine's operating life, all sectors of the economy may experience declines. Unless work opportunity is developed locally, the mine's trained labor force will have to go elsewhere. If this simple economic truth is recognized, and accepted, much can be done by advanced planning by community leaders and governmental agencies. New investments can be solicited by groups of private citizens, by the city and county governments, or by Arizona's Department of Economic Planning and Development. With careful planning and psychological preparation, there is no reason why the cessation of this mine needs to be a traumatic experience for Yavapai County and the immediate area of Prescott.

The discussion has been limited thus far to the economic effects on Arizona and the local communities. The operation of the mine will obviously bring in tax revenues to the federal coffers. It will also reduce imports of copper, thereby reducing the outflow of dollars from the United States. Since it is quite possible that imported copper may be more expensive, it may also mean reduced prices to American citizens in general, for copper dependent products.

## 2.7 Social Impacts

During the development phase, most of the employees will be semi-transient construction workers. Their presence will result in additional requirements for housing, schooling, churches and public services (police, fire protection, sanitary services, and water). These requirements will be accompanied by additional tax revenue, but the provision of the additional facilities will no doubt lag somewhat behind needs, requiring some adjustment on the parts of both the new arrivals and the established community. It is possible that this can be avoided somewhat by advanced community planning.

Temporary psycho-social strains can also be expected with the influx of a sizable number of semi-permanent outsiders of different cultural and ethnic backgrounds and financial circumstances. As the mine progresses, many of the problems will be solved, transient workers will gradually be replaced by permanent personnel, and the community should become pretty well readjusted. New residents will no doubt provide additional social, cultural, and political leadership. Since the community will have more people, it will be able to exert more influence on both state and federal decisions. Actually, solving the social and cultural problems generated by the influx should be a challenging and rewarding experience.

The addition of students and teaching staff should broaden social education, thus strengthening the capability for communicating with, understanding, and adjusting to the outside world. It is quite likely that the additional staff may provide new school courses previously not feasible. There is bound to be some broadening in the arts and/or crafts. Better library facilities can result from the availability of more funds.

With the additional market, Prescott stores can be expected to offer a larger selection, thereby reducing the requirement for traveling to Phoenix. Increases in attendance should allow some churches to conduct a more effective operation. Additional medical, dental and other professional facilities may become available. Strengthened public services, notably police and fire departments, and parks will be possible because of the increase in available funds.

The solution to the social and cultural problems will require that the community take an active part in the planning, as well as action phase. All of the surrounding communities must take part for effective solutions: Prescott; Wilhoit; Skull Valley; Kirkland; Kirkland Junction; Iron Springs; and the rural community. Problems and actions must be considered in association with other influences. The extent and the rate at which social and cultural benefits accrue will depend upon community attitudes, and upon how well the community prepares itself to take advantage of the opportunities that are sure to arise. The company's Community Relations staff will work with community leaders and officials toward maximizing the benefits from this new association.

## 2.8 Archaeological Impacts

A thorough archaeological survey of the Copper Basin area was undertaken during November and December, 1972, by Prescott College Archaeological Survey. Numerous prehistoric and historical sites were discovered on the Selected Lands. The nature and locations of these sites are such as to generally obviate their use for recreation and education for the ordinary citizen. None of these is deemed qualified for the National Register of Historic Places. However, there appears to be an opportunity for furthering scientific knowledge of the cultural development and environmental interactions of previous inhabitants of Copper Basin. It is apparent that archaeological excavation of selected prehistoric sites would provide considerable insight into interactions between Copper Basin inhabitants and other peoples of the Southwest.

The Offered Lands also have considerable archaeological value. The Tuzigoot Lands adjoining the Tuzigoot National Monument, contain significant archaeological remains and would permit expansion of the Monument. These remains could be made available for public inspection.

The Sycamore Springs Lands include valuable archaeological antiquities which could be made available for public recreation and education.

There are also archaeological remains in the vicinity of the Aztec Lands, but the extent of these has not yet been determined.

Government ownership of these Offered Lands, as a result of the exchange, will allow the expansion of the Tuzigoot National Monument. It can also assure the preservation of the specimens contained therein, making them available for public use, instead of possible destruction by the development of such as trailer courts, cabins, executive retreats, or other private developments.



### 3. FAVORABLE ENVIRONMENTAL EFFECTS

#### 3.1 The National Need

##### 3.1.1 The Copper Supply Problem

Perhaps the most important effect of all is a contribution toward alleviating the socio-economic impacts at the national level, since they affect so many people. As indicated in Section 1, increases in the demands for primary copper are far outstripping increases in production rates, and secondary copper production (recycled copper) cannot even come close to filling the gap. The result is importation and dependence upon foreign sources at an ever increasing rate.

From the viewpoint of public welfare, this is very undesirable for several reasons:

- National defense. It is obviously highly dangerous to depend upon foreign sources for any material which is vital to our defense posture.
- Foreign relations. Dependence upon foreign sources for vital materials places serious constraints upon the United States in international bargaining.
- National economy. Excessive outflow of American dollars to pay for imports weakens the American dollar, reduces American buying power, and contributes to inflation. Since the outlook is for continued excessive outflow, it is desirable to reduce imports wherever possible.
- Copper availability. International competition, international politics, and/or local problems may result in the unavailability of sufficient foreign copper to fill United States needs. It is also quite possible that development of foreign copper sources will not keep pace with demands, especially since some of the countries are expropriating and/or confiscating the properties of companies with the know-how for producing the copper.

- Copper costs. Supply and demand is an effective regulator on the international as well as the local market. Increases in copper costs will result in increases to the American citizen for copper dependent items and facilities.

Thus, there is an obvious and urgent national need for the development of new copper sources at an increasing rate. This is especially true, since for some vital materials, we have already passed the point of no return, and must henceforth depend largely upon foreign sources, with the consequent loss of American independence and the accompanying unfavorable "Balance of Payments."

The new copper mine which may be developed as a result of this exchange is one step toward softening these impacts.

### 3.1.2 Other National Benefits

The acquisition of these Offered Lands is another step in the elimination of islands of private property within National Forests. Acquisition of the Tuzigoot Lands will permit and facilitate expansion of the Tuzigoot National Monument.

Employment, federal tax revenues, and the economic health of the local communities are all obviously important to the national economy.

The appraised value of the Offered Lands is \$176,700 greater than the appraised value of the Selected Lands.

## 3.2 State and Local Considerations

### 3.2.1 Economics

The most obvious State and local benefits lie in the economic contributions to the respective communities. Although the scope of the proposed mining operation is not yet fixed, it seems quite likely that it will result in 500-1,000 new jobs in Copper Basin and surrounding communities, with an estimated increase in annual community income of \$7,000,000 to \$10,000,000. This is in a community whose present population is probably less than 20,000 people. This does not include the additional profits expected to accrue to the merchants and other members of the business community. There is also the revenue from local taxes,

which should amount to more than a quarter of a million dollars annually. These financial benefit estimates, provided by Dr. Richard Winkelman, Consulting Economist and Associate Professor of Economics at Arizona State University, are summarized in Tables 11 and 12.

### 3.2.2 Social and Cultural Aspects

The Offered Lands are much more desirable than the Selected Lands from both the recreational and educational viewpoints because of such factors as: the nature of the terrain and ground cover; uniqueness of habitat; antiquity content; locations; and public accessibility. The lack of surface waters and the common character of the terrain and its cover detracts considerably from the recreational value of the Selected Lands. The protection and exploitation of these Offered Lands for public recreation and education requires government ownership, since at least some of the parcels are obviously highly desirable for the development of housing, trailer parks, cabins, executive retreats, and/or camping facilities.

Following are specific examples of recreationally enticing and educational characteristics of the Offered Lands.

- Government Springs is a beautiful, accessible wooded area, with a spring which provides drinking water.
- The riparian habitat of the Packard Ranch (Sycamore Springs) is uncommon in Arizona and would lend itself to the cultivation of certain rare and endangered species. It is also the southern gateway to the Sycamore Canyon Wilderness Area, it holds interesting archaeological remains, and it is accessible to the public. If it is not now so, minor attention to the roads would make it accessible by ordinary sedan.
- Seventy-seven different bird species have been observed at the Tavasci Marsh<sup>19</sup> and environs on the Tuzigoot Lands, making it very attractive for bird watchers. Some of these birds, such as Nesting sora and Virginia rails are uncommon in Arizona. This area is presently leased for grazing, which over the long-term would probably reduce the size and quality of this habitat. Government ownership of these lands, which also contain valuable archaeological remains, is required for logical expansion of the

Tuzigoot National Monument. This Monument is an indoor and outdoor museum which has concentrated on keeping remains in their natural state, but uncovered for public inspection. Attention is called to the quotation on the public importance of this area on page 27

- Government procurement of the offered Aztec Lands would make a large, natural, forested area available for public recreational activities.

In addition, there are the social and cultural benefits that should accrue to the local community as a result of the mining operation, the accompanying influx of people, and the resulting economic benefits.

The addition of students and teaching staff should broaden social education, thus strengthening the capability of communicating with, understanding, and adjusting to the outside world. It is quite likely that the additional staff may provide new school courses previously not feasible. There is bound to be some broadening in the arts and/or crafts. Better library facilities can result from the availability of more funds.

With the additional market, Prescott stores can be expected to offer a larger selection, thereby reducing the requirement for traveling to Phoenix. Increases in attendance should allow some churches to conduct a more effective program. Additional medical, dental and other professional facilities may become available. Strengthened public service facilities, notably police and fire departments, and parks will be possible.

New residents will no doubt provide additional social, cultural, and political leadership. The community will be able to exert more influence on political decisions at both state and federal levels.

### 3.2.3 Biology

There are several biological benefits which would result from the proposed land exchange and subsequent mining operations.

- The federal government could protect the riparian habitat which is uncommon to Arizona, on the Packard Ranch.

- The federal government could preserve the size and quality of the Tavasci Marsh habitat, which is unique from the viewpoint of bird-life.
- Wildlife use of the Aztec Lands during migration could be preserved.
- On the Selected Lands, the greater availability of surface waters and water spillage, coupled with revegetation practices, may result in increased forage and increased wildlife and grazing capability. This effect will not be immediate.
- Tailings ponds are new bodies of water which will be used by ducks, geese, and perhaps other water birds for resting during migration. This water will also be available to permanent wildlife.

#### 3.2.4 Water

A new source of groundwater, not previously known or used will be developed. This water will be available to the community long after the cessation of the proposed mining operation.

The information derived from monitoring the levels and quality of the waters in the upper aquifer will be highly useful for community water use planning.

#### 3.2.5 Archaeology

As a result of the exchange, the remains on the Packard Ranch and the Tuzigoot National Monument can be preserved and made available to the public. It will also permit expansion of the Tuzigoot National Monument. Indian remains have also been observed in the vicinity of the Aztec Lands, but the extent and value of these antiquities has not been specifically investigated. It should be noted that the Tuzigoot National Monument is already included in the National Register of Historic Places, and the Offered Tuzigoot Lands would presumably become part of this Monument.

#### 4. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

##### 4.1 Selected Lands and Environs

As indicated in previous sections, mitigating actions and engineering know-how and thoroughness will reduce undersirable impacts to a minimum. However, some impacts on the Selected Lands, which will be regarded by at least some persons as adverse, cannot be avoided. Because of commitment to careful environmental consideration in the planning for and operation of the facility, and specific effort to be devoted to the amelioration of potential social and economic problems, none of these impacts is expected to be critical.

##### 4.1.1 Air Quality

Gaseous pollutants from increased traffic, mine vehicle operation, and additional space heating will be released to the atmosphere. It appears that: air pollution standards for gases will not be exceeded; changes in ambient air quality will not be significant to human health and welfare in any of the surrounding communities; dust will not be a problem.

##### 4.1.2 Water

Temporary depletion of groundwater resources is possible. This would be in the lower aquifer, which is not presently being tapped. As previously indicated, water levels in the upper aquifer will be monitored in order to assure that water from that level is not being inadvertently used for the mining operation.

Temporary slight contamination of groundwater is possible. Again, the well monitoring program will bring such problems to the foreground for immediate attention.

##### 4.1.3 Solid Wastes

Overburden waste and waste rock will be deposited in dumps and tailings will be accumulated in tailings ponds. These dumps will eventually occupy as much as 1,000 acres, and perhaps even more. The tailings ponds will eventually cover as much as a section (640 acres). These dumps and tailings ponds will

modify the landscape. The effect will be dampened somewhat by revegetation of the dumps and tailings dams, but there is no question but that they will definitely be visible and recognizable from Highway 89. The extent to which this is considered adverse depends very much on the individual's conditioning and values. There is no doubt that there will be some who will regard the change as aesthetically undesirable.

It should be noted that the numerous previous activities have left visible marks, so it is not reasonable to regard the present landscape as virgin. However, the proposed mining activities will cause a further departure from the natural landscape.

#### 4.1.4 Noise

The only significant change in the noise levels in the surrounding communities is expected to be caused by the additional traffic which will result from the addition of any appreciable industrial complex.

#### 4.1.5 Biology

Some local flora will be destroyed. Some of this will be replaced by revegetation, and the increased availability of surface waters and spillage may result in an increase in the total vegetation.

Wildlife will be displaced, but most of the displaced animals are expected to return as the additional surface waters and spillage produces additional forage and available drinking water. Grazing will also be reduced, at least temporarily, but again possible forage increases should at least maintain the present carrying capacity.

No rare or endangered or even uncommon species of flora or fauna are involved.

#### 4.1.6 Economics

Community financial readjustment will be required when the mine closes.

#### 4.1.7 Social and Cultural Aspects

Considerable community adjustment will be required with the influx of people with different social and ethnic backgrounds. There will also be a change in the community social and political structure and cultural activities when the mine closes.

The extent to which these impacts are regarded as adverse is a matter of viewpoint. That is, the adjustments may be looked upon as an interesting challenge rather than a distasteful problem.

#### 4.1.8 Archaeology

There will be some loss of accessibility to archaeological remains. None of these archaeological sites is deemed qualified for the National Register of Historic places, and they are not considered readily available for tourist observation.

#### 4.2 Offered Lands

The only unavoidable adverse effects foreseen on the Offered Lands are from the carelessness of people in the use of public property.



## 5. ALTERNATIVES TO THE PROPOSED ACTION

There are two alternatives which it is reasonable to talk about at this time.

### 5.1 Refuse to Make the Exchange

#### 5.1.1 Other methods of Acquiring Uses

In this event, other methods of acquiring the necessary land uses would have to be adopted by the company. These could include locating millsite claims on the Selected Lands which will be used for the attendant facilities to the mine development. This would result in the United States receiving \$5.00 per acre for the millsite patents rather than their appraised value by the exchange. The additional result would be that the United States would not receive the Offered Lands. Other land uses could be acquired by the company through rights of way and special land use permits. This would result in the United States receiving fair market rental value for the lands. The burden to the government for administering these permits would continue throughout their life. The United States would not receive the Offered Lands.

In either event, the environmental impacts would remain the same, but the public benefits that would accrue from government ownership of the Offered Lands would be obviated.

#### 5.1.2 No Mine

In the event of a refusal to make the exchange, the other possibility is, of course, to eliminate the development of the open-pit mine, with the accompanying benefits and costs to the public. The most serious cost of this option to the public would be the loss of copper production, resulting in additional imports with the accompanying additional forfeiture of American independence, economic stability, and standard of living. The benefits to the government from the acquisition of the Offered Lands would be erased. The Offered Lands would again become available for private development. It seems doubtful that the disposition of these lands could be guaranteed.

## 5.2 Modify the Exchange

The lands selected by the company could be reduced or increased in acreage or other United States lands substituted for those selected. The flexibility presented by this alternative is limited by the position of the mineral deposit and by the surrounding topography dictating the location of facilities to take advantage of area, slopes, and drainage patterns. The value to the public of other public lands in the Copper Basin area is not greatly different from those selected for the exchange. Therefore, there would be no advantage or disadvantage to the United States nor any change in the adverse or beneficial environmental effects by substituting other public lands for those selected.

The company has indicated the logical location and size of the areas needed for the development. It is believed that no additions to the area of the Selected Lands would be required for the development and that a decrease in the area size would seriously affect the operation. It is doubtful that the environmental benefits of reducing the area selected for the exchange would be greater than the adverse environmental effects of reducing the area of the lands offered to the United States. If the size of the area selected for exchange were reduced, the additional area necessary for the operation, again, could be acquired by mill-site claims or rights of way and special use permits with the attendant disadvantages of those methods previously discussed.

## 6. REFERENCES

1. -, January 1, 1970: National Environmental Policy Act of 1969. Public Law No. 91-190.
2. -, July 13, 1971: Forest Service Manual. Title 1900 - Environmental Planning and Management, Chapter 1940 - Environmental Statements.
3. -, May 4, 1972: BLM Manual. 1972 - Environmental Statements.
4. Blake, R.L., January 5, 1972: Appraisal Report on Phelps Dodge Property.
5. Associated Press, May 16, 1972: "Oil Flow Interrupted in Arab Unity Show." Arizona Republic, p. A-2.
6. -, January 1973: Quarterly Industrial Report: Copper, U.S. Department of Commerce.
7. Ageton, R.W., and G.N. Greenspoon, 1970: Copper. "Mineral Facts and Problems," U.S. Department of the Interior, pp. 535-553.
8. Morton, R.C.B., March, 1972: First Annual Report of the Mining and Minerals Policy Act of 1970 (P.L. 91-631). U.S. Department of Interior. 142p.
9. Green, C.R. and W.D. Sellers, 1964: Arizona Climate. The University of Arizona Press, Tucson, Arizona.
10. -, August 14, 1971: Federal Register. Vol. 36, No. 158, Part II, p. 15488, 15494, 15495.
11. -, 1972: The State of Arizona Air Pollution Control Implementation Plan. Arizona State Department of Health, Phoenix, Arizona. p. 1-11, 12; 4-1 through 4-27.
12. Kearney, T.H. and R.H. Peebles, 1964. Arizona Flora. University of California Press.
13. Swank, W.G., 1958: The Mule Deer in Arizona Chaparral. Wildlife Bulletin No. 3. Arizona Game and Fish Department.
14. -, 1972: Revised Antelope Range Map. Arizona Game and Fish Department.
15. Brown, D.E., 1972: Arizona Small Game Investigations, Bandtail Pigeon Management Information. Project W-53-22, WP 3, J5, Arizona Game and Fish Department.
16. -, 1966: Rare and Endangered Fish and Wildlife of the United States. United States Fish and Wildlife Service.

17. -, June 2, 1970: Federal Register. Vol. 35, No. 106.
18. -, May 11, 1973: "Tuzigoot Area Excellent Site for Pueblo Study." The Phoenix Gazette, p. 55.
19. Todd, R.L., 1972: Biological Report on a Marsh Near Tuzigoot National Monument. Arizona Game and Fish Department.
20. -, 1972: Compilation of Air Pollution Emission Factors. U.S. Environmental Protection Agency, PB-209 559, Research Triangle Park, North Carolina.
21. Pasquill, F., 1961: A Stability Classification Using Hourly Airport Observations. Journal of the Air Pollution Control Association, Vol. II, No. 10.
22. Turner, Bruce D., 1970: Workbook of Atmospheric Dispersion Estimates. U.S. Environmental Protection Agency, AP-26, Research Triangle Park, North Carolina, p. 6.
23. Personal Communication, April 11, 1973: Ladd S. Gordon, Director, State of New Mexico. Department of Game and Fish.
24. Peterson, A.P.G. and E.E. Gross, Jr., 1972: Handbook of Noise Measurement. General Radio Company. p. 17.
25. Personal Communication, February, 1973: Dr. Richard D. Winkelman, Associate Professor of Economics, Arizona State University.