Chapter 7 GILA RIVER AND WILCOX PLAYA WATERSHED

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GILA RIVER WATERSHED

SAN FRANCISCO RIVER SUB-WATERSHED

Physical Geographic Description

Drainage Area

The headwaters of the San Francisco River are located on the Apache National Forest northwest of the town of Alpine in Apache County. The watershed is south of the Little Colorado River (LCR) headwaters and east of the Black (upper Salt) River watersheds. The San Francisco River flows eastward into New Mexico, then southward, then westward back into Arizona to the confluence with the Gila River near Morenci. The drainage area exceeds 2,766 square miles.

Range of Elevation

Elevations in the sub-watershed range from over 9,700 feet above sea level at the headwaters to about 3,330 feet at the confluence with the Gila River.

Tributaries

The San Francisco's major tributaries are the Blue River in Arizona and Whitewater Creek and the Tularosa River in New Mexico.

Luna Lake

Site Description

Luna Lake dam was constructed in 1893 on the mainstem of the San Francisco River near its headwaters (Figure 1 and Figure 2). The dam was rebuilt in 1927 and raised an additional 12 feet in 1951. The lake is 154 surface acres, with a maximum depth of 21 feet and an average depth of 8 feet. Luna Lake is located at an elevation of 7,882 feet on the Apache-Sitgreaves National Forest, about 4 miles east of Alpine. Within Arizona, the majority of the San Francisco River sub watershed is on the Apache-Sitgreaves National Forest. The watershed is also on the Gila National Forest in New Mexico. Private land in-holdings are present along the river on both National Forests. The southernmost downstream portion of the river near Morenci is on Bureau of Land Management, State Trust and private lands.

Management of Water Body

Luna Lake has been managed as a put-grow-and take cold water fishery with rainbow and cutthroat trout (Table 1). The lake is productive and the trout grow to catchable size quickly and some grow to larger sizes.

Figure 1. Luna Lake Dam

Table 1. Stocking history at Luna Lake.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Brook trout	1943	1995	32	655,200
Brown trout	1935	1938	4	76,940
Bullfrog tadpoles	1968	1968	1	2,650
Coho salmon	1958	1964	2	156,100
Cutthroat trout	1952	2009	24	606,342
Native trout	1937	1938	4	154,064
Rainbow trout	1937	2009	334	10,243,154
Total			401	11,894,450

Because of the productivity, aquatic weeds also grow aggressively (Robinson et al. 2007) and the lake experiences strong blue-green algae blooms. The blooms have caused summer fish kills by depleting oxygen from the lake as the phytoplankton decays en masse. Table 2 shows the fish kill history at the lake.

Table 2. Fishkill history at Luna Lake.

Date	Magnitude	Cause
August 1982	Heavy	High pH from macrophytes
July 1984	Partial	Macrophytes
June 1988	Small	High pH, blue-green algae
June 1989	Small	High pH, blue-green algae

Date	Magnitude	Cause
July 1989	Moderate	Oxygen depletion
July 1999	Moderate	Oxygen depletion
July 2000	Moderate	Oxygen depletion
July 2002	Heavy	Oxygen depletion
July 2007	Small	Oxygen depletion

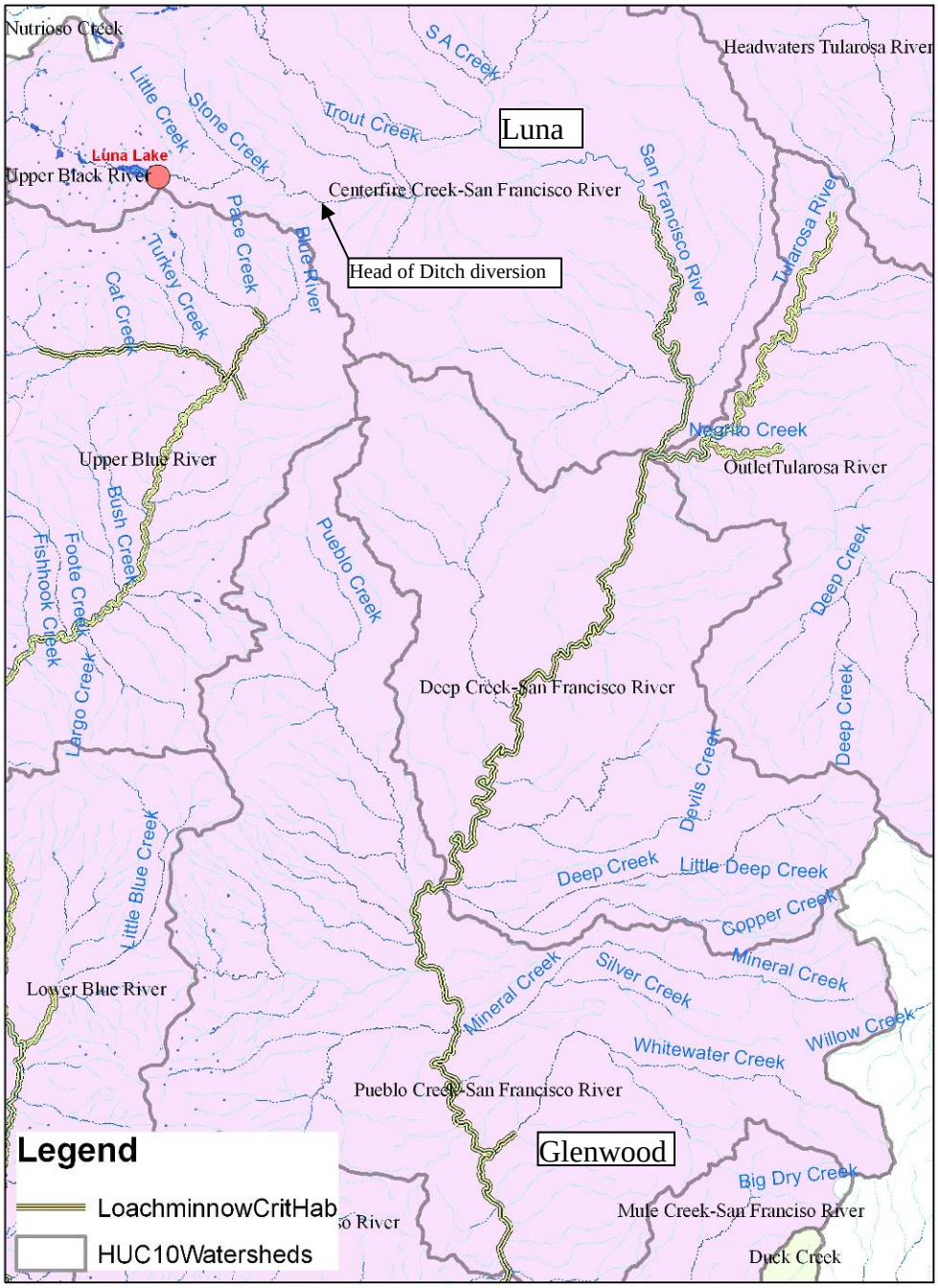

Figure 2. Overview of Luna Lake and downstream areas of San Francisco and Tularosa rivers.

The Department operates a weed harvester in the lake every summer to cut back the macrophyte density, to improve water quality and reduce the frequency of summer fish kills. Luna Lake is also an irrigation reservoir. Luna Irrigation Company in New Mexico owns most of the water rights. The Department owns a minimum pool water right in Luna Lake.

On the south shoreline, the Apache-Sitgreaves National Forest maintains the boat launch, picnic and campground facilities, and administers a special use permit for the concession, which sells tackle and rents boats (Figure 3). A fishing pier is also present on the south shoreline. The Luna Lake Wildlife Area at the upper end of the lake is closed to access from February 15 to July 31 each year to protect waterfowl. The picnic area and most of the lake is open year round, but the campground and concession are only open from May to September. The lake is used for ice fishing during the winter. Bank fishing is concentrated on the south shore and near the dam because of easy access. Boats have access to the entire lake except when the upper end is closed between April 1 and July 31.

Figure 3. Aerial picture of Luna Lake area.

Angler use has been determined by on-site creel surveys in 1981 (25,734 AUDs), 1983 (26,933 AUDs), and 1998 (20,285 AUDs), and by mail survey in 2001 (24,600 AUDs) (Pringle 2004).

The primary targeted opportunity is put-grow-and-take cold water trout fishery. The objective is to stock trout multiple times during spring and into autumn.

Proposed action

Rainbow trout and cutthroat trout are proposed for stocking into Luna Lake for the period covered by this consultation.

Fingerling, sub-catchable, and catchable rainbow trout will be stocked multiple times from April to November annually; numbers of rainbow trout stocked may be from 0 to 200,000 annually.

Fingerling, sub-catchable, and catchable cutthroat trout will be stocked multiple times from April to November annually; numbers of cutthroat trout stocked may be from 0 to 100,000 annually.

Water Distribution / Connectivity
Luna Lake is filled by seasonal flows coming down the upper San Francisco River directly into the lake. Most of the water coming into the lake enters during the spring snowmelt runoff, and the river above the lake dries frequently during the summer months.

Luna Lake spills nearly every year in the spring over the spillway (Figure 4 and Figure 6); however, during drought conditions the lake may not spill. Occasionally the lake will spill in the fall, but usually only when lake levels remain high during the irrigation season in conjunction with a heavy monsoon season. The lake has spilled during spring in 5 of the last 7 years, but has spilled only once during fall (Table 3).

Table 3. Spill history for Luna Lake 2003-2009

Year	**Spill months**
2009	February-mid April
2008	January-early May
2007	February-April
2006	October-November
2005	January-early May
2004	No spill
2003	March-early May

Figure 4. Luna Lake Spillway

The entire length of the San Francisco River from Luna Lake downstream to its confluence with the Gila River flows during heavy snowmelt runoff during the spring. However, that connectivity is broken during the summer months when Luna Lake is not spilling and the irrigation season begins (Figure 5). Water is also released from Luna Lake through a head gate in the dam to meet irrigation needs downstream during April 1 through November 1 during the irrigation season; during that period the river flow is continuous from the dam to an irrigation diversion known as the Head of Ditch about 7.5 miles downstream at Luna, New Mexico. The entire released flow during the irrigation season is diverted at the town of Luna, with the river below that diversion dry or intermittent for approximately another 5.5 miles until the river re-enters a canyon–bound reach. Below this point subsurface flow is forced back to the surface by the bedrock, and the river becomes perennial down to the confluence with the Gila River. Trout Creek is a tributary to the San Francisco River that joins it near the town of Luna. Trout Creek has permanent water in its headwaters, but is intermittent in the lower reaches near the San Francisco River.

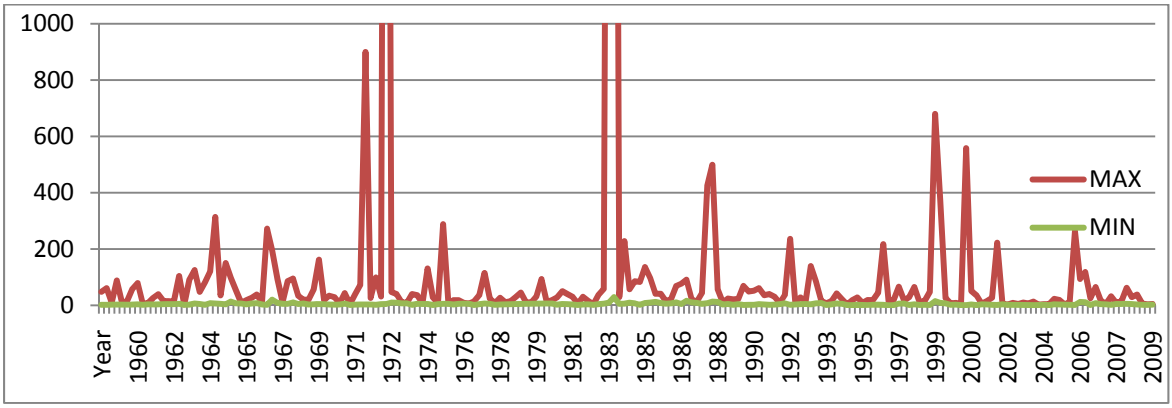

Figure 5. Minimum and maximum discharge in the San Francisco River during the months of July-October, 1959-2009 recorded from the USGS gage near Reserve, New Mexico.

Figure 6. Luna Lake irrigation release during summer irrigation season

From the beginning of perennial flow, downstream of Luna, the San Francisco River flows for about 9 miles to The Box and the beginning of designated Critical Habitat for loach minnow, which is about 21 miles downstream of Luna Lake; then another 5.7 miles to the beginning of loach minnow occupied habitat, which is 26 miles downstream of Luna Lake. Frisco Warm Spring is located 1.7 miles upstream of loach minnow critical habitat, which is significant in that it contributes to the warming of the stream. The San Francisco River continues for another 7.6 miles to the confluence with the Tularosa River, a major tributary. It then continues for another 37.7 miles to the Town of Glenwood and the confluence with Whitewater Creek, another major tributary. Another series of hot springs occur 5.9 miles downstream of Glenwood. The river continues perennial flow for 24.8 miles downstream of the hot springs, back into Arizona, and to the confluence with Harden Cienega Creek. The lower end of Harden Cienega is seasonally dry but likely flows continuously into the San Francisco River during the spring snowmelt runoff and summer flooding associated with monsoon events (McKell 2005c). The San Francisco River continues perennial for 2.6 miles to the confluence with Dix Creek, another 2.2 miles to the confluence with the Blue River, another 20.6 miles to the town of Clifton, then another 12.0 miles to its confluence with the Gila River.

Fish Movement

Trout may move upstream into the San Francisco River above Luna Lake; however, they would not likely persist very long as it regularly dries above the lake. Trout do persist in Luna Lake; however, occasional summer fish kills reduce those numbers in the lake but rarely result in a full fish kill. There is no evidence that trout spawn in Luna Lake or within the San Francisco River upstream.

Trout can and do escape downstream into the San Francisco River by going over the spillway when the lake spills in the spring. During this spring runoff, trout are able to move downstream into New Mexico, through the town of Luna when the river is running continuously, and down to loach minnow designated critical habitat and occupied habitat, 21.6 and 27.3 miles below Luna Lake, respectively. The trout are able to continue downstream and into major tributaries. At some point, the river becomes unsuitable for trout even during spring runoff, as no trout have been collected in the San Francisco River downstream of the Glenwood area, likely because water temperatures are above their thermal maximum which causes mortality. In addition, trout finding their way into perennial water immediately downstream of the town of Luna, likely would not persist, as the stream warms during the summer and becomes unsuitable. The hot springs along the San Francisco River and lower elevations contribute to the warming of the waters. The unsuitability of this portion of the San Francisco River for trout is supported by an analysis of designated uses for stream reaches within the Gila National Forest (Camarena 1997). This analysis cited recorded water temperatures of 78-80 degrees Fahrenheit June through August in the San Francisco River upstream of the town of Luna, and irrigation use from June through October in Luna Valley, which dries out the river from Head-of-the-Ditch to 1.5 miles

downstream of Luna. This analysis also described low water levels that result in shallow exposed water subject to high temperature and algal growth, and hot springs effect on water temperatures in the San Francisco River upstream of the town of Reserve, which is just above loach minnow occupied habitat. The analysis further describes the San Francisco River downstream of Reserve as a warm water fish designation.

When Luna Lake is not spilling, trout may still have an opportunity to escape through the headgate in the dam during irrigation releases during the summer months. Water released from the headgate flows through a rock strainer immediately below the dam (E. Nail, pers. comm.), which keeps larger trout from moving downstream during the irrigation releases; small trout have the potential to get through this rock strainer (Figure 7). During irrigation releases, fish can travel downstream nearly to the town of Luna if they get past the rock strainer. Trout may persist in deeper pools in this reach. During irrigation use, all flows are diverted at a diversion dam just upstream of Luna, New Mexico, which prevents fish from moving further down the streambed, because the streambed is dry through the Town of Luna during these periods. Fish could move into the irrigation ditches and into fields, but water does not flow back to the San Francisco River except as subsurface flow.

Figure 7.Luna Lake irrigation release water seeping through cobble bed between the spillway and culverts on Forest Road 570 on upper San Francisco River.

Community Description

Luna Lake contains cutthroat and rainbow trout, fathead minnows, crayfish, and tiger salamander (Table 4; M. Lopez, pers. comm.). The San Francisco River upstream of Luna Lake dries regularly and does not support fish populations. The San Francisco River downstream of Luna Lake to the Head-of-the-Ditch diversion just upstream of the town of Luna has been rarely surveyed; however, the species composition in this reach is considered to include reproducing populations of desert sucker, speckled dace, and fathead minnow. Occasionally, rainbow trout are also encountered (M. Lopez, pers. comm.). An August 11, 2009 fish survey, using a backpack electrofisher, of three sites in the San Francisco River between Luna Lake and the Arizona-New Mexico boundary, documented desert sucker, speckled dace, and fathead minnow at each site (Table 5). A fisheries survey in 1948 was conducted in the reach immediately downstream in New Mexico, approximately 4 miles west of the town of Luna (Kansas St. GAP data base), and documented desert sucker and speckled dace. No trout were found in either fish survey; however, the survey history in this reach is poor and rainbow trout are occasionally reported by anglers fishing the river in both Arizona and New Mexico (M. Lopez, pers. comm.).

Angler creel surveys conducted on the San Francisco River immediately downstream of Luna Lake in 1998 documented anglers catching rainbow trout that escaped from the reservoir. The creel survey documented the catch of 5 rainbow trout over 63 separate survey dates, and estimated a total catch of 166 rainbow trout. All the trout documented were caught in April, with no trout caught from May through November, indicating that they may not persist or, if they do persist, they do so in very low numbers.

Table 4. Five Year Survey History in Luna Lake using experimental gillnets. Effort is listed as gillnet nights (GN).

Date and Effort	**Species Collected**	**Num. Collected (TL range in mm)**
April 2008 Effort = 3 GN	Rainbow trout Cutthroat trout	7 (405-463) 4 (370-390)
April 2007 Effort = 3 GN	Rainbow trout	71 (192-434)
April 2006 Effort = 3 GN	Rainbow trout Cutthroat trout	135 (110-445) 1 (287)
April 2005 Effort = 4 GN	Rainbow trout cutthroat trout	8 (220-434) 26 (200-262)
April 2004 Effort = 3 GN	Rainbow trout	70 (109-330)

Table 5. Survey of San Francisco River between Luna Lake and AZ-NM border on August 11, 2009

Site	Species collected	Num. Collected
1	Desert sucker Speckled dace Fathead minnow	4 11 14
2	Desert sucker Speckled dace Fathead minnow	7 22 21
3	Desert sucker Speckled dace Fathead minnow	1 17 41
Total	Desert sucker Speckled dace Fathead minnow	12 50 76

The San Francisco River through the town of Luna does not support fish populations because it dries up during the irrigation season when all flows and irrigation releases are diverted into irrigation ditches. No known surveys exist in this reach.

Trout Creek, a tributary of the San Francisco River that enters in the town of Luna, has a currently unknown fish composition; however, it did contain rainbow trout at one time. The New Mexico Department of Game and Fish (NMDGF) stocked trout into Trout Creek until 1970 (Camarena 1997), plus the book “Fishing in New Mexico” by Titus Piper (1989) identified good rainbow trout fishing in Trout Creek.

The San Francisco River from the start of permanent flow downstream to The Box contains native fishes, including desert sucker, Sonora sucker, longfin dace, and speckled dace. This reach has a historical record of rainbow trout, caught approximately 6 miles north of Reserve in 1953, which could have come from Luna Lake, but also could have come from Trout Creek. Three other surveys conducted in this reach from 1948 to 1976, did not detect trout (Kansas GAP database 2009), indicating that although trout do show up in this area from unknown sources, they are infrequent and do not persist.

The San Francisco River from The Box downstream to just above Glenwood contains mostly native species; loach minnow, longfin dace, speckled dace, Sonora sucker, and desert sucker, and non-native fathead minnow and mosquitofish. Headwater chub were documented once in 1948. This reach is within designated loach minnow critical habitat. Twenty-two surveys were conducted in this reach from 1948 to 1991, finding the above-mentioned species, but finding no

trout (Kansas GAP database 2009), although deeper pools in the area of the box likely hold trout temporarily.

The Tularosa River is a perennial tributary entering the San Francisco River just downstream of the town of Reserve. Since 1988, the NMDGF has conducted fish surveys in the Tularosa River at Eagle Peak Road, also within loach minnow critical habitat. One rainbow trout was found in the Tularosa sampling site in 1997 (Propst et al. 2009 and Table 6). This trout could have come from a number of sources, from Luna Lake over 35 miles upstream of the Tularosa River, from Trout Creek, or from Negrito Creek, a tributary of the Tularosa River that holds a wild population of rainbow trout. According to Piper (1989) "Negrito Creek is a little spring-fed tributary to the San Francisco just east of Reserve. Negrito holds some of the best small-stream trout fishing in the entire Gila Watershed, especially in its mid-section".

Table 6. Occurrence of fishes at Tularosa River Eagle Peak Road site, Catron County, New Mexico, 1988-2008 (Propst et al. 2009).

Species	**Year**																				
	88	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**
Longfin dace	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Speckled dace	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Loach minnow	x	x	x	x	x	x	x	x	x	x	x	x		x	x						x
Desert sucker	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sonoran sucker	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Fathead minnow					x				x	x			x		x					x	
Rainbow trout									x												
Western mosquitofish		x		x	x		x							x	x	x	x			x	
Largemouth bass															x						

The San Francisco River around Glenwood contains the same species as the previous reach, but includes a higher occurrence of rainbow trout. Since 1988, the NMDGF has conducted fish surveys in the San Francisco River at the Glenwood Ranger Station site, also within loach minnow critical habitat. Rainbow trout were collected in 1990, 1991, 1992, 1994, 1998, 1999, and 2001 (Propst et al. 2009 and Table 7). Although the NMDGF has not stocked rainbow trout in the San Francisco River for over 30 years, according to Stan Long, hatchery manager at the Glenwood Hatchery, there is a potential that rainbow trout collected at this site might have

escaped from the Glenwood State Fish Hatchery, which is located on tributary Whitewater Creek less than 2 miles from the Glenwood Ranger Station sampling site. He also confirmed there are reproducing wild populations of brown and rainbow trout persisting in Whitewater Creek, a tributary to the San Francisco River at Glenwood that could also be providing fish to this reach of the river.

Table 7. Occurrence of fishes at San Francisco River Glenwood Ranger Station site, Catron County, New Mexico 1988-2007 (no surveys in 2000).

Species	**Year**																			
	88	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**
Longfin dace	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x		x	x
Speckled dace	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Loach minnow	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Desert sucker	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sonoran sucker	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Fathead minnow	x	x						x											x	
Rainbow trout			x	x	x		x				x	x	x							
Western mosquitofish	x		x				x					x			x					
Largemouth bass				x																

Downstream of Glenwood, the San Francisco River contains the same native species, but includes many more warm water fishes, including channel catfish, bullheads, green sunfish, red shiner, carp, and largemouth bass. Over 30 surveys have been conducted below Glenwood to the AZ-NM state line from 1948 through 1980, without detecting trout in this reach (Kansas GAP database 2009). In Arizona, no trout have been documented in the lower San Francisco River during surveys from 1983 through 1995.

Two tributaries to the San Francisco River, Harden Cienega and Dix Creek, contain native fishes, including Gila chub. These creeks are within designated critical habitat for Gila chub.

Surveys in these streams in 1983, 1988 1995, 1996, and 2005 have documented Gila chub, longfin dace, speckled dace, Sonora sucker, and desert sucker, but no trout (Papoulias et al. 1989; McKell 2005c; AGFD native fish database).

Although the San Francisco River and Luna Lake are within the historical range of narrow-headed gartersnakes, the species is likely extirpated from the Luna Lake stocking site (see analysis below).

Consultation Species or Critical Habitat
Potential impacts from the proposed action to candidate and listed species are described below. Please refer to Chapter 4 for a detailed description of the nature of the impacts (which may include predation, competition for space and food, and hybridization etc.).Subsequent responses (resulting from the frequency, magnitude and duration of the impacts) between proposed stocked and candidate and listed species, and any site or complex factors that provide context for determining the meaningfulness of the impacts, are discussed below. Impacts from the proposed action resulting from angler related recreation and/or potential introduction of disease, pathogen or invasive species are evaluated at a broad scale for the entire action area and are described in Chapter 4. If potential impacts specific to a stocking site or complex have been identified they are discussed below.

Chiricahua and Northern leopard frogs are analyzed at a local site and broad scale level due to the movement potential into the stocked area and fish movement potential up or downstream into areas where frogs may occur.

Northern Mexican gartersnakes are analyzed on a complex and downstream scale due to the movement potential into the stocked area and fish movement potential up or downstream into areas where the snakes may occur.

Mexican spotted owl designated critical habitat is analyzed below.

Chiricahua leopard frog
Local Analysis: Although Luna Lake is within the historical range of the Chiricahua leopard frog, the likelihood that Chiricahua leopard frogs could be exposed to stocked fish within the buffered stocking complex is low because there are no historical records for Chiricahua leopard frogs at Luna Lake. However, there are historical records for Chiricahua leopard frogs from 3 sites in the buffered stocking complex; San Francisco River (=Little Creek Confluence) (1971), San Francisco River (= Hwy 666) (1974), Unnamed Tributary (S of Luna Lake at Jackson Creek) (1979). There have been 22 surveys and site records at 10 sites within the buffered stocking complex between 1935 and 2009 with most surveys conducted between 1991-1995 (Figure 8; AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Chiricahua leopard frogs were not observed during subsequent surveys at San Francisco River (=Little Creek Confluence)

(1979 and 1995), San Francisco River (= Hwy 666) (1987 and 1995) or Unnamed Tributary (S of Luna Lake at Jackson Creek) (1994 and 1995) (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Although there are available habitats that have not been surveyed, it is likely that Chiricahua leopard frogs no longer occupy areas within the Luna Lake buffered complex because frogs have not been detected during recent surveys. In addition, the presence of crayfish and non-native fish in Luna Lake and non-native fish in major tributaries flowing into the San Francisco River make the habitat within the buffered stocking complex less suitable for Chiricahua leopard frogs.

Broad Scale Analysis: The likelihood that Chiricahua leopard frogs could be exposed to dispersing stocked fish is low, because it is unlikely that fish could reach occupied Chiricahua leopard frog sites. There are current records for Chiricahua leopard frogs at 2 sites in Dix Creek; a tributary of the San Francisco River; Dix Creek (=Right Prong) (2003, 2005, 2008) and Dix Creek (=Left Prong) (2003, 2005). As mentioned above in the *Fish Movement* section, trout stocked in previous years have not persisted downstream of the Glenwood area due to unsuitable habitat; water temperatures are above their thermal maxima. It is unlikely that stocked fish will disperse downstream of the Glenwood area and reach the San Francisco River and Dix Creek confluence where Chiricahua leopard frogs occur.

Northern Leopard Frog

Local Analysis: Although Luna Lake is within the historical range of the northern leopard frog, the likelihood that northern leopard frogs could be exposed to stocked fish within the buffered stocking complex is low because there are no historical records for northern leopard frogs at the Luna. However, there are historical records for northern leopard frogs from 3 sites in the buffered stocking complex: San Francisco River (=Little Creek Confluence) (1971), San Francisco River (= Hwy 666) (1974), Unnamed Tributary (S of Luna Lake at Jackson Creek) (1979). There have been 22 surveys at 10 sites within the buffered stocking complex between 1935 and 2009 with most surveys conducted between 1991 and 1995 (Figure 8; AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Northern leopard frogs were not observed during subsequent surveys at San Francisco River (=Little Creek Confluence) (1979 and 1995), San Francisco River (= Hwy 666) (1987 and 1995) or Unnamed Tributary (S of Luna Lake at Jackson Creek) (1994 and 1995) (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Although there are available habitats that have not been surveyed, it is likely that northern leopard frogs no longer occupy sites within the Luna Lake buffered complex because they have not been detected during recent surveys and the presence of crayfish and non-native fish in Luna Lake and non-native fish in major tributaries flowing into the San Francisco River

make the habitat within the buffered stocking complex less suitable for northern leopard frogs.

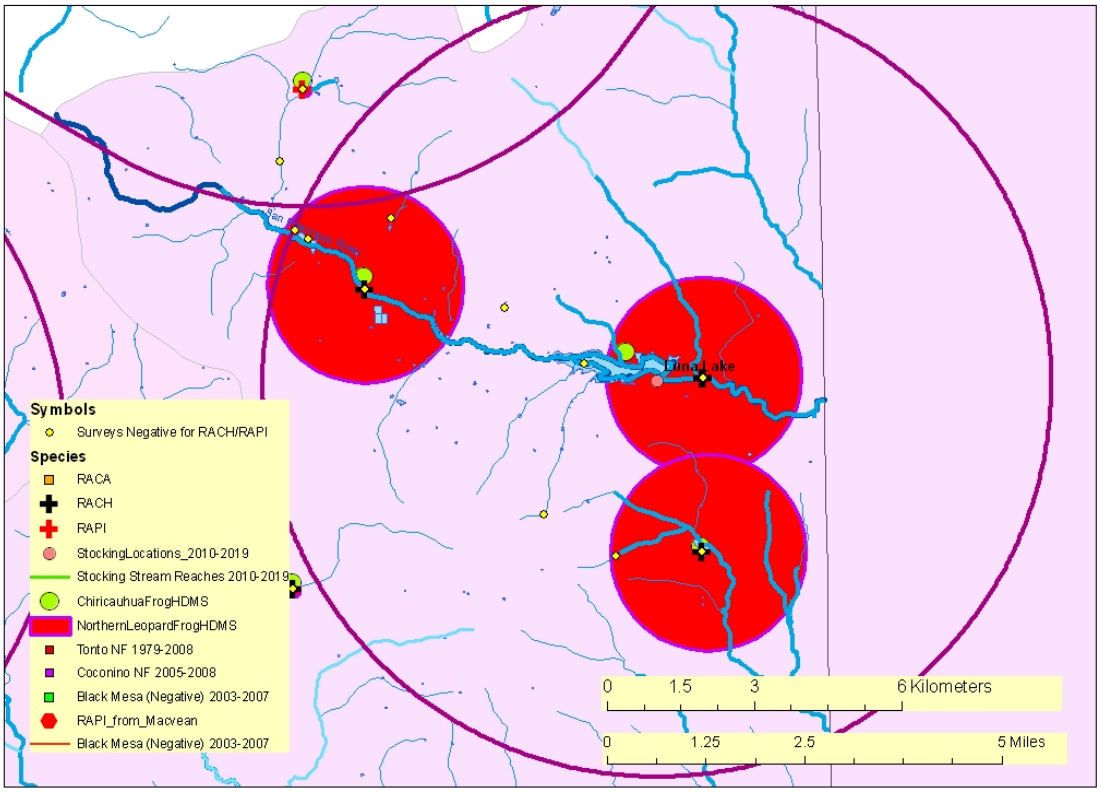

Figure 8. Map of Luna Lake buffered stocking site:

The purple line illustrates the 5 mile buffer surrounding a stocking site, stocking reach, or a group of stocking sites. Blue lines symbolize streams and rivers (both perennial and intermittent). A black line represents a Chiricahua leopard frog Recovery Unit boundary. The background color represents the 8 digit Hydrologic Unit Code. Other data are described in the legend. (Note: HDMS data appear as buffered points and may appear larger than site records for other surveys).

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to fish stocked at Luna Lake that disperse outside the buffered stocking complex is low, because previous surveys suggest that northern leopard frogs no longer occupy sites where fish could disperse. In addition, the habitat in these drainages is less suitable for northern leopard frogs due to the presence of crayfish and non-native fish.

Gila Chub and Critical Habitat

Gila chub occupied and critical habitat is found in small tributaries of the lower San Francisco River. The nearest occupied and critical habitats are located in Dix Creek and Harden Cienega Creek, which are 103.4 and 106.0 miles, respectively, downstream from Luna Lake. There have

been no records of trout collected in these tributaries or in the San Francisco River anywhere in the vicinity of these tributaries. The nearest record of rainbow trout in the San Francisco River was at the Glenwood Ranger Station New Mexico monitoring site, where rainbow trout were collected in 1990, 1991, 1992, 1994, 1998, 1999, and 2001. However, these collections were over 30 miles upstream and most likely were either escapees from the Glenwood State Fish Hatchery, located on tributary Whitewater Creek less than 2 miles from the monitoring site, or came from a robust wild population of rainbow trout in Whitewater Creek itself. The lower San Francisco River is unsuitable for trout, because water temperatures are too high, and is inhabited by predators such as flathead catfish that could easily prey upon unsuspecting dispersing trout. It is also unlikely for a Gila chub to disperse upstream to an area where it might encounter an escaped trout from Luna Lake, because numerous nonnative predatory fish in the San Francisco River near the tributaries inhabited by Gila chub likely limit the distribution of the chub to the tributaries.

Potential impacts

The proposed stocking activity would not be anticipated to have adverse impacts on the Gila chub or its critical habitat. Gila chub occupied habitat and critical habitat are over 100 miles from the stocking site. The distance and the presence of warm water, not suitable for trout, would likely preclude an escaped trout from Luna Lake from ever reaching and persisting in occupied or critical habitat for the Gila chub. The confluence area of Harden Cienega and Dix creeks with the San Francisco River has also been occupied by many species of non-native warm water fish: red shiner, mosquitofish, channel catfish, largemouth bass, fathead minnow, and flathead catfish.

Loach Minnow and Critical Habitat

Loach minnow occupied and critical habitat is found in the San Francisco River below The Box, near the town of Reserve, downstream to the confluence with the Gila River. Loach minnow have been documented 27.3 miles downstream of Luna Lake at Tularosa River (Paroz and Propst 2007) and critical habitat starts 21.6 miles downstream of the lake.

Potential impacts

The stocking location is 27.3 miles upstream of the upper range of loach minnow, approximately 4 miles upstream of the town of Reserve, and 21.6 miles upstream of Critical Habitat. The connectivity of the stocking location at Luna Lake allows the transport of stocked trout downstream into occupied and critical habitat in the San Francisco River when the lake spills during spring snowmelt runoff, between January and May, and rarely during an intense and long-duration summer thunderstorm. Trout are able to escape the reservoir through the headgate during irrigation releases in the summer through fall, but they have to get through a rock strainer just below the dam, which is a filter and not a complete barrier, and hence will reduce the number and size of trout escaping downstream. Creels surveys indicate that anglers caught trout

below the lake only in April, but caught no trout from May through November. This indicates that they catch most of the escaped trout immediately below the reservoir. Additionally, a recent fish survey just below the dam failed to collect any trout (Table 5). The stream also warms to temperatures unsuitable for trout during the summer months. All water released from Luna Lake during the irrigation season is diverted into irrigation ditches in Luna, New Mexico, resulting in a stretch of dry streambed downstream of the diversion through the town of Luna. Pools in the reach between Luna Lake and the town of Luna likely support rainbow trout that have escaped from the lake during the spring runoff, for short periods; however, summer temperatures likely preclude long term persistence and reproduction. The stream through Luna dries in the summer. Permanent flows don't exist until further downstream in The Box. However, in this reach, summer water temperatures, exacerbated by hot springs between the towns of Luna and Reserve, create an environment too warm for trout. The warm water from the hot springs would be masked by cold spring runoff flows, which may allow an escaped trout to persist for a short period. Once spring run-off ceases or is diverted at Luna, the water temperatures warm up. Trout likely do not persist long or reproduce in the San Francisco River.

The proposed stocking activity would be anticipated to have potential direct impacts on the loach minnow and its critical habitat as there is a potential for the stocked species to move into occupied and designated critical habitat during spring snowmelt runoff. However, impacts are likely infrequent and of short durations, because few trout likely would be able to make it that far during the spring runoff, and if they did, they would only persist for the short duration that water temperatures are suitable; these assertions are supported by the very low occurrence of trout in the survey record in the San Francisco River upstream and outside of the Glenwood hatchery area. Furthermore, the period when rainbow trout were collected in the Glenwood area (Table 7, above) coincided with the period when stocking of brook trout (through 1995) and cutthroat trout (through 2009) was also occurring in Luna Lake. Yet, these two species were not collected in the Glenwood area. Many explanations of this are possible, including that trout from Luna do not get to this area. Anglers also catch many of the escaped trout just below the lake before they have a chance to travel far downstream.

Some of the trout in the San Francisco River could be from other sources besides Luna Lake, These sources include wild trout populations in Trout Creek, which is a tributary to the San Francisco at Luna, Negrito Creek, a tributary of Tularosa Creek, which is, in turn, a tributary to San Francisco near Reserve, and Whitewater Creek, which is a tributary at Glenwood. Another possible source is the Glenwood State Fish Hatchery, located right on Whitewater Creek less than a mile from the San Francisco River, and less than 2 miles from collections of rainbow trout. Glenwood State Fish Hatchery currently raises only triploid female rainbow trout (Williams unpublished report).

Although few trout that escape from Luna Lake likely reach occupied and critical habitat, if they did they would potentially contribute to predation and competition.

Escaped trout from Luna Lake likely would not impact dispersal of loach minnow on a large scale, primarily because the numbers of escaped trout would be expected to be very low and of short duration. Loach minnow occupy nearly all of suitable habitat in the San Francisco River, from The Box downstream to the confluence with the Gila River. Poor water quality and water diversions are likely the greatest limitation to upstream dispersal of loach minnow, and downstream distribution is likely limited by naturally reproducing nonnative warm water fishes in the lower San Francisco River. Escaped trout from Luna Lake could potentially impact dispersal on a small short-term scale, between one riffle habitat and another within occupied range, if the trout occupies a pool between the riffles. However, any impact is expected to be very limited because of the very low numbers of escaped trout that might make it into occupied habitat, and the short time that water temperatures are suitable for trout in this reach of river.

Survey data indicate that rainbow trout and cutthroat trout do not reproduce in Luna Lake; no larval or early-stage juvenile fish have ever been captured (Table 4). It is possible that escaped trout could spawn in the San Francisco River, since both species are spring-time spawners (Behnke 1992), but larvae or juveniles would not persist because summer-time water temperatures are unsuitable for trout (M. Lopez, pers. comm.). According to New Mexico Department of Game and Fish (NMDGF) biologists, the stocking of trout are not issues of concern (D. Propst, pers. comm.), even to the point that they implemented a translocation of spikedace into the stream reach occupied by loach minnow as a recovery action for that species in 2009, knowing about the trout management ongoing at Luna Lake for the last 70+ years.

Indirect effects on loach minnow by anglers pursuing escaped trout are expected to be extremely limited, because of the very low occurrence of escaped trout in occupied habitat, and their short persistence. Anglers pursuing escaped trout in the portion of the river in Arizona are concentrated in the stream immediately below the lake, and rarely venture more than a mile downstream from the lake. An occasional angler may fish some of the perennial water in New Mexico for escaped trout, but this is probably pretty rare because of the low occurrence of escaped trout in this area (Propst et al. 2009).

The primary constituent elements identified for loach minnow critical habitat that could be affected are: abundant aquatic insect food base, habitat devoid of nonnative aquatic species detrimental to loach minor, or habitat in which detrimental nonnative species are at levels which allow persistence of loach minnow. Impacts on PCEs for critical habitat are expected to be low because of the very low occurrence of any trout and their short time of occupation within critical habitat.

Narrow-headed Gartersnake

Site-specific analysis: Although Luna Lake lies within the historical range of narrow-headed gartersnakes and suitable habitat may be present nearby, it is unlikely that narrow-headed gartersnakes will be exposed to stocked sportfish. There is one historical (1953) narrow-headed gartersnake record from the San Francisco River above Luna Lake, but no snakes have been observed since then (HDMS). Holycross et al. (2006) surveyed Alma Bridge in 2005 and San Francisco Hot Springs in 2004 and did not observe any snakes.

Downstream analysis: It is unlikely that narrow-headed gartersnakes downstream of Luna Lake would be exposed to dispersing rainbow and cutthroat trout in the San Francisco River downstream of the Glenwood area because water temperatures are above their critical thermal maxima for trout.

Mexican Spotted Owl and Critical Habitat

This stocking location is within Mexican spotted owl (MSO) critical habitat (CH).

Potential Impacts

The CH designation included most other protected and restricted habitats for the MSO. Indirect effects to CH may include actions that can affect forest structure and maintenance of adequate prey species identified as PCEs. These actions may include trampling of vegetation, soil compaction, removal of small woody debris or other physical degradation potentially altering the productivity and succession/regeneration of the vegetation. In the designation of critical habitat (USFWS 2004) most recreational activities, including angling, were not identified as requiring restrictions to protect the PCE's of critical habitat from destruction or adverse modification. In making that statement, recreational activities, including angling were assumed to not contribute to significant habitat-affecting activities such as cutting large trees or snags, removal of large woody debris from the forest floor, altering the tree species diversity, or other large-scale changes to habitat structure. The act of a relatively small number of people walking through habitat is not likely to cause the kind of effects that would result in adverse effects to the PCEs/KHCs of MSO CH and/or restricted and protected habitats.

Spikedace

On October 21, 2009, 112 spikedace from the Gila Bird Area were relocated to the San Francisco River upstream of the US 180 Bridge in Catron County, nearly 50 miles downstream of Luna Lake. Most were age 1+ spikedace averaging >70mm TL. This was the second stocking of spikedace into the San Francisco River, the first is unknown (unpublished report).

Potential impacts

The potential impacts that may result from the co-occurrence of stocked trout with the conservation population of spikedace would be very similar to those described for loach minnow,

and are elaborated in greater detail in Chapter 4. The potential for escapement, transport and occurrence of stocked trout in the areas stocked with spikedace was also previously described in the Fish Movement Section above.

According to New Mexico Department of Game and Fish (NMDGF) biologists, the stocking of trout are not issues of concern because there is little to no habitat in the San Francisco River from Luna, New Mexico downstream that is suitable for salmonids (D. Propst, pers. comm.) and because multiple years of survey data have only found one rainbow trout. Since 1988, the NMDGF has conducted fish surveys in the Tularosa River at Eagle Peak Road, also within loach minnow critical habitat. One rainbow trout was found in the Tularosa sampling site in 1996 (Propst et al. 2009 and Table 6). It is unlikely that this trout could have come from Luna Lake over 35 miles upstream of the Tularosa River. It is more likely that this trout came from Trout Creek, or from Negrito Creek, a tributary of the Tularosa River that holds a wild population of rainbow trout.

NMDGF implemented this translocation of spikedace into the stream reach also occupied by loach minnow as a recovery action for this species. NMDGF was aware of the trout management ongoing at Luna Lake in Arizona for the last 70+ years and did not expect this to be a threat to the translocated spikedace or their recovery in this reach for the reasons discussed in the previous paragraph.

UPPER GILA RIVER SUB-WATERSHED

UPPER GILA COMPLEX

Physical geographic description

Site Description

The Upper Gila River Complex is located in southeastern Arizona above Coolidge Dam near the Arizona-New Mexico border (Figure 9). The area covers about 7,430 square miles, and consists of rugged mountain ranges, broad intermountain plains, and flat, gentle valleys. The climate above 7,000 feet ranges from cool to sub-humid and annual precipitation approaches 20 inches. Vegetation is dominated by Ponderosa pine and pinon/juniper. In contrast, the valleys are arid with annual precipitation of only 9.5 inches. Dominant vegetation is desert scrub or desert grassland. Most rain falls during summer thunderstorms resulting in intense, localized runoff. Winter rains are generally mild, but can result in heavy runoff once the soil becomes saturated. Although the Upper Gila River and some of its tributaries are perennial, many tributaries are ephemeral. The ephemeral streams can be fast and free flowing during the rainy season, yet carry no water during the dry period. The majority of the surface water comes from precipitation, predominantly snow pack from the many mountain ranges. The volatility of the region is occasionally seen in flash flooding and torrential rains.

The main tributaries of the Upper Gila Complex are the San Francisco River, Blue River, San Simon River, Eagle Creek, Bonita Creek, and the San Carlos River.

The elevation at Coolidge Dam is roughly 2540 feet in elevation. The watershed above this point rises to a maximum elevation of 10,758 feet on Escudilla Mountain.

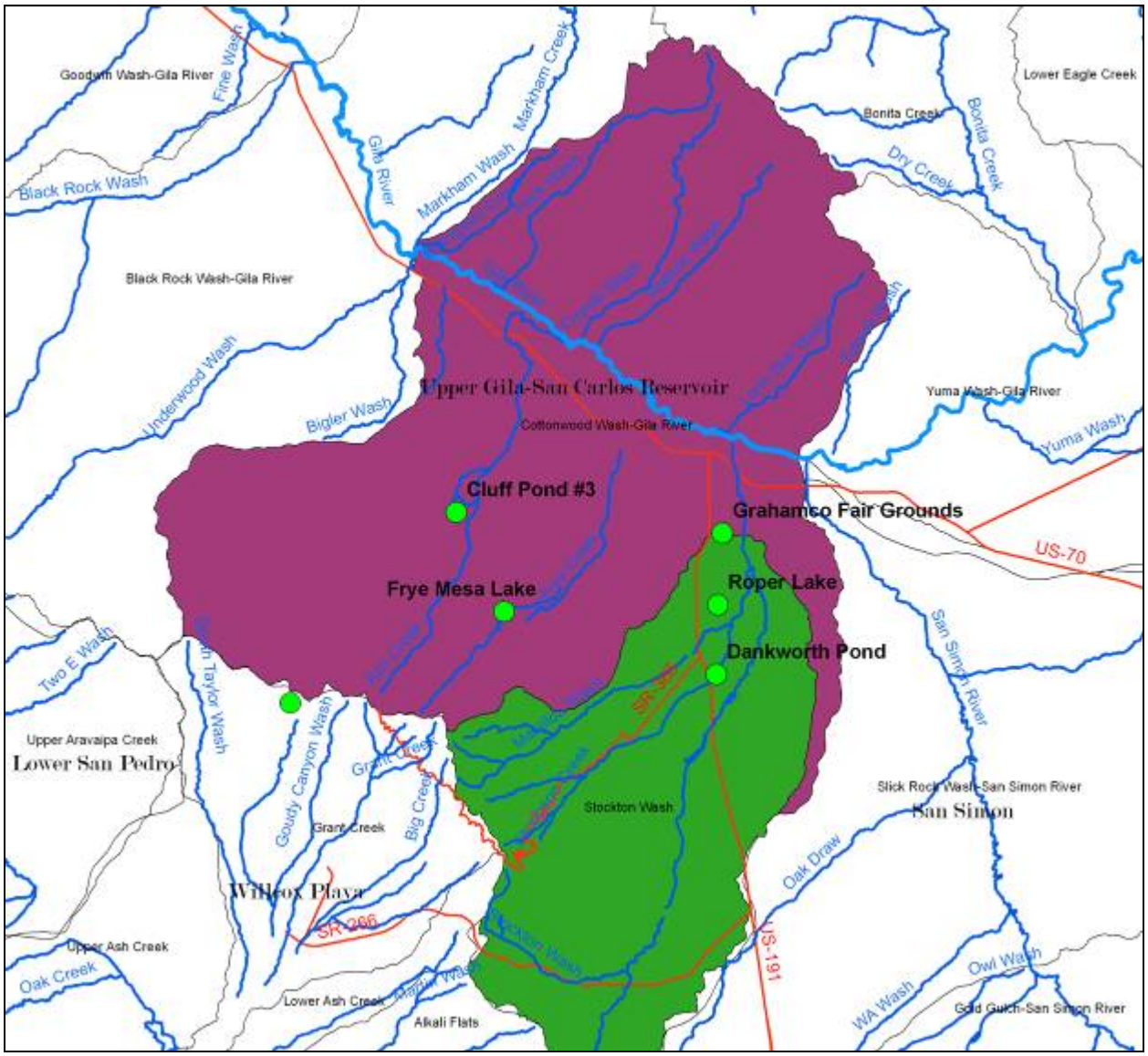

Figure 9. Upper Gila stocking sites overview map.

Graham County Fairgrounds

Site Description

The Department's involvement in this location is fairly new. Due to Arizona State Parks budget constraints and U.S. National Forest fire closures during 2002, a majority of the fishing

opportunities in the Safford area were closed to access. The City of Safford approached the Department about the possibility of re-starting a fish stocking program at this location in an effort to increase angler opportunity.

Graham County Fairgrounds pond is a 2-acre impoundment with an average depth of 6 feet; it is managed by Graham County as a public park located within the Graham County fairgrounds near the town of Safford at an elevation of 3,043 feet. This pond was constructed by building an above-grade berm in a horseshoe shaped configuration (Figure 10). A second smaller pond also in the shape of a horseshoe was constructed at the same time; however, this location is not proposed for stocking due to the small nature of the site. The landscape around the location is composed of county-maintained athletic fields, asphalt parking lots, and desert scrub.

Figure 10. Aerial photo of Graham County Fairgrounds Ponds

Management of Water Body

This location is managed primarily as a put-and-take rainbow trout fishery during the winter months. Catchable sized rainbow trout are stocked multiple times, between the months of November through March, annually. Along with the winter fishery, the Department also manages a secondary opportunity as a put-and-take channel catfish fishery during the summer months. Catchable sized channel catfish are stocked multiple times, between the months of May through September, annually, to provide additional opportunity to local anglers. The stocking

history by the Department at this pond consists of only rainbow trout and channel catfish (Table 1).

Although no official angler survey has been completed at this location, the Department, through observation by local wildlife managers during fishing license compliance checks, believes that this location receives most of its fishing pressure during the winter months of November through March, when catchable rainbow trout are stocked.

Table 8. Historic Department fish stocking at Graham County Fairground Pond.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
rainbow trout	2002	2007	5	12,500
channel catfish	1985	2007	22	2,200
Total			27	14,700

Proposed Action

The Department proposes to stock rainbow trout and channel catfish for the period covered by this consultation.

Catchable rainbow trout would be stocked from November to March multiple times annually with numbers of trout stocked ranging from 0 to 10,000 fish annually.

Catchable channel catfish stockings would occur multiple times annually during the summer months (typically May through September) with numbers of channel catfish stocked ranging from 0 to 5,000 fish annually.

Water Distribution / Connectivity

This small lake was constructed by building an 8 to 10 foot high earthen berm, which encircles the entire lake creating the basin in which the pond is located (Figure 9). This berm was built above grade, and the urban developed nature of the grounds surrounding the location does not allow for any natural drainage to flow into this lake. On the southeast end of the lake is a small outlet structure directing water escaping from the lake in the event of high water levels into a small canal connected to a small pond located approximately 150 yards to the south of the lake. This small pond is part of the public park maintained by Graham County. The pond is of a similar design to the lake and was constructed by building an earthen berm 6 to 8 feet above grade. The pond has no spillway structure associated with it. The shoreline of both the lake and the pond are lined with concrete and rock walls, which have been sealed to prevent water

infiltration in an effort to reduce water loss. If water did fill the pond to the point it would spill, water would leave in the form of sheet runoff and flow out across the park grounds or into active agricultural fields located east of the action area. Once reaching the active agricultural fields, water would then have to travel an additional 3 miles through more agricultural fields and urban development before reaching the Gila River.

The county pumps ground water to maintain the water levels in the lake and pond. County employees turn the pumps on as needed to fill the lake, and if overfilled, water will then travel down a man-made canal to the small pond. Once the level in the small pond has reached an acceptable level, county employees shut off the ground water pump and the canal begins to dry out. The location is not hydrologically connected to any drainages that connect with the Gila River, thus, this location is considered a closed system.

Fish Movement

There are only two opportunities for fish to leave the proposed stocking location. The first is by escaping through the small outlet directing water into the canal that delivers water to the small pond. Fish escaping in this manner would then become trapped in the small pond with no outlet structure to allow their escape, or become trapped in the man-made canal, only to perish once conditions begin to dry. In the unlikely event of a torrential rain event causing an overflow, fish may also be transported out over the top of the berm in sheet flow from either location and could then be transported across the landscape either into the developed grounds of the county park or the active agricultural fields. This type of flow event lends to very shallow water, minimizing potential movement of fish across this landscape.

Community Description

The fishery at this location is maintained by regular and repeated stockings of catchable sized fish; therefore, the Department has not conducted fish population surveys at this lake. Summer time water temperatures reach lethal limits for rainbow trout by mid April, and trout cannot spawn in the pond due to a lack of appropriate spawning habitat. Channel catfish likely persist year round in low numbers within the small pond, if they are not caught out by anglers. Catfish could potentially reproduce in the small pond; however, there is no evidence to support or refute this assumption. No other aquatic species are known to occur in this location.

Consultation Species or Critical Habitat

There are no aquatic consultation species, or critical habitats associated with this action area. Consultation species such as the southwestern willow flycatcher are discussed within the complex analysis.

Roper Lake

Site Description

Roper Lake is a 30 acre man-made lake located on US Highway 191, 5 miles south of Safford (Figure 11). Facilities at the lake include a boat ramp, natural stone hot tub, a swimming beach, a day use island with picnic tables and grills, camping cabins, and campgrounds. Located about 7 miles south of the Gila River, the lake was constructed by building a crescent shaped 8 to 10 foot high earthen berm, which stores water behind it to an average depth of 20 feet.

Originally constructed as a private recreational facility in the early 1960's, the Department purchased the lake and the land surrounding it in the late 1960's. After purchasing the lake, the Department entered in to a cooperative agreement with Arizona State Parks for the management of the land and parks facilities. The Department maintains management over the fishery at the lake. The Park itself was officially opened to the public in 1975 as Roper Lake State Park.

Figure 11. Roper Lake and Dankworth Pond Watershed

Management of Water Body

The primary fishery is a naturally reproducing year-round warm water fishery, consisting of largemouth bass, bluegill sunfish, redear sunfish, green sunfish, black crappie, and channel catfish. The Department also manages a secondary fishery, which consists of a winter put-and-

take rainbow trout fishery, with trout being stocked multiple times each year between the months of November through March.

The lake continues to be extremely popular with local citizens throughout the year. Angler surveys conducted in 2001 estimate that anglers expended 5,909 angler use days at the lake (Pringle 2004).

The stocking history shows that both flathead catfish and tilapia were stocked in the system in the early 1970's; however, neither of these species persisted in the lake and are no longer found there (Table 9).

Table 9. Historic Department fish stocking at Roper Lake

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Black crappie	1981	1981	1	147
Bluegill	1981	1981	1	85
channel catfish	1969	2006	18	60,750
Flathead catfish	1970	1970	1	5,000
Largemouth bass	1970	1981	7	1,627
Rainbow trout	1987	2007	127	192,227
Redear sunfish	1979	1979	1	5,000
Tilapia species	1971	1971	1	880
Total			157	265,716

Proposed Action

The Department proposes to stock rainbow trout, largemouth bass, channel catfish, redear sunfish, bluegill sunfish, black crappie, and white amur for the period covered by this consultation.

Catchable rainbow trout would be stocked from November to March multiple times each year; the numbers of trout annually stocked would range from 0 to 30,000 fish annually.

White amur ranging in size up to 15 inches in length would be stocked as needed to control aquatic vegetation, to allow for improved angler access. The number stocked would range from 0 to 1,000 annually.

Largemouth bass (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), black crappie (sub-catchables, catchables), bluegill sunfish (fry/fingerling, sub-catchables, catchables), and redear sunfish (fry/fingerling, sub-catchables, catchables) may be stocked on an as needed basis at any time during the period covered by this consultation, to augment the existing fishery or to recover the fishery following catastrophic events. Numbers of fish stocked for this purpose would be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution / Connectivity

Water from artesian wells sited near the lake and rain runoff are the sources of water for this man-made lake. This lake is not located directly within any natural drainage in the Gila River watershed, and as such there is no opportunity for flood water to enter the lake. Water that does enter the lake is delivered through a concrete lined irrigation ditch owned and operated by the Lebanon Ditch Company. This irrigation ditch collects rain runoff from Rincon Canyon in the Pinaleno Mountains west of the lake. The water is stored in two reservoirs west of the lake known as Lebanon reservoir #1 and Lebanon reservoir #2. When water is released from these reservoirs, it travels approximately 3 miles down the concrete irrigation ditch to the point where it enters Roper Lake at the southwest corner. Artesian well water that is used to augment the lake level during times of drought is carried through the same concrete irrigation ditch for delivery to the lake.

The spillway at this lake is located in the southeast corner of the lake near the boat ramp. The spillway is concrete lined as it crosses the road in the park, but is poorly defined once it leaves the park property. Water passing over this spillway will eventually encounter Stockton Road east of the lake, which forces the water to change direction and begin flowing north along the outer edge of the earthen berm of the lake. Eventually the water will cross Stockton road just before reaching Roper Lake Road, at which point the water makes another turn to the east and then back to the north after crossing Roper Lake Road. The water then enters both active and retired agricultural fields where it will likely spread out in sheet flow and travel for approximately 1.5 miles through the fields before emptying into Stockton Wash. Once the water is in Stockton Wash it travels ½ mile, finally reaching a flood control dike constructed by Graham County to protect active agricultural fields and urban development's located along Stockton Wash. This flood control dike is located approximately 3 miles south of the Gila River (Figure 12).

The flood control dike prevents water from reaching the Gila River, and there are no naturally occurring drainages connecting the upstream of this lake to natural habitats. This location is therefore considered a closed system.

Figure 12. Aerial photo of flood control dike preventing flow from Roper and Dankworth to the Gila River drainage.

Fish Movement

The only opportunity for fish to leave this lake in an upstream direction is by way of the concrete irrigation canal. While the opportunity exists for fish to escape upstream, there is no opportunity for them to escape from the canal, and once water delivery has ceased and the canal dries up, any fish left in the canal will perish.

Fish moving downstream may do so during events which produce flow through the spillway. Such events can be expected to occur during the summer monsoon season or in the spring during the snow melt events in the higher elevations of the Pinaleno Mountains. Typically, such events would have to fill the two storage reservoirs of the Lebanon Ditch Company first before water would be released down the irrigation ditch to Roper Lake. Fish escaping during such events would travel the same path described in the water connectivity section above, until reaching the flood retention dike. Once there, fish would persist for a period of time until water either infiltrates in to the surface or evaporates, leaving fish to perish.

Community Description

Currently, the fish population at this lake consists of largemouth bass, bluegill sunfish, redear sunfish, green sunfish, black crappie, channel catfish, and yellow bullhead catfish. All of these species can and do reproduce in the system. Rainbow trout are stocked at this location during the

winter months of November through March; however, they do not carry over due to high water temperatures in the summer months (D. Mitchell pers. comm.). Rainbow trout also do not reproduce in this location due to the lack of appropriate habitat. There is no knowledge of how or when the green sunfish and yellow bullhead got into the lake. It is likely that these populations were present prior to the Department taking over ownership of the property, but no records are known to exist of the conditions at that time. The only other aquatic species recorded at this location are bullfrogs and crayfish.

The Department conducts annual fish surveys in the spring, using 150-foot experimental gill nets set over a 12 hour period at randomly selected sites around the lake. Results consistently show a healthy and stable populations of all of the above mentioned warm water fish species (Table 8Table 10).

Table 10. Spring survey at Roper Lake 2008

Species	**Number Sampled**	**Percent of Total**
Black crappie	17	28
Bluegill	4	7
channel catfish	4	7
Flathead catfish	0	0
Largemouth bass	24	40
Rainbow trout	0	0
Redear sunfish	5	8
Green sunfish	6	10
Total	60	100

Although completely separate from the proposed stocking location, a refugia population of Gila topminnow was established at Roper Lake headquarters pond in July 1989, and follow up surveys consisting of visual surveys and dip net sweeps reported that the fish persisted until 1996. The headquarters pond was reported to be dry in 2001 by Arizona State Parks staff. The Department assisted by Arizona State Parks conducted a sampling effort consisting of visual surveys, dip net sweeps, and cast net tosses in 2004 did not capture any Gila topminnows (Foster 2004). The population is considered as failed at this time. No other listed or non-listed native aquatic species have been documented at this location.

Consultation Species or Critical Habitat

There are no aquatic consultation species or critical habitats associated with this action area. Consultation species such as the southwestern willow flycatcher are discussed within the complex analysis.

Dankworth Pond

Site Description

Dankworth Pond is located on US Highway 191 approximately 7 ½ miles south of Safford, in Graham County. Located about 7 miles south of the Gila River near the Jacobson Creek drainage flowing off the east side of the Pinaleno Mountains, the lake was originally constructed as a private aquaculture facility in the early 1960's. Dankworth Pond was constructed by building an earthen berm 6 to 8 feet high using dirt that was removed from the bottom of the future pond. Today the property including the pond along with several non-functioning ponds is now owned by Arizona State Parks and is managed as a sister park to Roper Lake State Parks, about 2 miles north of the site. Dankworth Pond is approximately 7 acres in size with an average depth of approximately 15 feet.

Dankworth Pond is managed as a day-use only park, and visitors are not allowed at the park after sunset. While boats are allowed at the lake there are no launching facilities available and boats must be small enough to be carried to the water from the parking lot.

Management of Water Body

The primary fishery is a naturally reproducing warm water fishery consisting of largemouth bass, redear sunfish, bluegill sunfish, channel catfish, and black crappie. The Department also manages for a secondary seasonal opportunity fishery consisting of a winter put-and-take rainbow trout. The stocking history shows that two species of tilapia were stocked in the pond; however, there is no data to suggest either of these populations have persisted (Table 11).

Table 11. Historic Department fish stockings at Dankworth Pond

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Blue Tilapia	1975	1976	1	100
Channel catfish	1977	1987	7	6,950
Largemouth bass	1975	1975	1	145
Rainbow trout	1989	2007	70	47,224
Redear sunfish	1976	1976	1	86
Mozambique tilapia	1976	1976	1	300
Total			81	54,805

An angler survey conducted in 1998 showed the small pond receives some light use, but less than that of other lakes and ponds in the area; however, because the data were combined with that from other lakes in the area during analysis, it is not possible to determine exact numbers for angler use at Dankworth alone (Porath and Blasius 1999).

Proposed action

The Department proposes to stock rainbow trout, largemouth bass, channel catfish, redear sunfish, bluegill sunfish, black crappie, and white amur for the period covered by this consultation.

Catchable rainbow trout would be stocked from November to March multiple times each year. The numbers of trout stocked would range from 0 to 20,000 fish annually.

White amurs ranging in size up to 15 in length would be stocked as needed any time during the period covered by this consultation, to control aquatic vegetation to allow for improved angler access; the number stocked would range from 0 to 1,000 fish annually.

Largemouth bass (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), black crappie (sub-catchables, catchables), bluegill sunfish (fry/fingerling, sub-catchables, catchables), and redear sunfish (fry/fingerling, sub-catchables, catchables) may be stocked on an as needed basis at any time during the period covered by this consultation, to augment the existing fishery or recover the fishery following catastrophic events. Numbers of fish stocked for this purpose would be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution / Connectivity

This man-made pond is not located directly within any natural drainage in the Gila River watershed, and as such there is no opportunity for flood water to enter the pond. Water levels at the pond are maintained only by ground water pumping from artesian wells associated with the property on which the pond is located. Although there are no water inlets associated with the small pond, there is a spillway that allows excess water to leave the pond, where it enters Jacobson Creek approximately 200 yards away. Jacobson Creek is an ephemeral creek that drains approximately 10,000 acres off the east slope of the Pinaleno Mountains just south of the Swift Trail Road. Once water reaches Jacobson Creek, water then flows north for approximately 2 miles, where it confluences with Marijilda Creek. Water then would travel approximately 1.5 miles down Marijilda Creek where it confluences with Stockton Wash. Water then travels 1.5 miles down Stockton Wash where it would then encounter the same county owned and maintained flood control dike that prevents water escaping from Roper Lake from reaching the Gila River, which is approximately 3 miles further south (Please see Roper Lake Water Distribution/Connectivity discussion). There are no naturally occurring upstream drainages that connect with this lake; therefore, this location is considered a closed system.

Fish Movement

There are no drainages providing water into Dankworth Pond, thus, there are no opportunities for fish to escape in an upstream direction; however, fish could escape downstream during events which produce flow through the spillway. The water level is maintained through groundwater pumping, and the only opportunity for such events would be caused by human failure to shut off

pumps. If this happened the water would travel through the spillway. Fish escaping during such an event would then travel the same path described in the water connectivity section, above, until reaching the flood retention dike on Stockton Wash, approximately 5.5 miles north of Dankworth Pond. Once there, fish would likely persist for a period of time until water either infiltrates into the surface or evaporates, leaving fish to perish.

Community Description

Due to the small size and the difficulties of launching a boat large enough to conduct fish surveys, the Department has never completed one at this location. Based on angler catch reports, it has been determined the current fish population at this pond consists of largemouth bass, bluegill sunfish, redear sunfish, green sunfish, black crappie, and channel catfish. All of these populations are considered self-sustaining through natural reproduction. Rainbow trout are stocked at this location during the winter months of November through March; however, they do not carry over due to high water temperatures in the summer months and cannot reproduce due to the lack of suitable habitat. Although green sunfish are part of the fish community at this location, there are no records of how this fish population was established.

Beyond the fish community, bullfrogs and crayfish also occupy this location. There has not been listed or non-listed native aquatic species documented in this location.

Consultation Specie or Critical Habitat

There are no aquatic consultation species or critical habitats associated with this action area. Consultation species such as the southwestern willow flycatcher are discussed within the complex analysis.

Frye Mesa Lake

Site Description

Frye Mesa Lake is located on Frye Creek on the north facing slope of the Pinaleno Mountains, approximately 5 miles southeast of the town of Thatcher, at an elevation of 5,000 feet. The land around the lake is desert scrub and is owned and managed by the United States Forest Service.

The small lake was originally constructed by the town of Thatcher for the purpose of supplying domestic water to the town. It is about 5 acres in size, and has an average depth of 40 feet. There are no facilities at the lake and watercrafts are prohibited.

Management of Water Body

The lake is managed as an intensive put-and-take rainbow trout fishery, as well as a put-grow-and-take brown trout and brook trout fishery, with multiple stockings of each species annually. The stocking history at this lake shows only trout species have been stocked by the Department (Table 12).

Table 12. Historic Department fish stockings at Frye Mesa Lake

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Brook trout	1988	1988	1	5,000
Brown trout	1998	2001	2	8,083
Rainbow trout	1939	2007	124	232,989
Total			127	246,072

The Department has never conducted an angler-use survey at this location; however, the location is a very popular fishing location for the residents of the area.

Proposed Action

The Department proposes to stock rainbow trout, brown trout, and brook trout for the period covered by this consultation.

Rainbow trout would be stocked multiple times annually during the summer months, from April through late September, with catchable size rainbow trout; the number of catchable size rainbow trout stocked range from 0 to 30,000 annually.

Gila trout may be stocked multiple times annually depending on availability, with catchable size Gila trout; the number of catchable size Gila trout stocked range from 0 to 10,000 annually.

Brown trout are stocked one time per year as fingerling or sub-catchables in late September each year; the number of fingerling or sub-catchable brown trout stocked ranges from 0 to 10,000 annually. Periodically as available this population may be augmented with catchable size trout; the number of catchable size brown trout stocked would range from 0 to 10,000.

Fingerling or sub-catchables brook trout may be stocked annually dependant on the availability of this species; the number of brook trout would range from 0 to 10,000. Periodically, as available, this population may be augmented with catchable sized trout; the number of catchable sized Brook trout stocked would range from 0 to 10,000.

Water Distribution / Connectivity

Water levels at Frye Mesa Lake are typically within 2 or 3 feet of full throughout the year. However, during drought conditions this level may fluctuate, since rain and snow runoff from Frye Creek are the only sources of water for this reservoir. The Frye Creek drainage encompasses approximately 15,600 acres. Frye Creek above Frye Mesa Lake is perennial and ephemeral below the lake. Events that would cause water to flow over the spillway at this small reservoir are summer monsoon events and spring snow melt runoff from the higher elevations. Water leaving Frye Mesa Lake travels down the ephemeral section of Frye Creek approximately 5 miles, before entering a subdivision and golf course built directly in the drainage bottom.

Water entering the golf course would likely inundate and spread out, becoming sheet flow rather than a channelized flow. Once water leaves the golf course and developed urban areas, it flows approximately 1.5 miles where all flow is stopped and contained by a 15 to 20 foot tall flood control dike built and maintained by Graham County (Figure 13). This flood control dike is approximately 1 mile in length and is about 2 miles southwest of the Gila River. The dike was constructed to protect active agricultural fields, the High Line Canal System, and urban development in the town of Thatcher.

The flood control dike prevents water from reaching the Gila River, and there are no naturally occurring drainages connecting the upstream of this lake to natural habitats; therefore this location is considered a closed system.

Figure 13. Aerial photo of flood retention dike in Frye Creek

Fish Movement

Upstream movement of fish into the perennial sections of Frye Creek above the lake are impossible due to the presence of natural barriers present at the upstream end of the lake, where Frye Creek enters the Lake (Figure 14). The initial barrier that would be encountered by fish trying to leave upstream is a sheer vertical rise approximately 40 to 50 feet tall.

Fish leaving downstream could possibly do so during the flow events following summer monsoon and spring runoff. Fish leaving the reservoir would follow the same path as the water described above in the water distribution and connectivity section. Once the fish reached the flood control dike downstream of the lake their progress would be stopped; once there, fish

would likely persist for a period of time until water either infiltrates into the surface or evaporates, leaving fish to perish.

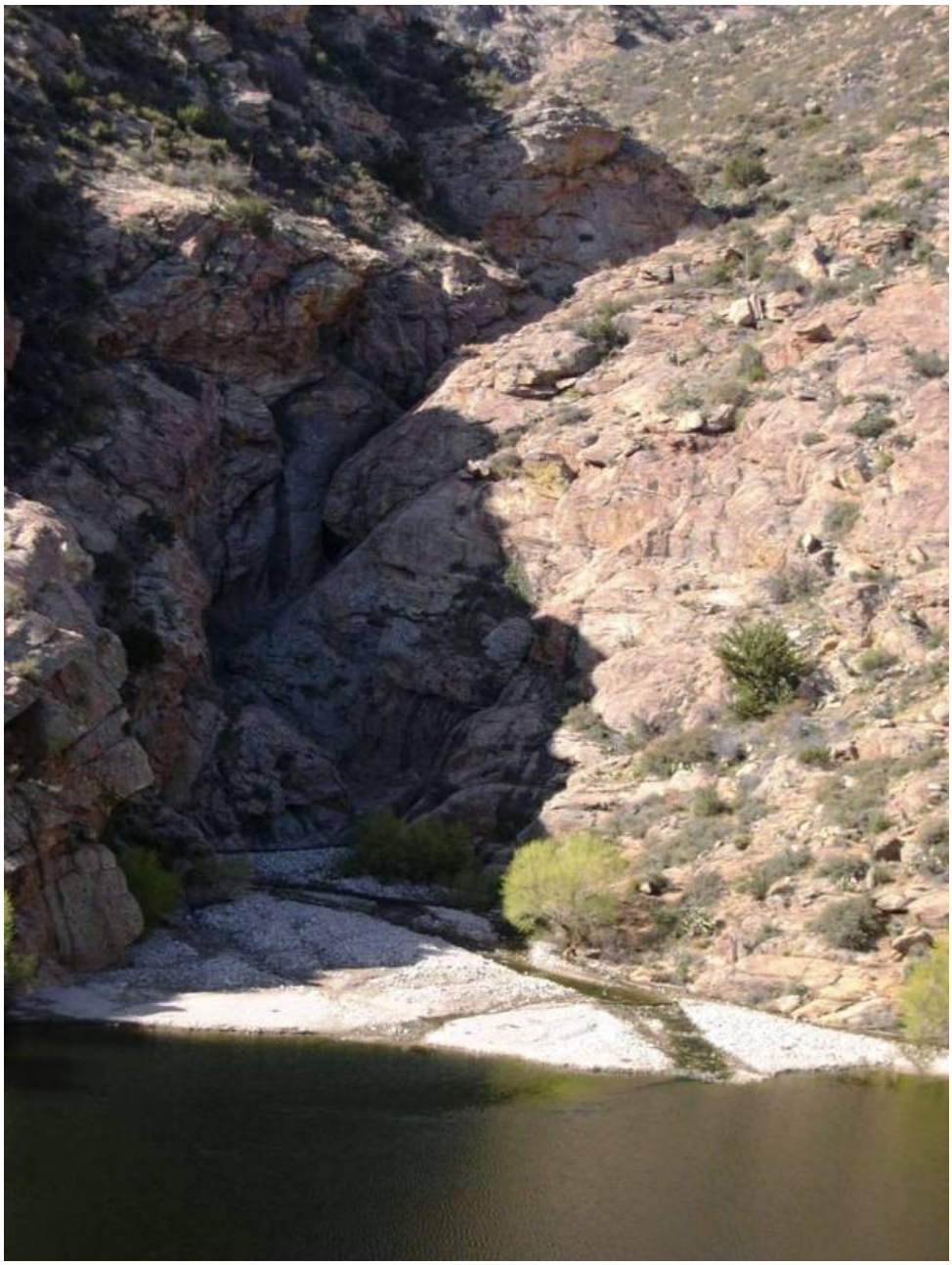

Figure 14. Upstream barrier to fish movement at Frye Mesa Reservoir

Community Description

Both brown and rainbow trout are known to still occur in this reservoir and are reported on a regular basis by anglers. It is not known for certain if brook trout are present. Anglers report catching brook trout; however, these reports have not been verified by the Department. Although

trout could carry over at this lake, there is no natural reproduction occurring due to the lack of appropriate habitat for successful spawning by trout species. The Department must maintain the fish population through stocking; therefore, fish surveys have never been conducted at this lake. Crayfish are also known to be present in the lake. Gila trout were stocked into Frye Mesa Creek upstream of the reservoir as a recovery action on Nov. 4, 2009.

Consultation Species or Critical Habitat
Consultation species such as the southwestern willow flycatcher are discussed within the complex analysis. Gila trout are discussed below.

Gila Trout
Gila trout were stocked into Frye Mesa Creek upstream of the reservoir as a recovery action on Nov. 4, 2009. It is too early to determine survival of the stocked fish or establishment of a recovery population but it is expected to occur into the future. The Gila trout were stocked by AGFD in cooperation with the Coronado National Forest. As part of the introduction process, the Forest prepared a Biological Assessment (Hayes 2009).

Potential Impacts

Gila trout washed down into Frye Mesa Reservoir may be subject to competition with and/or possible predation by stocked brown, brook, Gila or rainbow trout and may also hybridize with rainbow trout (although trout reproduction has never been documented in the lake). Additionally, Gila trout in Frye Mesa Lake will also be subject to harvest by angling as allowed under Section 4(d) of the ESA. Gila trout that migrate into the lake will be lost from the recovery population in the stream above because they will not be able to migrate back upstream due to existing natural waterfalls, which also prevent non-native trout stocked into the lake from accessing the recovery area.

Cluff Ranch Pond #3
Site Description
Cluff Ranch Pond #3 is a man-made pond about 10 acres in size, with an average depth of 12 feet. It is located about 5 miles south of Pima on the Cluff Ranch Wildlife Area (Figure 15). The Cluff Ranch Wildlife Area is located on Ash Creek at the foot of the Pinaleno Mountains. The Department acquired the property from the Federal Government in 1949. Cluff Ranch Pond # 3 is located in desert scrub at an elevation of 3,000 feet.

Facilities at the location include a concrete boat ramp, fishing pier, and restroom. Boats are restricted to a single electric motor, and camping overnight is prohibited.

Figure 15. Cluff Ranch Drainage

Management of Water Body

The Department manages the entire wildlife area today to optimize the potential of the area as wildlife habitat, to promote use of the area for present and future generations for public hunting, fishing, wildlife viewing, education and other wildlife oriented recreation. The primary management emphasis is on fishing for warm and cold water species.

As a primary fishery, the Department maintains naturally reproducing warm water species consisting of largemouth bass, bluegill sunfish, redear sunfish, green sunfish, channel catfish, and black crappie. Additionally the Department manages a secondary fishery consisting of a winter put-and-take rainbow trout fishery, with catchable rainbow trout stocked in the months of November through March. Historically, the lake has been stocked with a number of warm water species (Table 13).

Table 13. Historic Department fish stocking at Cluff Ranch Pond #3.

Species	**First Year**	**Last Year**	**Num. of Stockings**	**Num. Stocked**
Black crappie	1965	1965	1	1,000

Bluegill sunfish	1937	1953	2	8,375
Channel catfish	1964	1993	9	36,436
Largemouth bass	1937	1972	5	3,335
Rainbow trout	1972	2010	203	357,936
Threadfin shad	1957	1957	1	3,000
White Amur			1	100
Total			191	365,082

Cluff Ranch Pond #3 is a very popular fishing destination with the local citizens, with data collected in 2001 estimating that anglers expended 3,688 angler use days at the pond (Pringle 2004).

Proposed Action

The Department proposes to stock of rainbow trout, largemouth bass, channel catfish, redear sunfish, bluegill sunfish, black crappie, and white amur for the period covered by this consultation.

Catchable rainbow trout would be stocked from November to March multiple times each year; the numbers of trout annually stocked would range from 0 to 20,000 fish annually.

White amurs ranging in size up to 15 in length would be stocked as needed any time during the period covered by this consultation, to control aquatic vegetation to allow for improved angler access; the number stocked would range from 0 to 1,000 fish annually.

Largemouth bass (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), black crappie (sub-catchables, catchables), bluegill sunfish (fry/fingerling, sub-catchables, catchables), and redear sunfish (fry/fingerling, sub-catchables, catchables) may be stocked on an as needed basis at any time during the period covered by this consultation, to augment the existing fishery or to recover the fishery following catastrophic events. Numbers of fish stocked for this purpose would be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution / Connectivity

Cluff Ranch Pond #3 is maintained by rain runoff during the monsoon season and snow melt runoff in the early spring. Runoff is diverted from Ash Creek, approximately 3 miles upstream from the pond. The Department currently holds a water right for 1,223.48 acre-feet of water per year from Ash Creek. Ash Creek drains the north slopes of the Pinaleno Mountains, and

encompasses approximately 5250 acres, according to the Forest Service, with an 8.2 mile trail along the creek. Ash Creek is perennial from its headwaters near the top of the Pinaleno Mountains down to the Departments diversion; once past the diversion, the creek is ephemeral for the rest of its length. Water delivery from Ash Creek to the pond occurs through a 6-inch pipe operated and maintained by the Department. To direct the flow of water, there is a valve on this pipe allowing the ranch manager to either divert water into the pipe for delivery to the pond or directly down Ash Creek. In addition to the pipe delivering water to the pond, there is also a small unnamed drainage approximately 1 mile in length, entering the pond from the south. This small drainage would provide some rain runoff into the pond during the summer monsoon season, but the overall amount provided by this small drainage is unknown and thought to be minimal.

The spillway at this pond is poorly defined and the pond rarely, if ever, spills due to the management of the water level by the ranch manager. When the pond is full, the ranch manager closes the inlet to the pipe, allowing water to flow down Ash Creek instead of into the pipe for delivery into the pond. In the unlikely event that water were to spill over the spillway, it would leave the pond and flow into Shingle Mill Canyon via a now defunct irrigation ditch. Once the water enters Shingle Mill Canyon it would flow 2.5 miles to its confluence with Ash Creek. Once water enters Ash Creek it travels another 3 miles where the creek channel becomes bisected by the High Line Canal system (Figure 16). This canal consists of a 5 to 6 foot high berm, effectively acting as a dam and stopping all flowing water, preventing it from flowing further downstream. Depending on the size of the precipitation event and the amount of water pooled up behind the canal berm, water could spill over into the canal. In extreme events, water could fill the canal and spill over the other side of the canal berm, where it would simply be captured in active agricultural fields north of the canal. Water captured in the active agricultural fields at this point remains approximately 3 miles from the Gila River, separated by extensive agricultural and urban development.

The canal infrastructure built in Ash Creek channel diverts and stops all water flowing down Ash Creek, making it is impossible for water to reach the Gila River; therefore this system is considered closed.

Figure 16. Termination point of Ash Creek below Cluff #3

Fish Movement

The water pipe supplying water from Ash Creek is screened on both ends, and it is therefore impossible for fish to enter this pipe. Fish escaping from Cluff Ranch Pond # 3 in an upstream direction could only do so by entering the small unnamed drainage located on the south of the pond during summer monsoon rainfall runoff events. This small unnamed drainage is ephemeral and only has habitat appropriate to support aquatic wildlife during these rainfall runoff events. Any fish that were to escape in the upstream direction could potentially persist until conditions dry out, at which point the fish would perish.

Fish moving downstream could do so through the spillway, and would follow the same path as the water described above in the water distribution and connectivity section. As with the water, any fish that were to reach the berm of the canal system would find further progress blocked by the canal berm. All drainages associated with the downstream portion of this drainage, below the pond, are ephemeral and only contain aquatic habitat during these runoff events; once there, fish would likely persist for a period of time until water either infiltrates into the surface or evaporates, leaving fish to perish.

Community Description

Warmwater fish have persisted in the lake since before the Department purchased the property. The current warm water fish are self-sustaining and consists of largemouth bass, bluegill sunfish, green sunfish and black crappie (Table 14 and Table 15). There is no knowledge of how or when

green sunfish, and bullhead catfish got into the lake. It is likely these populations were present prior to the Department taking over ownership of the property, but no records are known to exist of the conditions at the time of purchase.

Table 14. Cluff Pond 2007 electrofishing survey for spring

Species	**Number Sampled**	**Percent of Total**
Black crappie	8	11
Bluegill sunfish	23	31
Largemouth bass	29	38
Green Sunfish	15	20
Total	75	100

Table 15. Cluff Pond 2007 electrofishing survey for fall

Species	**Number Sampled**	**Percent of Total**
Black crappie	14	6
Bluegill sunfish	85	36
Largemouth bass	103	44
Green Sunfish	34	14
Total 236 100	236	100

Rainbow trout are stocked during the winter months of November through March; they do not reproduce in the system, due to a lack of habitat. They do not persist in this system during the summer months, because water temperatures reach lethal limits during mid-summer.

Threadfin shad, although stocked in 1957, were not considered to be persisting in the small pond, and were thought to be eliminated until they were sampled again in the early 2000's. Repeated sampling over the years found no evidence that this species still persisted in the pond, suggesting they were illegally re-introduced to the system at some point. In addition there are also self-sustaining populations of bullfrogs and crayfish in Cluff Ranch Pond #3. There are no listed or non listed native species known from this drainage.

Consultation Specie or Critical Habitat
There are no aquatic consultation species, or critical habitats associated with this action area. Consultation species such as the southwestern willow flycatcher are discussed within the complex analysis.

UPPER GILA RIVER COMPLEX ANALYSIS
All of the proposed stocking locations within this complex have been determined to be closed systems with no connection to the Gila River drainage.

Water Distribution / Connectivity
The sites discussed in this analysis are all closed systems. Only two, Roper Lake and Dankworth Pond, have the potential for water spilled from the lakes to combine in Stockton Wash. However, a dike in Stockton Wash prevents water from entering the Gila River (See Roper Lake Water Distribution above).

Fish Movement
Fish cannot move between or from the proposed stocking locations as they are closed systems.

Community Description
The aquatic community at these locations may contain rainbow trout, largemouth bass, channel catfish, redear sunfish, bluegill sunfish, black crappie, and white amur. Frye Mesa Lake would be the exception, containing mainly rainbow, brown, and possibly brook trout.

Consultation Species or Critical Habitat
There are no anticipated effects to listed aquatic species residing in the Gila River drainage because the complex is a closed system.

Southwestern Willow Flycatcher
There are documented occurrences of the southwestern willow flycatcher along the Gila River proper. There is no suitable habitat for flycatchers at or adjacent to any of the proposed locations within the complex. There is no riparian vegetation necessary for the flycatcher at any of the stocking sites. Cluff Pond #3 is the closest location to the Gila River (approximately 1.5 miles).

Potential Impacts
No impacts are anticipated to southwestern willow flycatcher, as they occur only at the Gila River proper. There are no documented occurrences at the proposed stocking sites, which lack suitable habitat.

MIDDLE GILA SUB-WATERSHED
Physical Geographic Description

The Gila River originates in southwest New Mexico in the Mogollon Mountains in the Gila National Forest. The waters flow west through southeastern Arizona, to the south of Phoenix and eventually joins the Colorado River near Yuma. The Middle Gila River covers approximately 5,425 mi^2 from the confluence with the Salt River to San Carlos Reservoir (Figure 17).

Drainage Area and Elevations

The Middle Gila flows west from the San Carlos Reservoir to the confluence of the Salt River west of Phoenix and ends at the Ashurst-Hayden Diversion Dam. The Middle Gila consists of rugged mountain ranges, broad intermountain plains and flat, gentle valleys. Most rain falls during summer thunderstorms resulting in intense, localized runoff. Winter rains are generally gentle, but can result in heavy runoff once the soil becomes saturated (ADWR 2003). The Middle Gila River sub-watershed, for the purposes of this analysis, does not include the Santa Cruz sub basin, which is addressed in a separate chapter. The San Pedro River is the only major tributary between the San Carlos Reservoir and the Ashurst -Hayden Diversion Dam. According to the USGS Hydrologic Unit Codes, the Middle Gila watershed includes Wilcox Playa sub-watershed. The Ashurt-Hayden Diversion dam, a smaller earthen structure, located 50 miles downstream of Coolidge Dam diverts water into canals for delivery to water users. Significant tributaries include the San Pedro River and Salt River.

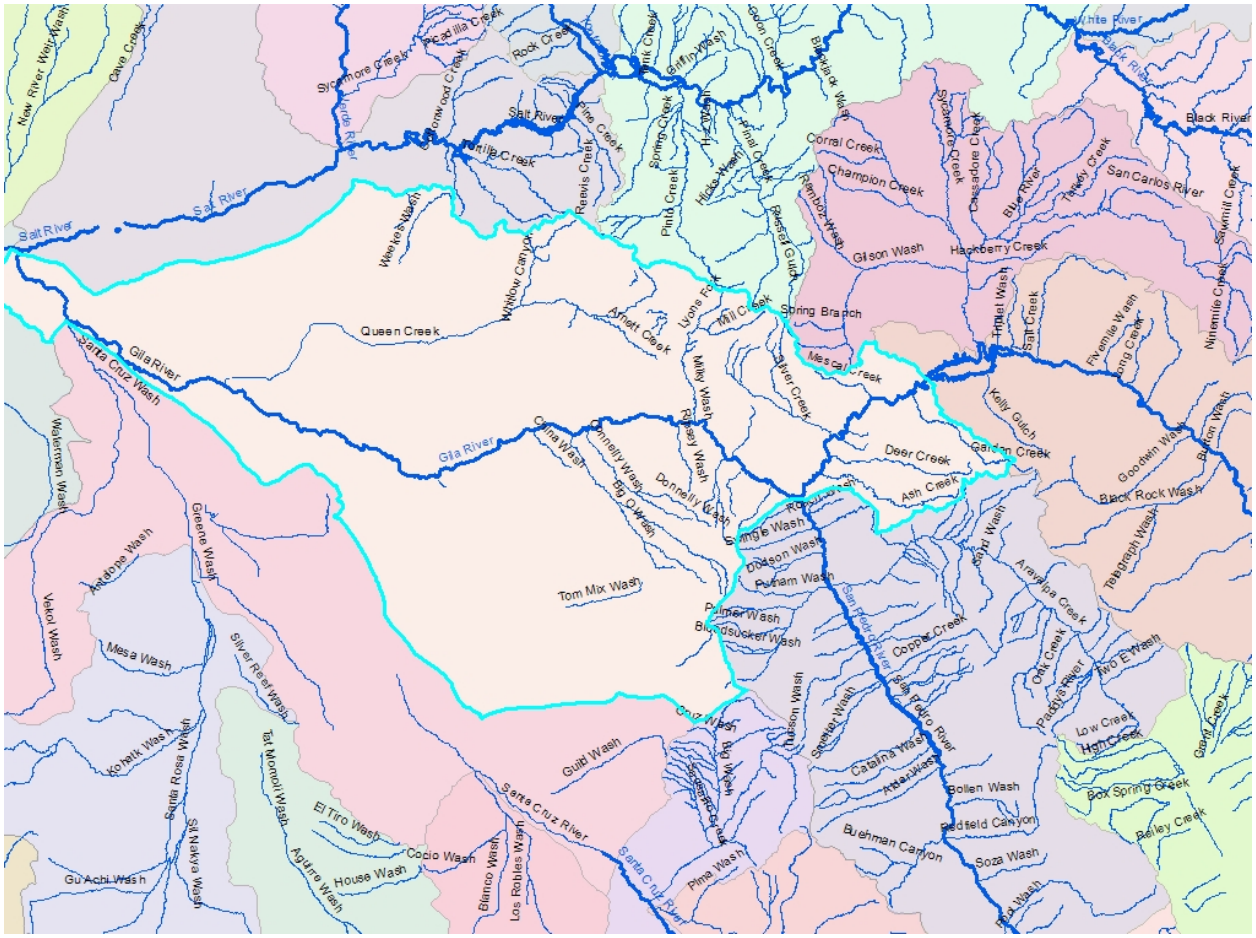

Figure 17. Middle Gila Sub-Watershed

Kearny Lake

Site Description

Kearny Lake is located in the town of Kearny at an elevation of 1860 feet, in Pinal County (Figure 18 and Figure 3). The lake is 5 acres in size and was constructed by the town to replace the previous lake when it was lost due to flooding in 1993. The lake was constructed above grade with a lined PVC geothermal membrane and a concrete lined shoreline. The lake is located within a city park that provides a campground facility, restrooms, and an improved concrete boat ramp.

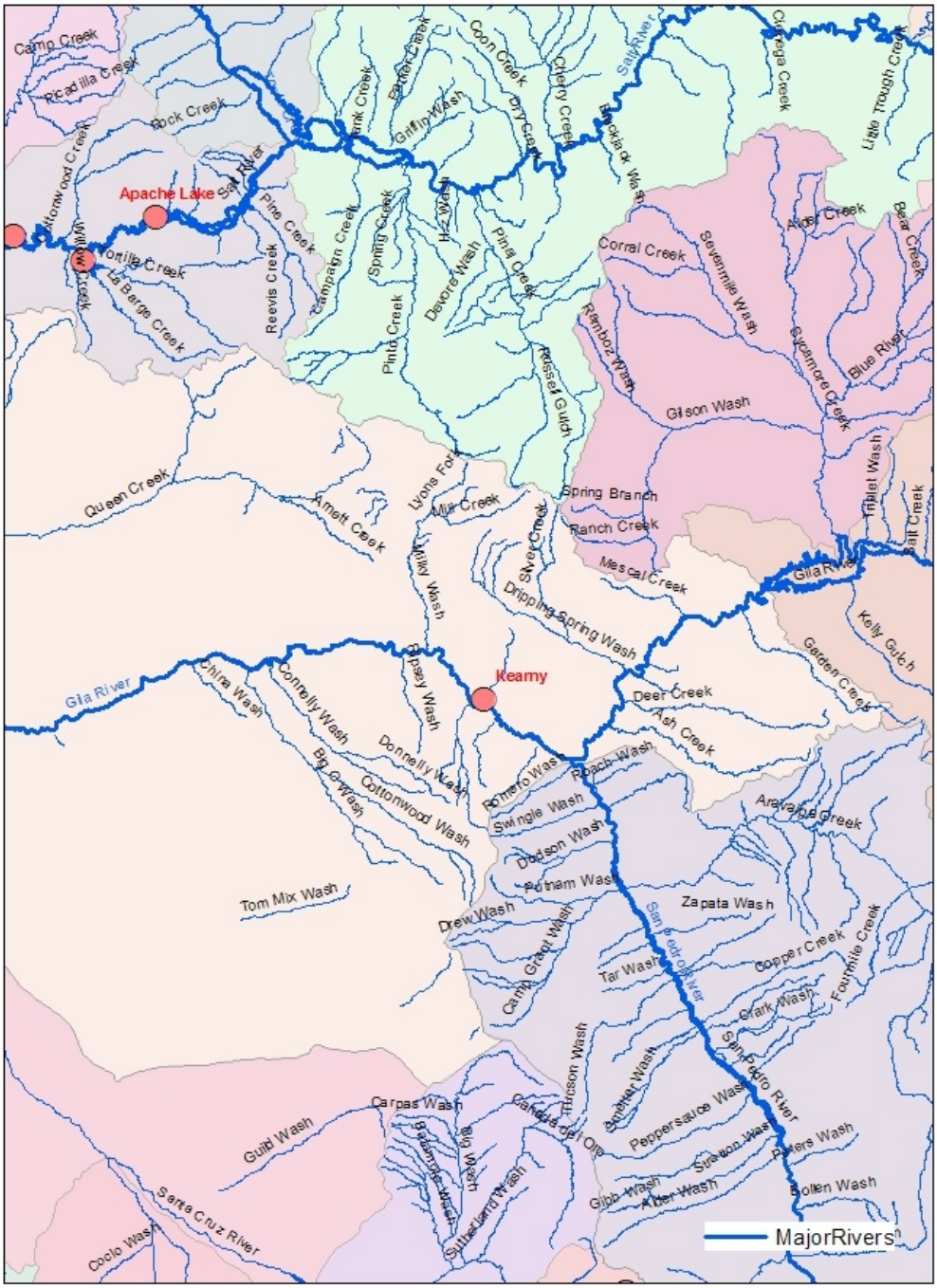

Figure 18. Kearny Lake.

Figure 19. Kearny Lake

Prior to 2002, the lake was managed as a self-sustaining warm water fishery and a winter put-and-take rainbow trout fishery. Angler surveys in 2001 estimated that Kearny provided approximately 3,000 angler use days (Pringle 2004). However, in 2002, golden alga (GA) was discovered. Blooms continue to occur each winter and kill all gill breathing animals. Prior to this discovery, the lake had experienced a series of severe fish kills resulting in a complete loss of aquatic life at the lake. Once GA had been positively identified the Department believed blooms would be ongoing because the alga is present and frequently reoccurs; there is no way of predicting if and when blooms will occur in the future. Because GA blooms prevent maintenance of self sustaining populations at Kearny Lake, private consultants hired by the town of Kearny have asked us to reconsider the stocking of fish following GA blooms to maintain a put and take fishery.

Since then, the lake has been managed as a put-and-take rainbow trout fishery as the Department determined that GA would prevent it from ever becoming a self-sustaining fishery. The

Department plans to expand it into a summer put-and-take warmwater fishery. Historic stocking at this location can be found in Table 16.

Table 16. Historic stocking at Kearny Lake.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Rainbow trout	2000	2002	9	14,248
Largemouth bass	2000	2000	1	1,900
Total				16,148

Proposed Action

The Department proposes to stock rainbow trout, largemouth bass, channel catfish, redear sunfish, and bluegill sunfish, for the period covered by this consultation.

Catchable rainbow trout would be stocked from November to March multiple times annually with numbers of trout stocked ranging from 0 to 20,000 fish annually.

Catchable channel catfish stockings would be stocked multiple times from April through October. Numbers of catfish stocked would range from 0 to 40,000 fish annually.

Largemouth bass (catchables), bluegill sunfish (catchables), and redear sunfish (catchables) may be stocked at any time to augment the put-and-take channel catfish fishery in an effort to increase angler interest and participation. Number for each of the three species would range from 0 to 10,000 per species.

Water Distribution / Connectivity

Groundwater pumping and rainfall are the only sources of water for this lake. There is no spillway at this lake. If water reaches a high level, it would automatically be siphoned from the lake through a screened pipe (Figure 20 and Figure 21). Excess water would then be delivered 500 m to the Gila River through this screened pipe; however, due to monetary constraints, the Town of Kearny maintains the lake at a level well below the siphon.

Figure 20. Screened pipe

Figure 21. Close up of screened pipe

Fish Movement

There is no possibility of upstream movement out of this location, because the lake was built above the natural grade with no contributing watershed or channel. Fish movement downstream could only occur through the screened pipe off the siphon. This is highly unlikely due to the fact

the water level is maintained below the siphon and the catchable size of fish stocked cannot pass through the screened pipe although sub-catchables might do so if present. Reproduction, while possible, has never been documented since GA was positively identified at the location. Again, it is not possible to predict when GA would bloom, but past history has shown fish do not survive for extended periods of time due to the blooms.

Community Description

The Department has no data for this location. After construction was completed and the lake stocked, there was a GA fish kill before surveys could be completed. Currently, this site is believed to be fishless due to GA. For the same reason, no invertebrates or amphibians are present at the lake.

Consultation Species or Critical Habitat

Kearny Lake is approximately .3 miles from the mainstem of the Gila River. Southwestern willow flycatcher and designated critical habitat occur along the Gila River potentially adjacent to the lake.

Southwestern Willow Flycatcher

The stocking site occurs adjacent to designated critical habitat along the Gila River. Southwestern willow flycatchers were last documented in 2002 approximately .6 miles from the lake, on the other side of the airport near the Gila River. It is unlikely that anglers would walk from this stocking location to the Gila River because they would have to cross two roads and an irrigation ditch, airport runway and because the Gila River at this location is not stocked with sport fish. No suitable habitat exists for the flycatcher at or in the vicinity of the lake. There is no riparian vegetation at the lake for the flycatcher to utilize.

Potential Impacts

No potential impacts are anticipated to individual flycatchers or critical habitat. The stocking site occurs adjacent to designated critical habitat along the Gila River. Suitable habitat is not present at the lake.

AGUA FRIA RIVER SUB-WATERSHED

Physical geographic description

Drainage area

The Agua Fria River sub-watershed occupies about 1,200 mi^2 in central Arizona (Figure 22). The northern half of the basin is in the Central highlands physiographic province, and the southern half is in the Basin and Range province. The basin's main drainage is the Agua Fria River, which flows north to south through the basin and empties into Lake Pleasant. The Agua Fria and its tributaries are generally intermittent streams, except for some perennial stretches where impermeable bedrock forces groundwater into the streambed. The basin is bounded on the north

by Hickey Mountain, on the west by the Bradshaw and Buckhorn Mountains, on the south by Lake Pleasant, and on the east by the Black Hills and New River Mountains. The Agua Fria sub-watershed has a mixture stewardship of Federal, State, and private lands. Specifically, 46.7% National Forest and Wilderness, 16.7% U.S. Bureau of Land Management, 14.6% State Trust Land, 12.1% National Parks, Monuments, and Recreational Areas, 7.1% Private and 2.6% Other (AGFD, County, and Bureau of Reclamation Lands) (ADWR 2007).

Range of elevations
Land-surface elevations in the Agua Fria basin vary from 1,570 feet above sea level at Lake Pleasant to 7,800 feet in the Bradshaw Mountains.

Tributaries
The Agua Fria and its major tributaries are a combination of intermittent and ephemeral streams, except for some perennial stretches. Connected tributaries to the Agua Fria river upstream of Lake Pleasant include, Black Canyon, Slate, Boulder, Squaw, Little Squaw, Tule, Big Bug, Silver, Sycamore, Larry, Lousy, Tank, Bishop, Badger Springs, Indian, Lynx, Yarber Wash, Chaparral-Gulch Arroyo, Coyote Wash, Clipper Wash, and Yellow Jacket Creeks.

Three stocking locations, Lynx Lake, Fain Lake, and Horsethief Basin Lake, are proposed. Proposed stocking actions in the watershed will be evaluated as two reaches, the Lynx Creek Complex (consists of the two stocking sites of Lynx Lake and Fain Lake) and the Black Canyon Complex (consists of one stocking site of Horsethief Basin Lake).

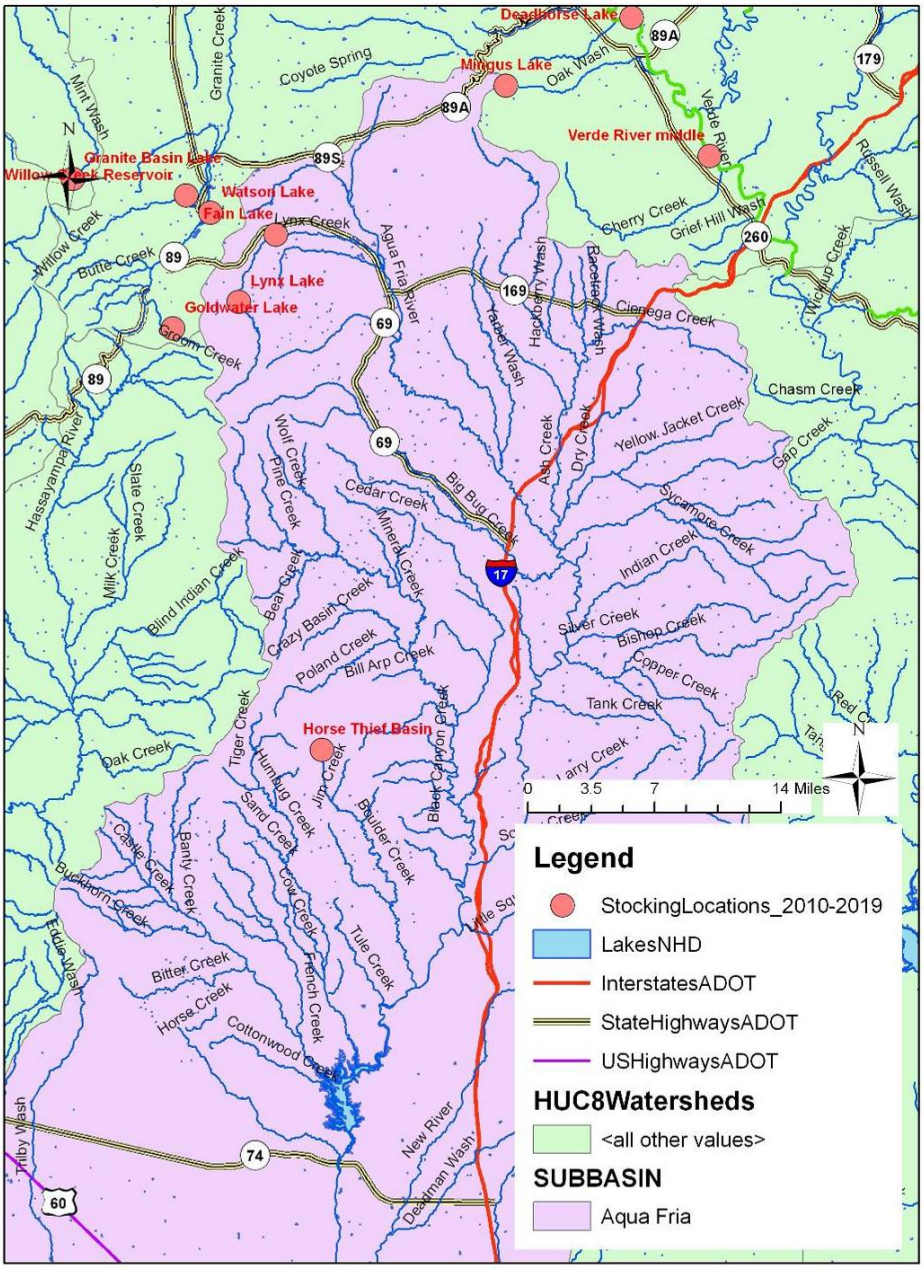

Figure 22. Overview map of the Agua Fria River Watershed and stocking sites.

LYNX CREEK COMPLEX

Physical Geographic Description

Drainage area and elevations

Lynx Creek begins off the northwest slopes of Mt. Davis in the Bradshaw Mountains, at roughly 6,500 feet of elevation, falling to 4,600 feet of elevation at its mouth. The stream bed courses

roughly 6-miles in a northerly path until in hits Lynx Lake. From the base of Lynx Lake Dam, the creek continues north to northeast 4.5 miles to Fain Lake. From the base of Fain Dam the creek continues east another 7.5 miles to its confluence with the Agua Fria River.

Tributaries
A number of small tributaries feed into Lynx Creek, including Smith Ravine, Benjamin Gulch, and Clipper Wash. All of these tributaries are ephemeral drainages.

Lynx Lake
Site Description
Lynx Lake is within the Prescott National Forest (PNF), but the lake itself is owned and operated by the Department (Figure 23). The 55-acre impoundment was created in 1963 and sits about 4-miles south of urban Prescott.

The area around the lake is a Forest Service recreation area with restrooms, campgrounds, picnic areas, a fishing pier, and a launch ramp for boats. Facilities are open all year. A general store and restaurant operated by a concessionaire is located on the north shore of the lake. The Prescott National Forest completed renovations and site improvements in 2002 in response to the ever-increasing popularity of Lynx Lake. Angling access is good because of a trail that contours the entire lakeshore. This trail has been closed on the east-side of the lake a minimum of December 1st to June 30th each year to prevent disturbance around a Bald Eagle nest.

Figure 23. Angler at Lynx Lake, July 2008.

Management of Water Body

Lynx Lake is managed primarily as an intensive use, put-and-take trout fishery using catchable sized rainbow, brown, brook, and cutthroat trout cultured at state hatcheries. Prior to stocking by the Department, other warm-water fish species such as common carp, and goldfish were illegally introduced. These species now maintain modest populations but are under-utilized by anglers at Lynx Lake. In April 2003, the Department modified its recent management approach and proposed to add brown trout, brook trout, cutthroat trout, channel catfish, largemouth bass, and crappie to the list of species approved for stocking, to improve the fishery. The crappie species currently present in Lynx is the black crappie. However, conditions at Lynx Lake are better suited for white crappie (Edwards et al. 1982). White crappie are currently present in the Agua Fria Watershed downstream at Lake Pleasant. Newer approved warm water species stockings did not start until 2004, and involve largemouth bass and channel catfish (Table 17 and Table 18).

Surplus trout in smaller age classes may be utilized to provide opportunity for a put-grow-take trout fishery. Trout stockings generally occur twice monthly with catchable fish throughout the year (with breaks in July and August due to water quality constraints). Smaller age classes would be stocked in autumn months to maximize the amount of growth time before water quality conditions become marginal. A secondary fishery is managed for warm water species, including largemouth bass, bluegill, crappie, and channel catfish. The warm water component is managed toward self-sustaining populations, with supplemental stockings of bluegill and channel catfish in spring, summer, and autumn for angler recruitment and retention special events. Summer supplemental stockings of largemouth bass and white crappie may be needed in the future, due to angler pressure or shifts in food webs and prey base. A lake management plan has been developed and contains strategies to achieve management goals (Clark 2004a). This plan will be updated every 2-years in conjunction with the Department's Operational Planning efforts.

Table 17. Stocking history of Lynx Lake.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Black crappie	1992	1992	3	18,000
Bluegill	1992	2006	32	331,954
Brook trout	1964	2009	17	141,633
Brown trout	1971	2005	63	160,002
Cutthroat trout	1972	1972	3	30,000
Largemouth bass	2006	2006	4	4,268
Rainbow trout	1963	2009	1,921	4,874,704
Tadpole	1978	1978	3	6,000
Channel catfish	2004	2008	5	1,831

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Total			2,040	5,533,466

Table 18. Total numbers of fish stocked into Lynx Lake by species and year for the previous ten years.

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Rainbow trout	35,768	29,217	30,416	22,100	21,469	41,595	20,424	18,951	18,873	17,500
Brown trout					8,186	25,433	14,029			
Brook trout									22,498	20,984
Largemouth Bass								1,217		
Bluegill						200		4,727		
Channel catfish						370	325	350	250	536

Lynx Lake was originally stocked in 1963 with catchable sized rainbow trout; however, in subsequent years it was found that due to poor benthos and zooplankton production, the size of the trout caught depended on the size of the trout stocked. The lake until 2003 was managed as a put-and-take cold water fishery supported by stocking as many as 51,000 rainbow trout annually. In 1964, largemouth bass and bluegill were discovered, and these species remained a secondary angler attraction until 2005. Other species such as Yellow bullhead, channel catfish, common carp, goldfish, green sunfish, and golden shiner were illegally introduced prior to subsequent stocking by AGFD (as listed in Table 17) and round out the warm water component of Lynx Lake as of 2008. Crayfish are also present locally in high numbers. Black crappie and golden shiner were plentiful in netting and electrofishing surveys until 2000. Origin and means of golden shiners accessing the lake are unknown. Golden shiner and black crappie have not been collected during survey efforts since that year. The lake was drawn down in 2002 for a complete a re-surfacing of the dam. Subsequently, in 2003 the lake was estimated at 18 feet below the spillway (this was its lowest level in some 25 years).

Past surveys and studies have suggested low levels of nitrogen and phosphorus as well as high levels of copper and zinc limits the primary productivity (Ziebell and Tash 1981). These factors have discouraged past fisheries managers from developing Lynx Lake into anything beyond a put-and-take trout fishery. During summer months, due in part to low primary productivity, dissolved oxygen levels fall to less than zero below a depth of 15-feet. Anoxic conditions deep in the lake combine with warm temperatures at the surface to force the suspension of trout stockings from July through late September. A hypolimnetic aerator was installed at the lake in 1999. This aerator was to pull cold anoxic water from the hypolimnon of the lake, saturate it with

oxygen and return it to the bottom, thereby avoiding mixing. Other aerators mix the layers in a lake thereby getting atmospheric oxygen in contact with water from the bottom. To date, the hypolimnetic aerator has not ameliorated the anoxic conditions during the summer months at Lynx Lake. The system was severely undersized at the onset of the project, and efforts to upgrade it have met with short-term successes only. Over the last 5-years the system has not been used due to mechanical or structural limitations.

Department fisheries personnel with the assistance of Department wildlife managers conducted a 13 month roving creel survey from June 1st 2008 to June 30th, 2009. This study was designed to determine the utilization of stocked fish and angler demographics for Lynx Lake. Outlined below are the key findings from that investigation.

- Rainbow trout were the most highly targeted species at 55%. If anglers listed more than one species, they were categorized as targeting anything. This accounted for 35% of the anglers. Catfish was the next highest at 6%.
- An estimated 13,529 fish were caught and 8,223 harvested. Catch rate overall was 0.17 fish/hr with a harvest rate of 0.10 fish /hr. 33,109 fish (cold and warm water species) were stocked into Lynx during the sampling period. This yields a 25% harvest return, a 41% catch return, and an angler success of 16%.
- 1,579 people were interviewed with a total of 71,281 angler hours or 35,318 angler use days. An angler use day is defined as any portion of a day that an angler is in the act of fishing.
- The Statewide survey of 2001 Arizona Anglers (Pringle 2004) estimated the annual angler use days to be 28,234 and the annual economic value (direct and indirect) of $3,924,526. This effort estimated the total number of angler use days to be 35,318 over the 13 month period. If we take into account the difference in the number of months, there remains a 15% increase in angler use days and an increase of $588,679 annual economic value.
- Average angler satisfaction with their fishing experience was 4.2 on a scale of 1-5.
- Ninety-six percent of anglers were residents of Arizona. 93% of anglers came from Yavapai County (51%) or Maricopa County (42%).

Angler's specifically targeting warm water species only account for about 10% of the anglers. This is likely a little lower than reality. Sampling is not done at night, when some anglers come out to catch catfish. While the number of anglers who do this is not high, they were not surveyed in this effort at all. The effort documented that both rainbow and brook trout were getting caught

during the summer months when they are not stocked. It was previously thought that rainbow trout would not over summer due to the anoxic conditions below the thermocline and the warm surface temperature. Based on these data rainbow trout did over summer in low numbers. During the survey period there were small areas where water quality was sufficient to sustain trout year-round. It is unclear if this occurs every year.

Some of the stocked fish are lost to avian predation, with double-crested cormorants taking the largest number of fish. Data are being collected to quantify the extent of the cormorant predation. Currently Lynx Lake is stocked once a month. While the harvest and catch numbers are not the lowest in the state, the angler success is only 16%. Only one in six anglers catches a fish. An angler has to fish nearly 6 hours to catch one fish. For a put-and-take trout fishery this is very low.

Angler use days were estimated to be 35,318 over the 13 month period. If we take into account the difference in the number of months, and use the same multipliers as the 2001 survey, a 15% increase in angler use days remains, and an increase of $588,679 annual economic value from just under $4 million to over $4.5 million annually. This is likely a low number, since the multiplier likely has increased from 2001 values. A complete summary of this creel survey is available in the appendices.

Proposed Action

The Department proposes to stock largemouth bass, bluegill sunfish, white crappie, rainbow trout, brook trout, brown trout, cutthroat trout and channel catfish for the period covered by this consultation.

Catchable and sub-catchable rainbow trout would be stocked twice monthly except during July and August; numbers of trout stocked may be from 0 to 30,000 fish annually.

When available catchable and sub-catchable brook trout, brown trout and/or cutthroat trout would be stocked multiple times year round; total numbers of trout stocked may be from 0 to 50,000 fish annually.

Catchable bluegill sunfish would be stocked in support of angler recruitment/clinics; numbers of bluegill sunfish stocked may be from 0 to 3,000 fish annually.

Catchable channel catfish would be stocked in support of angler recruitment/clinics; numbers of catfish stocked may be from 0 to 3,000 fish annually.

Largemouth bass (fry/fingerling, sub-catchables, catchables), bluegill sunfish (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), and white crappie (sub-catchables, catchables) may be stocked as needed basis at any time during the year to augment the fishery or recover the fishery from catastrophic events. Numbers of fish stocked for this

purpose will be determined according to stocking guidelines identified in the sport fish stocking protocol. White crappie would be a new species established; numbers and sizes of fish stocked for this purpose will be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution/Connectivity

The lake's main tributary, Lynx Creek, begins off the northwest slopes of Mt. Davis in the Bradshaw Mountains at roughly 6,500 feet of elevation. The stream bed courses roughly 6-miles in a northerly path until in hits Lynx Lake. The portion of Lynx Creek upstream of the lake is ephemeral in nature, typically flowing in response to snow run-off or local thunderstorm events. Two sediment "check-dams" are situated on Lynx Creek immediately upstream from the lake (Figure 24). The two structures are designed to control sedimentation of the lake from the surrounding shallow watershed. The upper dam failed in August of 2001, and excess sediment from behind both dams washed into Lynx Lake. The PNF and the Department dredged and repaired both structures and they are currently functioning properly.

Figure 24. Lower most sediment dam on Lynx Creek just upstream of Lynx Lake, March 2009.

Downstream of Lynx Lake Dam, Lynx Creek continues 4.5-miles until it reaches Fain Lake. Several diversions exist in this stretch; the largest diverts water to meet the 250-acre feet water right of Asphalt Paving Company (APS) in Prescott Valley. This diversion begins roughly one-half mile above Fain Lake and is carried by a canal around Fain Lake to an upper pond on APS property. The water in this pond and two others on the property are used for sand and gravel processing operations. All water is diverted during normal summertime releases from Lynx Lake. The nature and amount of water diverted by other diversions is unknown. Lynx Creek in

this stretch is ephemeral. Run-off from local thunderstorms may reach Fain Lake and downstream up to several times per year, depending on stochastic precipitation events. During normal and above normal snowfall years, some water spills over Lynx Dam and reaches Fain Lake; however, the frequency is highly variable and unknown.

A downstream water right minimum of 250 acre-feet is typically pumped out of Lynx Lake annually. The water is transported through two 8-inch pipes that sit on the spillway and deliver water to a normally dry streambed below the dam. This water is delivered regardless of the amount of spill in a given year. The Department is not required to deliver the 250 acre-feet if the lake level is lower than 15-feet below the spillway. The water delivery must happen between the months of May and August each year.

Lynx Lake spilled in 1999, 2005, 2007, and 2009 as a result of spring runoff. The spillway drops for 60 feet and ends in a small plunge pool. Water flows through Lynx Creek until it reaches a diversion dam (Figure 25) where a portion (depending on flows) is taken from the creek and then flows around Fain Lake into a series of ponds at the Asphalt Paving and Supply (APS) sand and gravel operation. Water that spills from the lake may also be diverted; however, some or all of the water may move downstream in Lynx Creek past Fain Lake and the APS property.

Below Fain Lake, water is diverted from Lynx Creek into a 5-acre pond that is secondarily used to maintain the upper pond that receives Lynx Lake water. These ponds are all used primarily for sand and gravel recovery and processing. Water in Lynx Creek does make it past the diversions on occasion. APS employees stated that “several times catfish have been seen in the streambed dying from desiccation”. Downstream of the lower pond, yet another pond exists to capture as much water as is allowed. Once below the APS operation, water in Lynx Creek released during high flows may reach the confluence of the creek and the Agua Fria River. Department field staff reports that this happens rarely because of the wide sandy highly impacted streambed and the rarity of a precipitation event that could cause such a flow. Once below the APS operation, Lynx Creek flows through ephemeral reaches (Figure 27) and rarely makes it to its confluence with the Agua Fria River.

Figure 25. Diversion dam on Lynx Creek between Lynx Lake and Fain Lake, July 2009.

Fish Movement

Both Lynx Creek and the Agua Fria River are ephemeral/intermittent streams flowing seasonally and during high precipitation events (Corkhill 2002). During periods of deliberate release from the lake, small stocked sport fish could be transported with the water diversion through the set of 8 inch pipes. These pipes provide water through a gas powered water pump when they are delivered outside of normal spilling of the reservoir. The action of passing water through the impellers likely greatly reduces the potential for transport of live adult fish through the pipes. All sizes of stocked sport fish could be washed over the spillway when the lake spills due to high inflows (Figure 26).

Figure 26. Drop from the spillway at Lynx Lake to Lynx Creek, March 2009.

Figure 27. Lynx Creek downstream of the APS lower pond, March 2009.

Community Description

No official surveys have been conducted on Lynx Creek above or below Lynx Lake. This is due to the ephemeral nature of the creek. Visual surveys performed by local Department wildlife managers and Department fisheries personnel have not recorded any fish persisting in the creek for more than a few months.

Department summer interns working out of the Regional Fisheries Program walked the entire stretch of Lynx Creek between Lynx Lake and Fain Lake in July 2009. Only small pools of shallow, fishless water were reported. Regional electrofishing efforts commenced in 2005 at the lake (Table 19). Channel catfish appear to be reproducing because young have been observed at the lake (A. Clark, pers. comm.), although they have not been collected during these recent sampling efforts.

Table 19. Number, relative abundance, relative biomass and catch per unit effort of sampling at Lynx Lake.

June 2005 (electrofishing)						
N= 39	Total Weight= 29,576			Total effort units = 45		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Yellow Bullhead	9.00	9.00	23.08%	0.20	565	1.91%
Common Carp	8.00	8.00	20.51%	0.18	25761	87.10%
Channel Catfish	2.00	2.00	5.13%	0.04	2118	7.16%
Bluegill	5.00	5.00	12.82%	0.11	283	0.96%
Largemouth Bass	14.00	14.00	35.90%	0.31	774	2.62%
Rainbow Trout	1.00	1.00	2.56%	0.02	75	0.25%
May 2007 (electrofishing)						
N= 65	Total Weight= 41,262			Total effort units = 45		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Yellow Bullhead	13.00	13.00	20.00%	0.29	6%	0.00%
Goldfish	2.00	2.00	3.08%	0.04	846	2.05%
Common Carp	25.00	25.00	38.46%	0.56	36952	89.55%
Channel Catfish	2.00	2.00	3.08%	0.04	2316	5.61%
Bluegill	15.00	15.00	23.08%	0.33	720	1.74%
Largemouth Bass	6.00	6.00	9.23%	0.13	234	0.57%
Brook Trout	2.00	2.00	3.08%	0.04	194	0.47%
	65.00			1.44		
September 2009 (electrofishing)- fish under 100mm total length were not weighed or measured.						
N= 173.00	Total Weight= 15,553.8			Total effort units = 45		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Yellow Bullhead	7.00	7.00	4.05%	0.16	6	0.04%
Goldfish	0.00	0.00	0.00%	0.00	0	0.00%
Common Carp	2.00	2.00	1.16%	0.04	3068	19.73%
Channel Catfish	4.00	4.00	2.31%	0.09	6130	39.41%
Bluegill	107.00	65.00	61.85%	2.38	2464	15.84%
Largemouth Bass	31.00	23.00	17.92%	0.69	3134	20.15%
Brook Trout	22.00	6.00	12.72%	0.49	752	4.83%

Total	173.00			3.84		

Non-natives have been recorded at the confluence of Lynx Creek with the Agua Fria River. Non-native fish captured during 1979 – 1995 surveys at this location were green sunfish and fathead minnows. Speckled dace is the only native fish sampled at this location (A. Clark pers. comm.).

Consultation Species or Critical Habitat
There are no aquatic consultation species in the immediate vicinity of Lynx Lake. Breeding bald eagles occur at the lake and are discussed below. Additional consultation species, including Gila Chub and spikedace, known from downstream in the Agua Fria River, Gila topminnow and desert pupfish in isolated tributaries along with Northern Mexican gartersnakes will be discussed in the Agua Fria River Complex Analysis section.

Bald Eagle
Lynx Breeding Area is located approximately 0.5 miles from Lynx Lake on private property and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2001 and were last observed in 2010 with young eaglets present. Nest watchers were able to observe the prey types and in some cases species that were delivered to the nest by the eagles. In 2006 birds accounted for 17.1%, fish 14.3%, mammals 14.3%, carrion 5.7%, and unknown 48.6%. No prey items could further be identified. Lynx Breeding Area productivity data shows that the nest has been successful in 2007, 2008, and 2009 (Jacobson et al. 2006, 2007; McCarty and Jacobson 2008, 2009).

Potential Impacts

Nesting bald eagles are known to occur in the vicinity of this stocking site all year. Human disturbance and monofilament line/fishing tackle disposal are issues for this site. Lynx Lake does have monofilament bins present.

Non-breeding bald eagles can occur within the vicinity of the stocking site and may be present at any time of the year. The amount of human disturbance at this site may result in effects to roosting or foraging that may affect the eagles' use of the site. Non-breeding eagles normally move between available sites so the reduction in use of a particular stocking site may not be significant.

Fain Lake
Site Description
Fain Lake is a 2-acre impoundment is owned by the Town of Prescott Valley (Town) and managed as a city park (Figure 28). In 1996 the Fain family donated the lake to the Town but retained the upstream water rights. These water rights are now owned by the Asphalt Supply

Company. A fishing pier was installed in 1998 using State Lake Improvement Funds to improve angler access. No boats are allowed at Fain Lake.

Figure 28. Fain Park, July 2002.

Management of water body

The Department currently operates the lake's fishery under a Cooperative Agreement with the Town. Fain Lake is located approximately 5-miles downstream of Lynx Lake. In 2003, Fain Lake was approved for stocking of rainbow trout, brown trout, cutthroat trout, brook trout, largemouth bass, channel catfish, bluegill, and white crappie. However, not all of these species were stocked into the lake (Table 20 and Table 21). Rainbow trout are stocked annually with about 16,000 catchable sized fish. State hatcheries stock Fain Lake every month, except July and August. Fain Lake's water quality conditions are similar to Lynx Lake, making white crappie a logical choice for that fishery as well.

Data from the latest Department mail-out angler survey estimates that 12,589 angler use days were expended at Fain Lake in 2001, and most (8,497) were seeking trout. The remaining 4,092 angler use days were attributed to anglers seeking warm water species, such as largemouth bass or channel catfish. A fountain type aerator was installed at Fain Lake in 1998, and during most

years, the aerator is able to maintain adequate oxygen levels to sustain trout stockings throughout the summer.

As with Lynx Lake, many of the stocked fish are lost to avian predation, with double-crested cormorants taking the largest number of fish. Fain is small enough that anglers or general visitors can visually observe double-crested cormorant predation. Numerous anglers complain of the lack of trout several days after a stocking and claim they have witnessed cormorants eating multiple trout. Data are being collected to quantify the extent of the cormorant predation.

Table 20. Stocking history of Fain Lake

Species	**First Year**	**Last Year**	**Num. of Stockings**	**Num. Stocked**
Rainbow trout	1997	2008	183	140,242
Channel catfish	1997	2008	7	3,060
Brook trout	2007	2008	2	13,492
Bluegill	2007	2007	1	1,000
Total			193	157,794

Table 21. Total numbers of fish stocked into Fain Lake by species and year.

Species	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Rainbow trout	9,355	10,800	11,500	9,851	14,327	23,842	14,001	15,851	19,882	13,630
Brown trout										
Brook trout									3,000	10,492
Largemouth Bass										
Bluegill									1,000	
Channel catfish						260	150	250	250	150

Similar to Lynx Lake, Fain Lake is managed primarily as an intensive use, put-and-take trout fishery using catchable sized rainbow, brown, brook, and cutthroat trout cultured at state hatcheries. Surplus trout in smaller age classes may be utilized to provide a small opportunity for a put-and-grow type concept. Trout stockings occur twice monthly annually with breaks in July and August due to water quality constraints. Smaller age classes would be stocked in autumn months to maximize the amount of growth time before water quality conditions become marginal. A secondary fishery is managed for warm water species, including largemouth bass, bluegill, white crappie, and channel catfish. The warm water component is managed to develop a self-sustaining populations with supplemental stockings of bluegill and channel catfish in spring,

summer, and autumn for angler recruitment and retention special events. Summer month supplemental stockings of largemouth bass and white crappie may be needed due to angler pressure or shifts in food webs and prey base.

Proposed Action

The Department proposes to stock largemouth bass, bluegill sunfish, white crappie, rainbow trout, brook trout, brown trout, cutthroat trout and channel catfish for the period covered by this consultation.

Catchable and sub-catchable rainbow trout would be stocked twice monthly year round except during July to August; numbers of trout stocked may be from 0 to 30,000 fish annually.

When available catchable and sub-catchable brook trout, brown trout and/or cutthroat trout would be stocked multiple times year round; total numbers of trout stocked may be from 0 to 25,000 fish annually.

Catchable bluegill sunfish would be stocked in support of angler recruitment/clinics; numbers of bluegill sunfish stocked may be from 0 to 3,000 fish annually.

Catchable channel catfish would be stocked in support of angler recruitment/clinics; numbers of catfish stocked may be from 0 to 3,000 fish annually.

Largemouth bass (fry/fingerling, sub-catchables, catchables), bluegill sunfish (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), and white crappie (sub-catchables, catchables) may be stocked as needed basis at any time during the year to augment the fishery or recover the fishery from catastrophic events. Numbers of fish stocked for this purpose will be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution/Connectivity

Flash flood events, typically in late summer, can transport and deposit large amounts of sediment into the lake. The lake has been dredged several times by the Town in the inflow areas, but extensive sedimentation remains in the main basin of the lake. The slopes of the surrounding hills as well as a narrowing canyon leading into Fain Lake make it vulnerable to flooding. Prior to the Fain family donation of the lake to the Town in the early 1990s, the lake was dredged every 6-8 years.

Historically, water from Lynx Lake was released bi-annually to meet a downstream water right and to maintain Fain Lake. Water is still released bi-annually from Lynx Lake, but due to the creation of a ditch to transport this water around Fain Lake, it no longer reaches Fain Lake under normal conditions. Water does spill over the dam at Lynx Lake periodically, and as a result fish

have most likely been transported downstream to Fain Lake. Trout were documented by anglers in 1997 before the Department started stocking Fain Lake.

Fish Movement

Overflow occurs by water topping the dam and dropping an estimated 60-foot onto bedrock and boulders (Figure 29). The water, once through this narrow bedrock canyon, opens to wide sandy alluvium and enters the APS property. Water is diverted from Lynx Creek into a 5-acre pond that is secondarily used to maintain the upper pond that receives Lynx Lake water (Figure 30). These ponds are all used primarily for sand and gravel recovery and processing. Water in Lynx Creek does make it past the diversions on occasion. Conversations with employees at APS revealed claims that “several times catfish have been seen in the streambed dying from desiccation”. Downstream of the lower pond, yet another pond exists to capture as much water as is allowed. Once below APS’s operation, water in Lynx Creek rarely makes it to its confluence with the Agua Fria River (Figure 31). From this point, the first viable habitat that could hold fishes occurs roughly 13-miles downstream.

Figure 29. Dam at Fain Lake.

Figure 30. Middle Pond on APS property.

Figure 31. Confluence of Clipper Wash, Lynx Creek and Agua Fria river looking west from road crossing to the sub-division of Quail Run, Prescott Valley, March 2009.

Community Description

No surveys have been implemented at Fain Lake due to its use as an intensively stocked and put-and-take trout fishery. Common species caught by anglers are rainbow trout, largemouth bass, bluegill, and channel catfish. Yellow bullhead and green sunfish have been found historically. Because of Fain Lake's connection to Lynx Lake (downstream from it), it has been assumed species that are found at Lynx Lake can also be found in Fain Lake. Native species of fish are not known from anywhere in the Lynx Creek area upstream from the Agua Fria confluence. Longfin dace are known from the Agua Fria River downstream of the mouth of Lynx Creek and are addressed in the Agua Fria Complex analysis.

Consultation Species or Critical Habitat

There are no aquatic consultation species in the immediate vicinity of Lynx Lake. Potential impacts to bald eagle are discussed below. Additional consultation species, including Gila Chub and spikedace, found downstream in the Agua Fria River, Gila topminnow and desert pupfish in isolated tributaries along with Northern Mexican gartersnakes would be discussed in the Agua Fria River Complex Analysis section.

Bald Eagle

Lynx Breeding Area is located approximately 4.2 miles from Fain Lake and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2001 and were last observed in May 2010. Nest watchers were able to observe the prey types and in some cases species that were delivered to the nest by the eagles. In 2006 birds accounted for 17.1%, fish 14.3%, mammals 14.3%, carrion 5.7%, and unknown 48.6%. No prey items could further be identified. Lynx Breeding Area productivity data shows that the nest has been successful in 2007, 2008, and 2009 (Jacobson et al. 2006, 2007; McCarty and Jacobson 2008, 2009).

Potential Impacts

Nesting bald eagles are known to occur in the vicinity of this stocking site all year. Human disturbance and monofilament line/fishing tackle disposal are issues for this site. Fain Lake does have monofilament bins present.

Non-breeding bald eagles can occur within the vicinity of the stocking site and may be present at any time of the year. The amount of human disturbance at this site may result in effects to roosting or foraging that may affect the eagles' use of the site. Non-breeding eagles normally move between available sites so the reduction in use of a particular stocking site may not be significant.

BLACK CANYON CREEK COMPLEX

Physical Geographic Description

Drainage area and elevations

Black Canyon Creek and its tributaries drain a surface area of 244 square miles (refer back to Figure 22). Elevations range from a high over 6600 feet near Horsethief Basin, down to lower than 2000 feet at the confluence with the Agua Fria River.

Tributaries

The larger tributary drainages of Black Canyon Creek are Poland Creek, Crazy Basin Creek, Soap Creek, Rock Creek, Sycamore Creek, Poison Creek, Castle Creek, Bill Arp Creek, Arrastre Creek, Bumble Creek and its tributaries, and Turkey Creek and its tributaries. The only known documented perennial waters within these drainages occur within Castle Creek, as well as a few known localized springs within Black Canyon Creek and a tributary to Turkey Creek. There are no surface water or precipitation gauges on Black Canyon Creek or its tributaries. The Black Canyon Complex contains one stocking location (Horsethief Basin Lake).

Horsethief Basin Lake

Site Description

Horsethief Basin Lake was constructed in 1936 by the City of Phoenix to provide water resources to then-proposed Horsethief Basin Recreation Area. The lake is approximately a 5-acre impoundment with a storage capacity of 64 acre-feet of water and a maximum depth of 20 feet (Figure 32). It is located in the Bradshaw Mountains approximately 65 miles northwest of the Phoenix Metropolitan area and 3.5 miles southeast of the community of Crown King. It sits at an elevation of 6080 feet atop a small watershed connected to a tributary named Poland Creek. The watershed area for Horsethief Basin Lake is 0.76 square miles. Land ownership of Horsethief Basin Lake is comprised of 100% PNF lands. Poland Creek is intermittent/ephemeral for about 9 miles where it reaches Turkey Creek to form Black Canyon Creek, a 16-mile long tributary to the Agua Fria River. It is unknown if the lake ever spills, but the small watershed area relative to the size of the lake would suggest spill to be extremely unlikely.

Management of Water Body

Fisheries management practices for the lake were relatively passive from 1960 to 1988, mostly involving water quality examinations and intermittent sport fish stockings. Fish management strategies for Horsethief Basin Lake were more active from 1988 to 1998. The lake was modestly stocked with channel catfish six times over the ten-year period and two additional species, redear sunfish and fathead minnows were stocked in 1988 (Table 22). Water quality measurements were taken in 1988, 1991, 1993, and 1996-98 to determine oxygen/temperature profiles. The surveys from 1988 to 1993 revealed extreme levels of temperature stratification and less than

adequate dissolved oxygen levels (< 4.0 ppm) for fish; survival below two meters in depth were observed. In 1994, the Forest Service purchased a lake aeration system to remedy the poor water quality. A put-and-take catfish program ran, post aeration system from 1994-1998.

Figure 32. Horsethief Basin Lake

Fisheries management since 1999 has consisted of managing for largemouth bass and redear sunfish, in addition to the put-and-take stocking management for channel catfish of 300 catchables per year (during the summer to augment the non-reproducing population). The aeration system has not been operational for since at least 2005 and poor water quality has since returned to the lake. No stockings have occurred in this lake since 2003. In 2006 and 2009, water quality surveys were again conducted with dissolved oxygen levels varied from a marginal 4-5 ppm at the surface, to unacceptable levels for fish below two meters with readings of less than 2 ppm.

Table 22. Fish Species stocking summary for Horsethief Basin Lake, 1954-2003.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Bluegill	1954	1954	1	17,000
Channel catfish	1965	2003	18	10,228

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Fathead minnow	1998	1998	1	1,500
Largemouth bass	1954	1960	2	7,000
Redear sunfish	1988	1988	1	300
Total			22	36,028

In addition to the fish surveys, voluntary angler surveys have been conducted. A volunteer angler survey box was placed at the lake during the months of June - August in 1992, 1997, and 1998 to determine angler pressure and success rates. The creel form was designed to determine and establish baseline data for angler effort, success, harvest, demographics, and preferences. The results from these surveys indicated that catch and harvest rates improved from 1992 to 1998. Unfortunately, only ten survey cards were collected in 1997, rendering that data somewhat suspect. However, comparisons of the 1992 and 1998 angler survey data show a significant increase in angler harvest rates of 167%, from .05 to .35. Angler catch rates did improve somewhat for channel catfish between 1992 and 1998; however, only six catfish were reported caught during the angler survey in 1997, and 15 in 1998 survey. There were no reports of catfish caught during the 1992 angler survey. It is possible that most of the channel catfish had been harvested before or after the voluntary angler surveys, or during the surveys and not reported; regardless, these data suggests a less than anticipated return for the stocking investment. The Department also initiated two statewide angler use surveys in 2001 and 2006. The results from these surveys indicate an increase in angler use days on Horsethief Basin Lake from 163 in 2001 to 2220 in 2006.

Proposed Action

The primary objective is to stock largemouth bass, channel catfish, and bluegill sunfish for the period covered by this consultation. Largemouth bass (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), and bluegill sunfish (sub-catchables, catchables) may be stocked as needed basis at any time during the year to augment existing populations or recover the fishery following catastrophic events. Numbers of fish stocked for this purpose will be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution/Connectivity

The Horsethief Basin Lake inflow sits on top of a small watershed that connects to the Poland Creek drainage, and is confined to inflow of only a 0.76 square mile watershed. The lake has not been documented to spill. During water quality surveys the lake has never been documented to rise over 7.2 meters in depth. For these reasons the Department determined the action is confined to only the lake.

The outflow of the lake, if it were to occur, drains into Horsethief Canyon. Horsethief Canyon travels north 8 miles where it connects with Poland Creek. Poland Creek drains approximately 11 miles where it connects to Black Canyon Creek. Other tributary drainages connected to Poland Creek include Crazy Basin Creek and its tributary. These creeks and canyons are ephemeral in nature.

Black Canyon Creek traverses 19 miles where it connects to Agua Fria River approximately 15 miles upstream from the northern arm of Lake Pleasant within the town of Black Canyon City. Other tributary drainages of Black Canyon Creek are Soap Creek, Rock Creek, Sycamore Creek, Poison Creek, Castle Creek, Bill Arp Creek, Arrastre Creek, Bumble Creek and its tributaries, and Turkey creek and its tributaries. The only known documented perennial waters within these drainages occur within Castle Creek, as well as a few known localized springs within Black Canyon Creek and a tributary to Turkey Creek.

Fish Movement

Black Canyon Creek and its tributaries are known to be intermittent and ephemeral in nature (ADWR 2007). The ephemeral and intermittent streams within the Agua Fria and its tributaries are the biggest inhibitor to fish movement within the drainage. It is undocumented if fish barriers exist within this drainage. If fish were to leave Horsethief Basin Lake they would have the ability to move down Horsethief Canyon to Poland Creek, then to Black Canyon Creek, and to the Aqua Fria River, which empties into Lake Pleasant. All of the species recommended for stocking have been collected in Lake Pleasant. However, these species have not been collected in Black Canyon Creek or its tributaries (LCRB Aquatic GAP database). This suggests stocked fish are not washing out of Horsethief Basin Lake and if they are that the ephemeral nature of the drainages downstream of the lake do not have the proper habitat to support long-term survival of these species.

Community Description

Fish population surveys were conducted in the summers of 1988, 91-93, 1996, 2006, and 2009 to document fish species presence and relative abundance. Table 23 compares the surveys conducted in a comparable fashion over time. The most recent survey at Horsethief Basin Lake once again documented the presence of largemouth bass, redear sunfish, and channel catfish. In addition, this survey indicated a healthy and abundant reproducing population of redear sunfish. The Largemouth population was in poor condition, seemingly due to lack of prey base. The channel catfish population in the lake was the lowest, most likely due to the poor water quality in the deeper portion of the lake, seriously inhibiting the habitat preference of a bottom dweller.

Table 23. Horsethief Basin Lake Gillnet/Electrofishing survey results by species..

Year	Species	Number	Rel. Abun. (%)	CPUE total effort (EFU)	CPUE total effort (NNU)

2009	Largemouth Bass	17	20.7	8.5	3.2
	Redear Sunfish	64	78	53.9	2.8
	Channel Catfish	1	1.2	0.9	0.0
	TOTAL	82	100	63.3	6.0
2006	Largemouth Bass	35	39	33.9	0
	Redear Sunfish	55	60	51.4	0.8
	Channel Catfish	1	1	1.0	0
	TOTAL	91	100	86.4	0.8
1996	Largemouth Bass	23	82		7.4
	Redear Sunfish	4	14		1.3
	Channel Catfish	1	4		.4
	TOTAL	28	100		9.1
1992	Largemouth Bass	34	67	9.5	3.3
	Redear Sunfish	15	29	5.7	.7
	Channel Catfish	2	4	.5	.2
	TOTAL	51	100	15.7	4.2

Below Horsethief Basin Lake, within the Black Canyon watershed, the presence of the following aquatic species has been documented: Gila topminnow, lowland leopard frog, longfin dace, red shiner, fathead minnow, and green sunfish (Kansas GAP 2009; HDMS 2009). Lowland leopard frogs are documented in most of the riparian sections throughout the Black Canyon watershed and its tributaries, with the closest know location is within 12 miles of the stocking location (HDMS 2009).

Gila topminnows were known to historically to occupy Castle Creek in 1987 and 1989. These topminnows were hypothesized to have washed out of Bench Well, a stocked site in 1983 (Kansas GAP 2009). Gila topminnows were also documented post-stocking in an unnamed spring near Cedar Creek in 1985 (Kansas GAP 2009). However, in the late 1980s and early 1990s, massive flooding scoured the Bradshaw Mountains. Since these floods, all of the Gila topminnows have disappeared from this drainage. Gila topminnows are currently considered extirpated from all waters within the Black Canyon Creek drainage.

Longfin dace are documented to occupy Castle Creek and Black Canyon Creek near the confluence with Castle Creek (Kansas GAP 2009), more than 15 miles downstream from Horsethief Basin Lake.

Red shiner, fathead minnow, and green sunfish, all non-native, are documented in Black Canyon Creek near the confluence with Castle Creek (Kansas GAP 2009). None of these fish are present in Horsethief Basin Lake, which is more than 15 miles upstream from the collection site. These fish are hypothesized to be invading Black Canyon Creek from the Agua Fria River during times of higher flows.

Consultation Species or Critical Habitat

The consultation species include Gila chub, spikedace, Gila topminnow, desert pupfish, and Northern Mexican gartersnakes. These species will be discussed in the Agua Fria River Complex Analysis section.

AGUA FRIA RIVER SUB-WATERSHED ANALYSIS

Water Distribution and Connectivity, fish movement, and aquatic community descriptions have been discussed for Lynx Lake and Fain Lake, down to the confluence of Lynx Creek and the Agua Fria River, and for Horsethief Basin Lake down to the Confluence of Black Canyon Creek and the Agua Fria River. Downstream connectivity the Agua Fria River and its connected tributaries would be discussed in this analysis along with the potential impacts to consultation species in the Agua Fria Complex.

Water Distribution/Connectivity

The Agua Fria River flows north to south and empties into Lake Pleasant and drains approximately 2,300 square miles into the central part of Arizona. The northern half of the basin is in the Central Highlands physiographic province, and the southern half is in the Basin and Range province. Connected tributaries to the Agua Fria river upstream of Lake Pleasant include, Black Canyon Creek, Slate Creek, Boulder Creek, Squaw Creek, Little Squaw Creek, Tule Creek, Big Bug Creek, Silver Creek, Sycamore Creek, Larry Canyon, Lousy Canyon, Tank Creek, Bishop Creek, Badger Springs Wash, Indian Creek, Lynx Creek, Yarber Wash, Chaparral-Gulch Arroyo, Coyote Wash, Clipper Wash, and Yellow Jacket Creek. Perennial streams in this basin include the Agua Fria River, Ash Creek, Sycamore Creek, Indian Creek, Silver Creek, a small stretch of Humbug Creek, Yellow Jacket Creek, and Grapevine Creek; all of these perennial streams have intermittent reaches (ADWR 2007). The rest of the streams are considered ephemeral.

Fish Movement

The ephemeral streams within the Agua Fria and its tributaries are the biggest inhibitor to fish movement within the drainage. The United States Geological Survey have constructed and maintains three surface water gauges on the Aqua Fria River; one near Humbolt (Figure 33), one near Mayer (Figure 34), and one near Rock Springs (Figure 35). The Rock Springs gauge provides solid data supporting the ephemeral nature of the drainage with monthly mean discharges of 0.00 cubic feet per second (cfs) annually since 2000 (Table 24). The other two

gauges also provide data supporting annual dry spells with monthly means of less than 1 cfs. Big Bug, Indian and Little Sycamore creeks are intermittent and often consist of isolated pools during dry times of year; there are no documented barriers to offer protection from nonnative fish species in these systems. However, no known invasion of non-native fish have occurred in these drainages, indicating some type of geologic characteristic is preventing their upstream movement in to occupied habitats (Kansas GAP 2009). Grapevine Creek, a tributary to Big Bug creek has perennial flows for over 1 mile of stream. Flows become intermittent beyond this point for approximately 0.6 miles and then the stream is dry for over three miles to the confluence of Big Bug creek. Lousy Canyon and Larry Creek are unique systems, in that they are at the top of relatively small basins. They are very well isolated from the mainstem Agua Fria River as evidenced by the fact they were fishless before being stocked with endangered fishes and there are documented barriers to fish movement. Other higher order tributaries within the drainage are ephemeral in nature and thought to be isolated from the mainstem Agua Fria River through distance of ephemeral channel and connection to one of these dry creeks listed above.

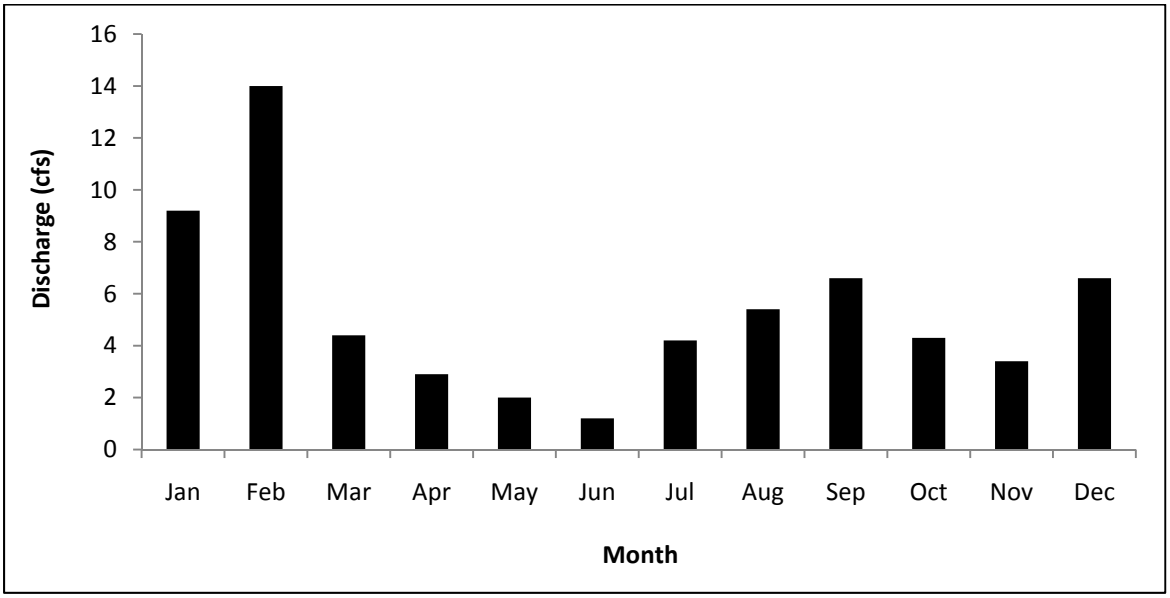

Figure 33. Mean monthly discharge for the USGS site at Humbolt, AZ for the period Jan 1, 2000 to September 30, 2009.

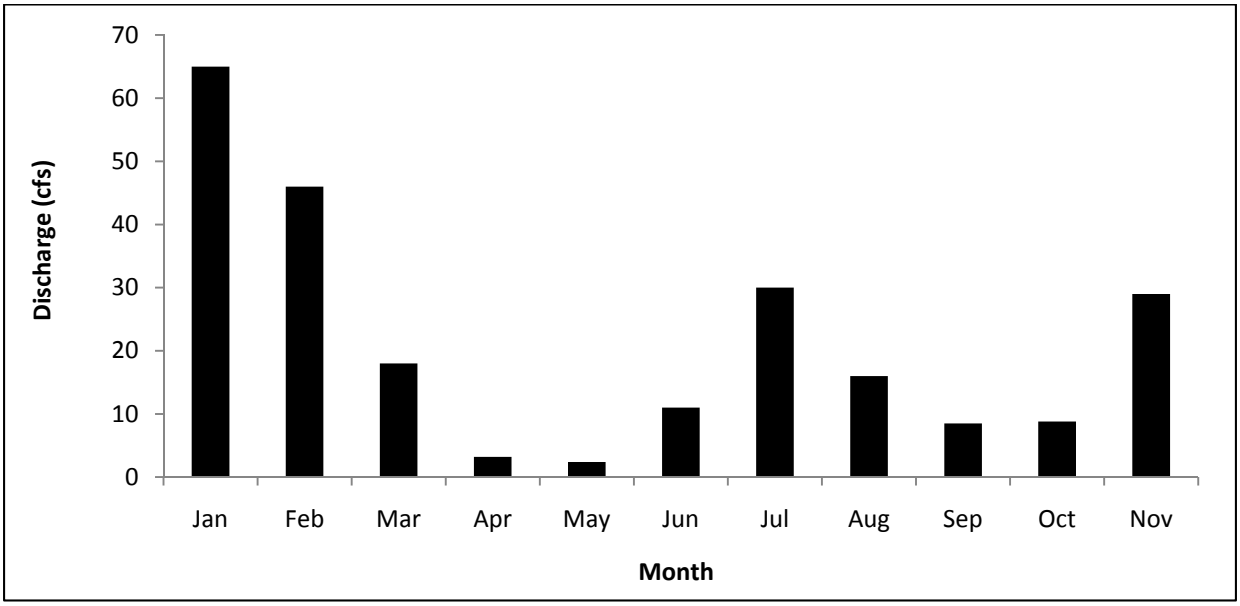

Figure 34. Mean monthly discharge for the USGS site at Mayer, AZ for the period Jan 1, 1940 to September 30, 2008.

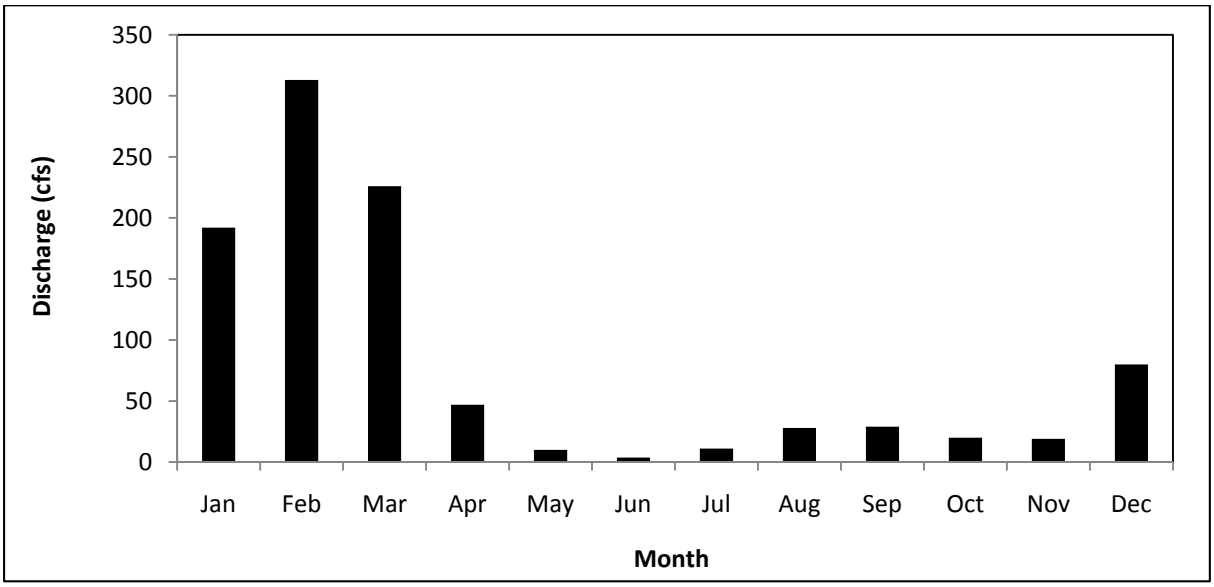

Figure 35. Mean monthly discharge for the USGS site at Rock Springs, AZ for the period February 1, 1970 to September 30, 2008.

Table 24. Mean monthly discharge for the USGS gage at Rock Springs, AZ for the period from January 1, 2000 to September 30, 2008.

YEAR	Month											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2000	1.0	0.8	13.6	2.7	0.3	11.5	0.8	6.5	2.5	136.5	18.2	2.2
2001	15.7	59.8	144.5	11.4	1.3	0.1	0.2	5.8	0.0	0.0	0.0	0.0
2002	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	99.9	0.3	0.1	0.0
2003	0.0	135.3	145.6	4.5	0.3	0.0	0.0	38.1	4.3	0.7	0.0	0.2
2004	0.2	0.2	2.9	4.7	0.0	0.0	8.2	5.3	10.4	4.8	73.8	546.8
2005	842.8	1650.0	180.1	47.6	16.8	2.1	20.4	76.8	6.3	9.7	8.4	2.1
2006	3.0	3.7	7.1	4.2	2.1	0.4	22.1	50.8	21.0	0.7	0.5	0.8
2007	0.9	1.0	0.7	0.2	0.0	0.0	27.6	12.2	0.3	0.0	0.5	157.0
2008	498.6	225.8	27.6	2.8	3.6	0.8	11.2	5.2	3.6			
Mean	151.4	230.7	58.0	8.7	2.7	1.7	10.1	22.3	16.5	19.1	12.7	88.6

In addition to the ephemeral nature of the Agua Fria watershed, Arizona's diverse topography and geology created canyon-bound reaches where natural barrier falls developed along stream courses or man-made structures were built (Table 25). Natural barriers are known to be present on Silver Creek and Sycamore Creek. There is also a man-made fish barrier in Tule Creek above Lake Pleasant that was developed to secure populations of Gila topminnow from invasion by nonnative fish. Upstream of these barriers are nonnative free (Kansas GAP), with the exception of Sycamore Creek, which contains a natural, reproducing population of rainbow trout in its headwaters (Gill 2006b) that is a remnant population established in 1942 from a single stocking of 2000 rainbow trout. These barriers inhibit the movement of fish upstream. Below these barriers, or the lower most barriers on these streams, nonnative fish populations exist (Kansas GAP).

Table 25. Known barrier locations in the Agua Fria Drainage.

Stream	Barrier Type	Location	Comments
Silver Creek	Natural	Narrow Gorge	1-2 meter drop
Agua Fria River	Natural	Below Badger Springs	Only during low flow
Sycamore Creek	Natural	Double T water fall near Double T ranch	3-4 meter drop
Sycamore Creek	Natural	Middle Box	1-2 meter drop
Sycamore Creek	Natural	Rock Bottom Box	2-3 meter drop
Tule Creek	Man Made	¼ mile upstream from the confluence	None

Community Description

The presence of the following species has been documented from the Agua Fria River watershed including its tributaries upstream of Lake Pleasant: northern Mexican gartersnakes, lowland leopard frog, longfin dace, yellow bullhead, desert sucker, common carp, red shiner, desert pupfish, mosquitofish, Gila chub, channel catfish, green sunfish, spikedace, rainbow trout, fathead minnow, sailfin molly, Gila topminnow, and speckled dace (Kansas GAP 2009; Holycross et al. 2006; HDMS). These records excluded accounts from the Black Canyon Creek Drainage and the Agua Fria and its tributaries upstream of the Ash Creek Confluence, which have already been addressed previously in the stocking site information.

Holycross et al (2006) surveyed the Agua Fria for northern Mexican and narrow-headed gartersnakes and found green sunfish, fathead minnow, common carp, red shiner, brown bullhead, and mosquitofish in the main river channel, and fathead minnow and green sunfish in Sycamore Creek near the Forest Service cabin, but did not document any stocked species. Likewise, the Department surveyed Sycamore Creek in the early nineties, and in 2001, 2005, 2008, and 2009, and did not find any of the stocked species, although rainbow trout from that 1942 stocking event have been found in Sycamore Creek and in the Agua Fria River at the mouth of Sycamore Creek in the past.

Northern Mexican gartersnakes were historically observed from the Agua Fria Watershed at Table Mesa Road, Bloody Basin Road, and at the confluence with Big Bug creek (Holycross et al. 2006). Based on surveys as reported in Holycross et al. (2006), and from additional surveys and requests for information, it appears this species may be extirpated from the Agua Fria drainage (see analysis below).

Lowland leopard frogs are found in most of the riparian sections throughout the Agua Fria River and its tributaries (HDMS 2009).

Longfin dace and desert sucker have similar distribution in the Agua Fria drainage and have been documented in most of the riparian sections throughout the Agua Fria River, Tule creek, Badger Springs Wash, Indian Creek, Silver Creek, Big Bug Creek, Ash creek, Sycamore creek, Little Ash creek, Little Sycamore Creek, Dry creek, Yellow Jacket Creek, and Cienega Creek (Kansas GAP 2009).

Yellow bullhead, channel catfish, red shiner, mosquitofish, and common carp have only been documented in a few localities between Rock Springs to Lake Pleasant in the Agua Fria mainstem. Mosquitofish were also known to occupy Mud Springs Tank, which is located above Larry Creek (Kansas GAP 2009).

Grapevine Creek was historically fishless up until November 2009 when Gila trout were stocked into the upper perennial section. Big Bug creek is also historically fishless presumably because it is intermittent during summer months and temperatures become too hot to support trout (J. Carter, Pers. Com.).

Desert pupfish occupy three streams in the drainage, Tule Creek, Larry Creek, and Lousy Canyon (Kansas GAP 2009).

Gila chub occupy six tributaries of the Agua Fria Drainage. These are Larry Creek, Lousy Creek, Silver Creek, Indian Creek, Sycamore Creek, and Little Sycamore Creek. All six of these streams have critical habitat associated with the occupied sites (Kansas GAP 2009).

Green sunfish and fathead minnow are also widely distributed throughout the Agua Fria Drainage. They have been documented in the mainstem Agua Fria from Lake Pleasant to Rock Springs, near Badger Springs Wash, in Silver Creek, Sycamore Creek, Little Ash creek, Dry creek, and Yellow Jacket Creek. Fathead minnows also occupy Cienega Creek (Kansas GAP 2009).

Rainbow trout are located only in the upper sections of Sycamore Creek (Kansas GAP 2009).

Sailfin molly has only been documented around Rock Springs in the Agua Fria mainstem (Kansas GAP).

Gila topminnows were stocked throughout the 1980s and early 1990s in many locations throughout this drainage. Many of these stockings failed due to numerous variables, including lack of sustainable water, grazing, and flooding events. Gila topminnow currently occupy Larry Creek, Lousy Creek, and Tule creek (Kansas GAP 2009). All other stocked sites within this drainage are considered extirpated.

Speckled dace occupy Ash Creek, Sycamore Creek, Little Ash Creek, Little Sycamore Creek, and Dry Creek (Kansas GAP 2009).

Consultation Species and/or Critical Habitat

Potential impacts from the proposed action to candidate and listed species are described below. Please refer to Chapter 4 for a detailed description of the nature of the impacts (which may include predation, competition for space and food, and hybridization etc.).Subsequent responses (resulting from the frequency, magnitude and duration of the impacts) between proposed stocked and candidate and listed species, and any site or complex factors that provide context for determining the meaningfulness of the impacts, are discussed below. Impacts from the proposed action resulting from angler related recreation and/or potential introduction of disease, pathogen or invasive species are evaluated at a broad scale for the entire action area and are described in

Chapter 4. If potential impacts specific to a stocking site or complex have been identified they are discussed below.

Northern Mexican gartersnakes are analyzed in this complex and downstream discussion, rather at the individual stocking sites due to the movement potential into the stocked area and fish movement potential up or downstream into areas where the snakes may occur.

Gila Chub

Suitable and occupied habitat for the Gila chub occurs in six tributaries of the Agua Fria River. These are Silver Creek, Sycamore Creek, Little Sycamore Creek, Indian Creek, Lousy Canyon, and Larry Canyon. All six of these streams have critical habitat associated with the occupied sites. The closest occupied habitat to Horsethief Basin Lake occurs at Larry Canyon approximately 35 stream miles from the stocking site and the next closest being Indian Creek, which is 45 miles from the stocking site. Lousy and Larry Canyons and Indian Creek are also designated critical habitat. Suitable habitat does not exist at Horsethief Basin Lake.

Potential Impacts

Due to the ephemeral and intermittent nature of the watershed and natural fish barriers, it is not anticipated that stocked species of fish would likely come into contact with individuals of Gila chub, but if so only on a rare basis following large scale flooding events. Populations of green sunfish, bullfrog, crayfish, and mosquitofish occur in downstream reaches of the Agua Fria River and may affect the ability of Gila chub displaced from habitats above the fish barriers in Sycamore and Silver creeks to persist in the stream and river below these barriers. The addition of piscivorous sport fish species, particularly channel catfish, even briefly, may result in additional predation that could affect the short-term persistence of these Gila chub populations. It is unclear if this potential effect is meaningful or reasonably certain to occur.

Gila trout

Gila trout were stocked into fishless Grapevine creek in November, 2009. Grapevine creek provides over 1 mile of habitat, and the Gila trout population counts towards recovery of the species in the San Francisco-Gila River recovery unit. Subsequent stocking may occur over the course of the next five to ten years. Because Gila trout are a federal threatened species, AGFD has the ability under the 4(d) rule of the Endangered Species Act to regulate take by allowing limited utilization of reestablished populations as a sport fisheries. Grapevine Creek is currently closed to angling while the population becomes established; however, the potential of the Gila trout population in Grapevine Creek to open to angling, once established may be considered in the future if the population is large enough to sustain limited catch-and-release angling pressure.

Potential Impacts

It is unlikely that Gila trout in Grapevine creek would move downstream into Big Bug creek or further into the Agua Fria since there is a three mile "dry barrier" upstream from the confluence with Big Bug Creek. If a trout did move downstream in an extreme precipitation and flow event, it would not persist in either Big Bug Creek or the Agua Fria due to temperatures above critical tolerance levels and lack of habitat (J. Carter, Pers. Com.). Prior to the stocking in November 2009, Grapevine creek was fishless, and Big Bug Creek is currently fishless indicating that fishes present in the Aqua Fria have not been successful at moving into and occupying Big Bug Creek. Consequently, if sport fish stocked in either Lynx or Fain lakes escape and move downstream into the Agua Fria, it is not expected that they would move upstream into Big Bug Creek or Grapevine Creek.

Desert Pupfish

Desert pupfish occupy three streams in the Agua Fria Watershed above Lake Pleasant; Tule Creek, Larry Creek, and Lousy Canyon; no critical habitat was designated for desert pupfish in the Agua Fria Watershed. Desert pupfish were stocked into Tule creek on September 19, 2007 and augmented again on October 15, 2009. To date this population has not established itself. Desert pupfish were stocked into Larry Creek and Lousy Canyon on March 31, 2006. Subsequent monitoring of the populations has determined both populations still occupy the creeks. Lousy Canyon and Larry Creek are unique systems in that they are at the top of relatively small basins. They appear to be very well isolated from the mainstem Agua Fria River although there are no obvious barriers to fish movement. They were fishless before being stocked with endangered fishes. The Biological Opinion (BO) (2-21-99-F-031) for the reintroduction of Gila topminnow and Desert Pupfish into Silver Creek, Larry Creek, and Lousy Canyon states, "The Agua Fria River downstream of all three stocking sites is occupied by green sunfish and mosquitofish. These two non-native fishes represent a biological barrier that would preclude both topminnow and pupfish from becoming established outside the maximum dispersal area." In addition to this statement, the BO further supports this by stating, "Any movement of these two fishes into the Agua Fria River would be considered temporary and subject to 100% incidental take from existing non-stocked non-native fishes, and other activities."

Potential Impacts

Because of the ephemeral and intermittent nature of the watershed and natural fish barriers, it is anticipated that stocked species of fish could potentially come into contact with individuals of Desert pupfish only on a rare basis following large scale flooding events. As provided in the BO, any desert pupfish displaced out of the reintroduction area is assumed to be lost due to the presence of non-native predators and competitors. Any individuals of the stocked species that reach habitats containing displaced desert pupfish could prey on or compete with the desert pupfish; however, as these individuals are already considered lost, this does not create an additional adverse impact.

Gila Topminnow

Gila topminnows occupy three streams in the Agua Fria Watershed upstream of Lake Pleasant. These are Tule Creek, Larry Creek, and Lousy Canyon. No critical habitat was established for Gila topminnow in the Agua Fria Watershed. Gila topminnows were initially stocked into Tule Creek in 1968, but due to cattle grazing and floods they needed to be restocked in 1981. Gila topminnow has persisted in the creek since that time. In 1992 a fish barrier was installed on Tule Creek to prevent the upstream movement of non-native fish. Surveys since that time have only reported longfin dace and Gila topminnow occupying the creek. Gila topminnows were stocked in the year 2000 into Larry Creek and Lousy Canyon. Multiple surveys post stocking have determined that both of these populations are established, reproducing, and recruiting. Lousy Canyon and Larry Creek are unique systems in that they are at the top of relatively small basins. They appear to be very well isolated from the mainstem Agua Fria River, in part because they were fishless before being stocked with endangered fishes, although there are no documented barriers to fish movement. The Biological Opinion (BO) (2-21-99-F-031) for the reintroduction of Gila topminnow and Desert Pupfish into Silver Creek, Larry Creek and Lousy Canyon states, "The Agua Fria River downstream of all three stocking sites is occupied by green sunfish and mosquitofish. These two non-native fishes represent a biological barrier that would preclude both topminnow and pupfish from becoming established outside the maximum dispersal area." In addition to this statement the BO also further supports this point by stating, "Any movement of these two fishes into the Agua Fria River would be considered temporary and subject to 100% incidental take from non-native fishes, and other activities."

Potential Impacts

Because of the ephemeral and intermittent nature of the watershed and natural fish barriers, it is anticipated that stocked species of fish would come into contact with individuals of Gila topminnow only on a rare basis following large scale flooding events. As provided in the BO, any Gila topminnow displaced out of the reintroduction area is assumed to be lost due to the presence of non-stocked non-native predators and competitors. Any individuals of the stocked species that reach habitats containing displaced desert pupfish could prey on or compete with the desert pupfish; however, as these individuals are already considered lost, this does not create an additional adverse impact.

Northern Mexican Gartersnake

Stocking complex analysis: Although the Agua Fria drainage lies within the historical range of northern Mexican gartersnakes, the likelihood the species would be exposed to fish stocked at Lynx Lake, Fain Lake or Horse Thief Basin is low. There are no records for northern Mexican gartersnakes from any of the stocking sites (HDMS 2009, AGFD Riparian Herpetofauna Database 2009, V. Boyarski pers. comm. 2009). Northern Mexican gartersnakes were previously observed at several sites along the Agua Fria drainage, though only two records fall within the 20

km buffered stocking complex and they include a 1985 record from Horseshoe Bar (Rosen and Schwalbe 1988) and a historical record (ca. 1900) along Granite Creek (HDMS). Additional sites where northern Mexican gartersnakes have been observed in the Agua Fria drainage, but outside of the buffered stocking complex include: Table Mesa Road (1984-85), Bloody Basin Road (1980), Big Bug Creek confluence (1980), Little Ash Creek (1984), and Ash Creek (1992) (Rosen and Schwalbe 1988, HDMS 2009, AGFD Riparian Herpetofauna Database 2009). From 2004-2005, Holycross et al. (2006) surveyed 11 sites along the Agua Fria River for northern Mexican gartersnakes, including previously known locations, but did not find the species. In addition, bullfrogs and crayfish have been documented along much of the Agua Fria, making the habitat less suitable for gartersnakes. Based on data reported in Holycross et al. (2006) and the lack of any documented observations since the late 1980s to early 1990s, the U.S. Fish and Wildlife Service determined that northern Mexican gartersnakes are likely extirpated from the Agua Fria drainage (USFWS 2008a). However, sites exist in the Agua Fria drainage that might be suitable for future northern Mexican gartersnake recovery activities.

Downstream analysis: If fish were to disperse downstream of Lynx Lake, Fain Lake or Horse Thief Basin, the likelihood that northern Mexican gartersnakes would be exposed to stocked fish is low because, as detailed above, the species has likely been extirpated from the Agua Fria drainage (USFWS 2008a).

Spikedace

The only record of spikedace in the Agua Fria River was documented in 1943 near Rock Springs (Kansas GAP 2009). The Designation of Critical Habitat for the Spikedace (72 FR 13355 13422), is at sites that were occupied at the time of listing, occupied during the time of the designation, or where features essential to the conservation of the species exist. Neither the Agua Fria River nor any of its tributaries were designated for critical habitat. For this reason, spikedace are considered extirpated from the Agua Fria River.

Potential Impacts

Due to the extirpation of spikedace from the Agua Fria River, no potential impacts from the stockings of Horsethief Basin, Lynx, or Fain Lakes would be anticipated.

LOWER GILA RIVER SUB-WATERSHED

Physical Geographic Description

Drainage area

The lower Gila River begins at Phoenix at the confluence of the Gila and Salt Rivers, and ends about 150 miles downstream at its confluence with the Colorado River near Yuma. The drainage area is large, and including the Agua Fria sub-watershed, covers 14,857 square miles (9,509,290 acres). The lower Gila below Painted Rock Dam is depicted in Figure 36. Inflows are limited to

water releases from upstream dams, wash flows from rainfall events, wastewater effluent releases, and drainage/seepage from the Wellton-Mohawk Irrigation and Drainage District. The river is intermittent along its length in this reach. This basin contains low elevation mountain ranges surrounding plains and valleys with desert scrub vegetation (ADWR 2006).

Range of elevations
Elevations range from 1092 feet near Phoenix to 141 feet near the confluence with the Colorado River near Yuma.

Tributaries
No perennial tributaries enter the Gila River in this reach. There are several major washes; however, they only flow after rainfall events.

LOWER GILA-YUMA COMPLEX
The Lower Gila River Sub Watershed (Figure 36) contains three proposed stocking sites; Wellton Golf Course Pond, Redondo Pond and Fortuna Pond. These three locations form one stocking complex, the Lower Gila Complex, because they are in proximity to the each other and the Lower Gila River, which is intermittent within this reach, running east to west (Figure 37). Two of the three waters proposed for stocking are closed systems.

Wellton Golf Course Pond
Site Description
This 1.5 acre pond is located on a golf course in the town of Wellton. The pond was constructed in the 1980s as a water hazard on the golf course (Figure 38). It is near the bottom of the watershed/complex and is owned by the town of Wellton.

Management of Water Body
Wellton Pond has not been actively managed as a fishery in the past; however, the local community has expressed an interest in conducting a fishing clinic/derby at this site. The Department would like the ability to stock this pond to facilitate future fishing clinics/derbies. The Department’s stocking database indicates that "Wellton Ponds" was stocked with 200 mosquitofish and 500 tilapia in 1976. However, it is likely that the stocked pond was a smaller pond located in the vicinity of this pond, since the pond addressed in this consultation did not exist in 1976 (L. Whitaker, pers. comm.). Wellton Pond as identified in this consultation is not known to have been previously stocked.

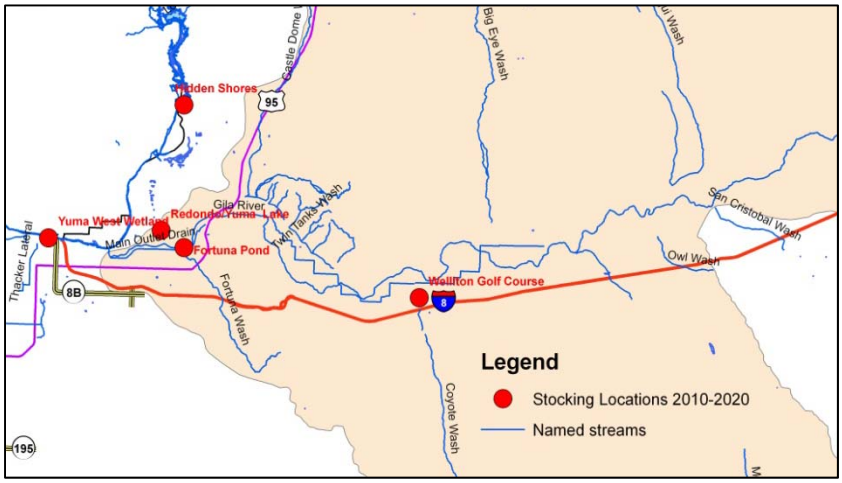

Figure 36. Lower Gila River sub-watershed. Wellton Golf Course, Fortuna Pond, and Redondo (Yuma Lakes) are located at lower reaches of the Gila River.

Figure 37. Map of Lower Gila Complex with stocking sites (sub-watershed shaded yellow), Laguna Dam and Morelos Dam identified.

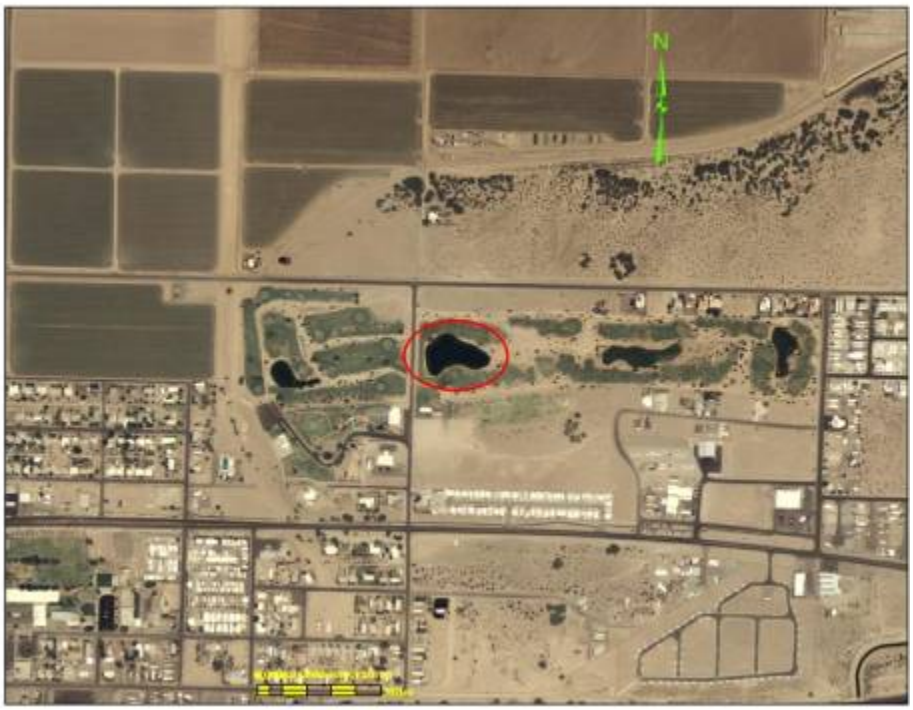

Figure 38. Aerial photo of Wellton Golf Course Pond (circled in red).

Proposed Action

Rainbow Trout, largemouth bass, channel catfish and bluegill sunfish for the period covered by this consultation.

A total of up to 2,000 catchable fish would be stocked once annually; species to be stocked could include one or more of the following species: rainbow trout, largemouth bass, channel catfish or bluegill sunfish depending on availability, cost and time of year. Sub-catchable bluegill sunfish or largemouth bass may also be stocked in place of the catchables.

Water Distribution / Connectivity

Water is supplied by a well and there is no outflow/overflow from the pond. The pond is considered permanent and the surface elevation does not fluctuate largely. The pond is isolated with no hydrologic connection to the Colorado or Gila Rivers, and is considered to be a closed system.

Fish Movement

Fish cannot escape or enter this pond because it is a closed system.

Community Description

No surveys have been conducted on this pond and no fish are known to occur in the pond; however it is suspected that carp, tilapia, and mosquitofish may be present.

Consultation Species or Critical Habitat
Please see the Lower Gila – Yuma Lakes complex analysis for a discussion of consultation species including Yuma clapper rail.

Fortuna Pond

Site Description
Fortuna Pond is a 9-acre impoundment located about 9 miles east of Yuma, adjacent to the Gila River. Land ownership is Bureau of Land Management (BLM), Bureau of Reclamation (BR) withdrawn. Fortuna Pond was constructed in 1985 by the BR as mitigation for lost fishing opportunities that resulted from the construction of the Yuma Desalting Plant west of Yuma. This pond is located close to the City of Yuma and receives heavy fishing and outdoor recreation activity. Facilities include parking lots, picnic areas, two fishing jetties, and unimproved camp sites. There are dirt roads to the site, no boat ramp, and boat motors are restricted to electric only (Figure 39).

Figure 39. Photo of Fortuna Pond.

Management of Water Body
The BR stocked Fortuna Pond for several years following its construction, although stocking records have not been located, and is required to provide and maintain sport fish angling opportunities. The Department began stocking the pond in 1999 and currently stocks the pond with both warm and cold water species to facilitate fishing clinics/derbies and to maintain the

fishery, which receives heavy fishing pressure year-round (Table 26). In recent years the pond has been stocked with catchable size channel catfish, 2 to 4 times per year during the warm part of the year, and with catchable size rainbow trout, 3 times per year during the winter months. Fishing clinics/derbies are generally scheduled to coincide with stocking events. Previous consultations provided for the stocking of rainbow trout and largemouth bass.

Fortuna Pond is managed primarily as a put-and-take intensive use channel catfish and rainbow trout fishery, and secondarily as a warm water, self-sustaining largemouth bass, and bluegill fishery. As such, supplemental stockings of largemouth bass and bluegill may be required to maintain the desired level of those species in this pond to support angler opportunity and demand.

Table 26. Fortuna Pond stocking history 1999 to 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Rainbow trout	1999	2009	30	59,287
Channel catfish	2006	2008	8	7,612
Total			38	66,899

Proposed Action

The Department proposes to stock rainbow trout, channel catfish, largemouth bass, and bluegill sunfish for the period covered by this consultation.

Catchable sized rainbow trout would be stocked October through March; numbers of rainbow trout to be stocked would be from 0 to 16,000 fish annually (~ 1,000 to 4,000 fish per stocking).

Catchable sized channel catfish will be stocked during the warmer months; however, stockings of channel catfish could occur any time during the year. Numbers of channel catfish to be stocked will be from 0 to 16,000 fish annually (~ 1,000 to 4,000 fish per stocking).

Catchable or sub-catchable largemouth bass and/or bluegill sunfish may be stocked as needed at any time during the year to augment existing populations, or to recover fishery following a catastrophic event. Numbers of fish stocked for this purpose would be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution / Connectivity

Fortuna Pond is maintained by inflow from a ground-water well. Outflow occurs through a screened pipe located at the surface of the pond, then through a culvert and ditch that leads to the Gila River (Figure 40 and Figure 41). The outflow is screened with a mesh size of less than a ½ inch, is maintained by the BR as necessary, and the screen prevents medium to large fish from

escaping; however, the pond is considered connected to the Gila River due to the outflow. The pond is inside the primary levee for the Gila River but is isolated from the river, except for the outflow, by a secondary levee surrounding the pond.

Figure 40. Aerial photo of Fortuna Pond.

Figure 41. Aerial photo of Fortuna Pond.

Once the water reaches the Gila River it travels downstream approximately 6 miles to the confluence of the Gila and Colorado rivers. This stretch of the Gila River is choked with vegetation and normal flows are extremely low. Notable flood events have occurred in late spring in four of the past 20 years: 1992, 1993, 1995, and 2005. Mean monthly discharge data for the past 20 years along the Lower Gila River downstream from Painted Rock Dam (USGS gauge 09519800) and also just upstream from Fortuna Pond near Dome (USGS gauge 09520500) indicate that during non-flood years, flows in the Lower Gila are on average less than 35 cfs (Figure 42). Flows are lowest in July through December and higher in the winter and early spring months. During the four notable flood years on record, maximum mean monthly flows ranged from 1,235 cfs in 1995 to 22,550 cfs in 1993 at the Dome.

It is not uncommon to find stretches where there is only sub-surface flow. The Gila River enters the Colorado River about 8 miles below Laguna Dam and 12 miles above Morelos Dam in what is called the Yuma Division of the Colorado River. Once in the Colorado River, water travels down to Morelos Dam and is then diverted into a canal system that delivers water to Mexico per treaty agreement. There is normally no water delivered downstream of the Morelos Dam except for a small amount of “leakage” that passes through the dam and continues down the Colorado River for a short distance until it goes sub-surface. Only on rare occasions does sufficient water flow through Morelos Dam that surface flows reach Mexico. Those rare occasions would be during times of inadvertent irrigation overruns and during flood control releases. The last

significant flow below Morelos Dam came during flood control releases in the winter of 1997-1998.

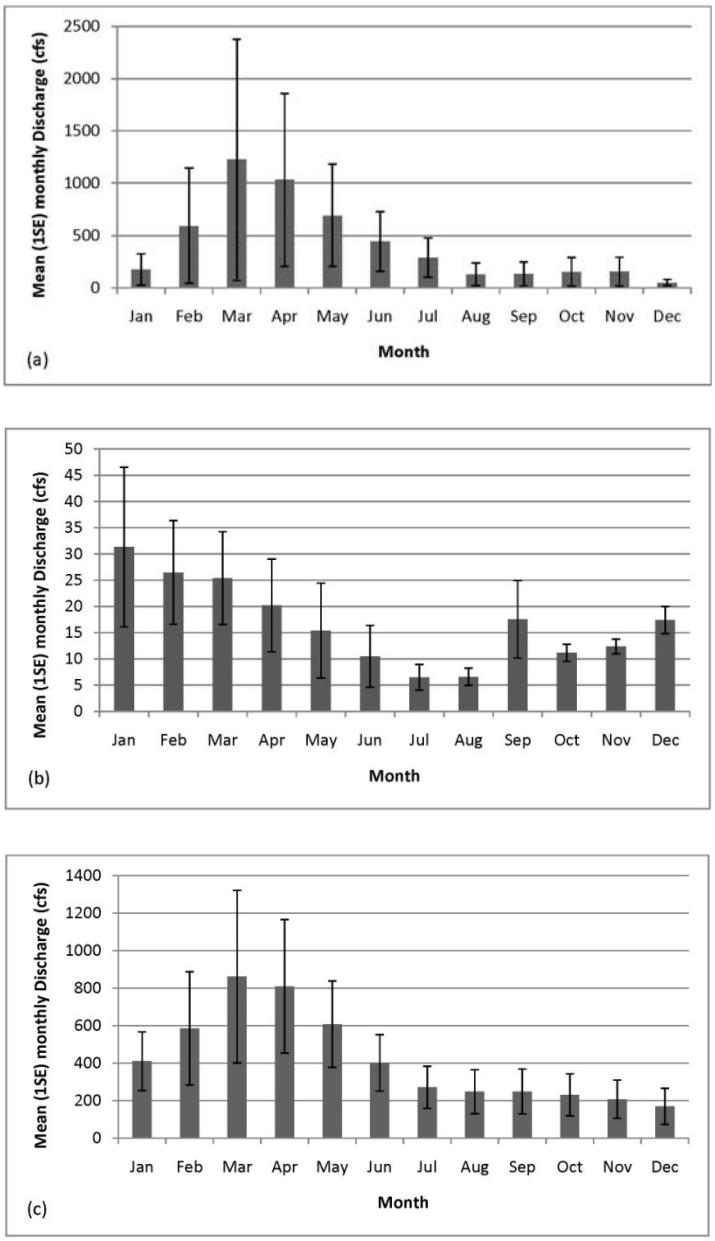

Figure 42. USGS mean (1SE) monthly discharge (cfs) for 3 gauges on the Gila River.

Figure (a) gauge station 09520500 on the Lower Gila River near Dome, AZ, just upstream from Fortuna Pond from 1990 – 2009 (b) gauge station 09520500 on the Lower Gila River near Dome, AZ, just upstream from Fortuna Pond from 1990 – 2009 with flood years 1992, 1993, 1995, 2005 removed, and (c) gauge station 09519800 on the Lower Gila River below Painted Rock Dam 1989 – 2008.

Fish Movement

Medium to large-sized fish cannot leave the pond due to the screening structure on the outtake pipe. Upstream movement of small fish that may have been spawned by stocked fish that escape through the screen would be very limited in distance, because large sections of the Gila River above Fortuna Pond and below Painted Rock Dam are typically dry, with no surface flow. Movement would be most likely to occur during flood events in which the Gila River flows heavily, because normal flows are very low and can go subsurface in spots downstream from Fortuna Pond. Painted Rock Dam, approximately 87 miles upstream of Fortuna Pond and west of Gila Bend is a barrier for upstream fish movement during times of occasional high flows.

Small fish passing through the screened outlet could move downstream to the Colorado River during times when flows are sufficient to transport fish; this would most likely occur during winter months when flows are higher on average. Upstream movement of any small fish reaching the Colorado River from Fortuna Pond would be blocked by Laguna Dam. Fish moving downstream in the Colorado River would normally be blocked by Morelos Dam or end up in the canal system in Mexico, which provides municipal, industrial, and agriculture water. Only in extremely rare occasions such as flood control releases would fish be able to move past Morelos Dam and into Mexico via the Colorado River.

Community Description

Fisheries surveys of Fortuna Pond from 1999 to 2003 detected the following species: largemouth bass, bluegill, redear sunfish, green sunfish, tilapia, carp, and threadfin shad (Table 27). Channel catfish and striped mullet also occur. Rainbow trout are stocked seasonally, and are present in the cooler months of the year.

Fisheries surveys of the Yuma Division of the Colorado River from 1991 to 2003 show robust populations of non-native fish species including largemouth bass, smallmouth bass, redear, bluegill, warmouth, crappie, tilapia, threadfin shad, channel catfish, flathead catfish, carp, yellow bullhead, and goldfish (Table 28). Razorback suckers and bonytail chub have been documented in the Colorado River upstream from Laguna Dam; however neither species have been detected in surveys in the Yuma Division.

These stretches of the Gila and Colorado Rivers also contain invasive species including bullfrogs, crayfish, quagga mussels, and giant salvinia.

Yuma clapper rails are resident in some areas of the Lower Gila or Colorado River, but not in the immediate shoreline of Fortuna Pond.

Table 27. Summary of electrofishing fisheries surveys at Fortuna Pond during October 1999 (1 EFU = 15 minutes of pedal time).

Year/Month	Effort	Species	Num. Sampled	% of Total	Min Len. (mm)	Max Len. (mm)
1999 October	3.14 EFU	largemouth bass	22	100	100	595
2000 October	2.81	largemouth bass	16	100	59	383
2003 November	3.4	largemouth bass	25	100	115	556

Table 28. Summary of fish surveys in the Yuma Division.

Year	Species	Num. Sampled	% of Total	Min Len.(mm)	Max Len.(mm)
1991	largemouth bass	80	81	113	532
	channel catfish	11	11	97	631
	flathead catfish	5	5	423	810
	striped bass	2	2	196	431
	smallmouth bass	1	1	171	171
1992	largemouth bass	66	42	97	512
	bluegill	50	32	61	205
	redear sunfish	1	1	204	204
	warmouth	1	1	194	194
	channel catfish	7	4	358	648
	flathead catfish	2	1	529	794
	carp	20	13	146	381
	goldfish	10	6	120	228
1993	largemouth bass	68	52	147	585
	flathead catfish	2	4	372	800
	striped mullet	61	47	201	380
1994	largemouth bass	89	68	100	545
	black crappie	1	1	226	226
	channel catfish	5	4	173	694
	flathead catfish	8	6	410	960
	striped mullet	28	21	285	403
1995	largemouth bass	164	94	133	590
	channel catfish	4	2	120	582
	flathead catfish	6	3	710	1060
1996	largemouth bass	177	83	101	605
	black crappie	1	0	298	298
	channel catfish	6	3	138	680
	flathead catfish	15	7	322	1072

Year	Species	Num. Sampled	% of Total	Min Len.(mm)	Max Len.(mm)
	striped bass	1	0	157	157
	striped mullet	12	6	265	430
	smallmouth bass	1	0	165	165
1997	largemouth bass	339	94	87	694
	black crappie	5	1	142	317
	channel catfish	4	1	263	602
	flathead catfish	5	1	349	835
	machete	7	2	163	205
1998	largemouth bass	110	88	131	677
	black crappie	2	2	193	203
	channel catfish	5	4	408	634
	flathead catfish	6	5	231	865
	striped bass	1	1	172	172
	striped mullet	1	1	255	255
1999	largemouth bass	47	12	69	604
	bluegill	233	60	47	199
	redear sunfish	4	1	104	112
	black crappie	2	1	118	208
	tilapia	9	2	63	363
	channel catfish	1	0	591	591
	flathead catfish	2	1	623	863
	carp	42	11	356	636
	goldfish	30	2	271	448
	striped mullet	8	8	168	441
	smallmouth bass	1	0	305	305
	threadfin shad	8	2	78	145
2000	largemouth bass	214	93	89	635
	black crappie	2	1	97	134
	channel catfish	6	3	254	508
	flathead catfish	7	3	147	940
2001	largemouth bass	71	97	91	568
	black crappie	1	1	192	192
	flathead catfish	1	1	493	493
2002	largemouth bass	198	97	85	605
	black crappie	1	0	255	255
	channel catfish	3	1	237	591

Year	Species	Num. Sampled	% of Total	Min Len.(mm)	Max Len.(mm)
	flathead catfish	1	0	603	603

Consultation Species and Critical Habitat
No listed or candidate fish species have been detected in surveys in the Gila River downstream from Painted Rock Dam, or in the Yuma or Laguna Divisions of the Colorado River below Imperial Dam; the closest occurrences are upstream from Laguna Dam in the Colorado River.

The only listed species known to be at, or near, Fortuna Pond are the Yuma clapper rail. Clapper rails are present in the lower Gila and Colorado Rivers. Please see the Lower Gila – Yuma Lakes complex analysis for a discussion of consultation species including Yuma clapper rail and yellow-billed cuckoo.

Bonytail chub
Currently no self-sustaining populations of bonytail chub are known to exist in the wild; wild populations of bonytail chub in the lower Colorado River below Parker Dam are considered extirpated. The nearest documented occurrence of bonytail chub to this site is approximately 65 miles upstream in the Colorado River, and that site is separated from this proposed stocking site by 2 dams. Bonytail chub have been stocked into isolated ponds above Imperial Dam at Imperial National Wildlife Refuge (LCR MSCP 2009a) and into the river further upstream. Due to extremely low survivability of stocked bonytail chub in the lower Colorado River (Schooley et al. 2008), there will most likely be a hiatus in stocking bonytail chub below Palo Verde Dam. This would further reduce the potential number of bonytail chub in the Colorado River between Imperial Dam and Palo Verde Dam over the next 10 years.

There is no critical habitat designated below Parker Dam for bonytail chub. The nearest critical habitat is more than 100 miles upstream from Fortuna Pond, in the Colorado River.

Potential Impacts
Potential impacts to bonytail chub from stocked trout, channel catfish, largemouth bass, and bluegill sunfish or their progeny would include predation and competition. Only catchable size fish are proposed for stocking in Fortuna Pond and they cannot escape the pond due to the screened outlet; stocked fish would have to reproduce and their progeny would have to escape through this screened outlet. Water does not constantly flow out of the pond and even if eggs, fry, or small fish reached the Gila or Colorado Rivers they would likely be preyed upon by the robust populations of non-native fish, bullfrogs, crayfish, and birds found in, and along, these rivers. Since bonytail chub are not presently known to occur below Imperial Dam, it is extremely unlikely that they or their progeny, would come into contact with fish proposed for stocking in Fortuna Pond. Any progeny of stocked fish that escaped and survived would not be expected to

have any meaningful or measurable impact on the existing populations of non-native fish in the lower Gila and Colorado Rivers.

Non native fish in the Yuma Division of the Colorado River are blocked by Laguna Dam and Imperial Dam from moving upstream to where bonytail have been stocked or documented as having occurred in the past. There is a slight possibility that stocked bonytail could migrate down to Imperial Dam, pass through Imperial Dam and Laguna Dam, and end up in the Yuma Division in proximity to surviving progeny of fish proposed for stocking in Fortuna Pond. However, bonytail chub have not been documented below Imperial Dam in recent history and based on changes to stocking policies it is unlikely they would show up or occur there during the period covered by this consultation.

Razorback Sucker

Razorback suckers have been stocked into the Imperial Division of the Colorado River and into ponds at Imperial National Wildlife Refuge in recent years (Schooley et al 2008; LCR MSCP 2009a). Razorback suckers were also stocked in the Imperial Division for research purposes in the late 1990s (Bradford and Gurtin 2000). In addition to these more localized stockings; razorback suckers are also stocked further upstream in the Colorado River and could move down into the vicinity of Imperial Dam. However, due to the extremely low survivability of stocked razorback suckers in the Lower Colorado River (Schooley et al. 2008), there will most likely be a hiatus in stocking razorback suckers below Palo Verde Dam. That would reduce the potential number of razorback suckers in the Colorado River between Imperial Dam and Palo Verde Dam over the next 10 years. Razorback suckers have not been documented in the Colorado River below Imperial Dam or in the lower Gila River in recent history.

There is no designated critical habitat for the razorback sucker below Imperial Dam. This stocking site is separated from designated critical habitat by 2 dams.

Potential Impacts

Potential impacts to razorback suckers from stocked trout, channel catfish, largemouth bass, and bluegill sunfish or their progeny would include predation and competition. Only catchable size fish are proposed for stocking in Fortuna Pond and they cannot escape the pond due to the screened outlet; stocked fish would have to reproduce and their progeny would have to escape through this screened outlet. Water does not constantly flow out of the pond and even if eggs, fry, or small fish reached the Gila or Colorado Rivers they would likely be preyed upon by the robust populations of non-native fish, bullfrogs, crayfish, and birds found in, and along, these rivers. Since razorback suckers are not known to occur below Imperial Dam, it is extremely unlikely that razorback suckers and their progeny would come into contact with fish proposed for stocking in Fortuna Pond. Any progeny of stocked fish that escaped and survived would not be

expected to have any meaningful or measurable impact on the existing populations of non-native fish in the lower Gila and Colorado Rivers.

Non-native fish in the Yuma Division of the Colorado River are blocked by Laguna Dam and Imperial Dam from moving upstream to where razorback suckers have been stocked or documented as occurring in the past. There is a slight possibility that stocked razorback suckers could migrate down to Imperial Dam, pass through Imperial Dam and Laguna Dam, and end up in the Yuma Division in proximity to surviving progeny of fish proposed for stocking in Fortuna Pond. However, razorback suckers have not been documented below Imperial Dam in recent history, and based on changes to stocking policies, it is unlikely they would show up or occur there during the period covered by this consultation.

Redondo Pond (Yuma Lakes)

Site Description

Redondo Pond, also known as Yuma Lakes, is an 11-acre pond formed in a retired gravel pit (Figure 43). The pit was created in the late 1950s as material was taken from it and used in the construction of the Gila Gravity Main Canal. The south end of the pond is privately owned (Wellton-Mohawk Irrigation District) while balance of the pond is owned by BLM. It is located about 8 miles east of Yuma and 0.8 miles north of the Gila River and is at the bottom of the watershed/complex. The pond is located close to the City of Yuma and receives heavy fishing and outdoor recreation activity (Figure 44).

Figure 43. Photo of Redondo Lake.

The private portion of the pond is developed as a trailer park with a beach. There is a primitive dirt boat launch on the BLM land that is only appropriate for small boats; restrictions limiting boat engines to a single electric motor are currently in place. No public recreational facilities exist, apart from the primitive boat launch and unimproved camping sites. There are currently plans to construct a small parking lot, walking and wheelchair path, and a fishing dock to increase angler access. Long-term plans include further development of parking areas, toilets, trash receptacles, improved boat ramp, and improved vehicle, pedestrian, and fishing access. Angler access to the shoreline is currently very poor on the public portion of the pond. The edges of the pond are generally very steep, except on the privately-owned portion, and heavily vegetated with small saltcedar and arrowweed.

Figure 44. Aerial photo of Redondo Lake.

Management of Water Body

For the past several years management of this pond has been mostly passive. It has not been stocked since 1974, except for one recent stocking of channel catfish (Table 29). There is current planning underway to increase management and fishing opportunities at this pond. Recent surveys and reports from the public indicate a poor fishery currently exists at this site. The management objective for Redondo Pond is to provide both a warm water and cold water fishery near the urban center of Yuma. Stocking is required to create and maintain the desired fishery due to heavy fishing pressure. The pond will be managed primarily as a put-and-take intensive use fishery for rainbow trout and channel catfish, and secondarily as a self-reproducing warm water fishery for largemouth bass and bluegill. Supplemental stockings of largemouth bass and bluegill may also be required to maintain the desired level of those species in this pond.

Table 29. Redondo Pond stocking history 1970 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Channel catfish	1970	2009	3	5,952
Largemouth bass	1970	1974	2	680
Redear sunfish	1974	1974	1	930
Tadpole	1980	1980	1	500
Total			7	8,062

Proposed Action

The Department proposes to stock rainbow trout, channel catfish, largemouth bass, and bluegill for the period covered by this consultation.

Catchable sized rainbow trout would be stocked October through March; numbers of rainbow trout to be stocked would be from 0 to 16,000 fish annually (approximately 1,000 to 4,000 fish per stocking).

Catchable sized channel catfish will be stocked during the warmer months; however, stockings of channel catfish could occur any time during the year. Numbers of channel catfish to be stocked will be from 0 to 16,000 fish per stocking (approximately 1,000 to 4,000 fish per stocking).

Catchable or sub-catchable largemouth bass and/or bluegill sunfish may be stocked as needed basis at any time during the year to augment existing populations, or to recover fishery following

a catastrophic event. Numbers of fish stocked for this purpose would be determined according to stocking guidelines identified in the sport fish stocking protocol.

Water Distribution / Connectivity
The pond is sustained by ground-water and inflow from a channel that captures seepage from the Gila Gravity Main Canal. The pond is permanent with very little fluctuation in surface elevation. The inflow channel and pond are not connected to any other water conveyance structures or systems. The pond does not overflow and is considered to be a closed system.

Fish Movement
Fish cannot escape or move from this pond because it is a closed system.

Community Description
Fisheries surveys from 1981 to 2007 detected the following species: largemouth bass, bluegill, redear sunfish, green sunfish, warmouth, black crappie, tilapia, channel catfish, carp and yellow bullhead. The current assemblage seems to be much less diverse, with largemouth bass and bluegills making up 94 percent of the catch on the 2007 electrofishing survey. Freshwater jellyfish also occur in the pond.

Consultation Species and Critical Habitat
Please see the Lower Gila–Yuma Lakes complex analysis for a discussion of consultation species, which includes Yuma clapper rail.

LOWER GILA–YUMA LAKES COMPLEX ANALYSIS
Consultation Species and Critical Habitat
Yuma Clapper Rail
The nearest known occurrence was documented in 1997 along the Gila over a mile from Fortuna and Redondo Ponds with additional occurrences (2001, 2003) upstream in the Gila over 6 miles. Minimal cattail habitat is present at either site, adjacent portions of Gila River contain marsh habitat.

There is no suitable habitat on Wellton Golf Course Pond or adjacent to the pond; habitat on Gila River is several miles away.

Potential Impacts
Yuma clapper rails are found along the Gila River nearby Fortuna Pond and Redondo Lake. There may be a limited amount of cattail in Fortuna Pond and Redondo Lake, but it is not sufficient to support Yuma clapper rails on site so there will be limited exposure to the rail from sport fish stocking at this site. Competition for food is unlikely since Yuma clapper rail habitat is not in the stocking site. Noise disturbance from anglers using the pond may reach occupied habitats in the Gila River, but is likely to be minimal due to distance and noise has not been identified as a concern for Yuma clapper rail.

No potential impacts would be anticipated for Wellton Golf Course Pond.

WILLCOX PLAYA WATERSHED

Physical geographic description

Drainage area
The Willcox Playa watershed encompasses approximately 1,680 square miles and is a hydrologically closed basin (Figure 45). The surrounding landscape drains into the typically dry Willcox Playa lakebed where water captured in the playa becomes trapped until it infiltrates into the ground or evaporates.

Range of elevations
The watershed ranges in elevation from 4100 feet above MSL to its highest point at 10,600 feet above MSL in the Pinaleño Mountains on the northern boundary of the watershed.

Summary of Major Tributaries/Sub-watersheds
There are numerous tributaries within this basin; however the Willcox Playa is comprised mostly of ephemeral drainages that only contain water following significant rainfall events. Only Grant and Big Creeks in the Pinaleño Mountains and West Turkey and Rucker Creeks located in the Chiricahua Mountains and Leslie Canyon in the Swisshelm Mountains are identified as perennial streams. Big Creek is believed to be fishless, Grant Creek has hybrid Apache x Rainbow trout, and Leslie, West Turkey and Rucker are managed for native Yaqui fishes. All of these creeks are isolated from Riggs Flat Lake, either by topography, or by the vast Wilcox basin itself, which is dry much of the year and saline when it contains water.

Vegetation
Vegetation in the Willcox Basin is primarily semi-desert grassland with smaller areas madrean evergreen woodland and Rocky Mountain and montane conifer forest. Riparian vegetation includes conifer oak and mixed broadleaf on Turkey Creek and conifer oak on Rucker Creek.

Stocking Sites
There is only one stocking site located in this closed basin, Riggs Flat Lake, located in the Pinaleno Mountains.

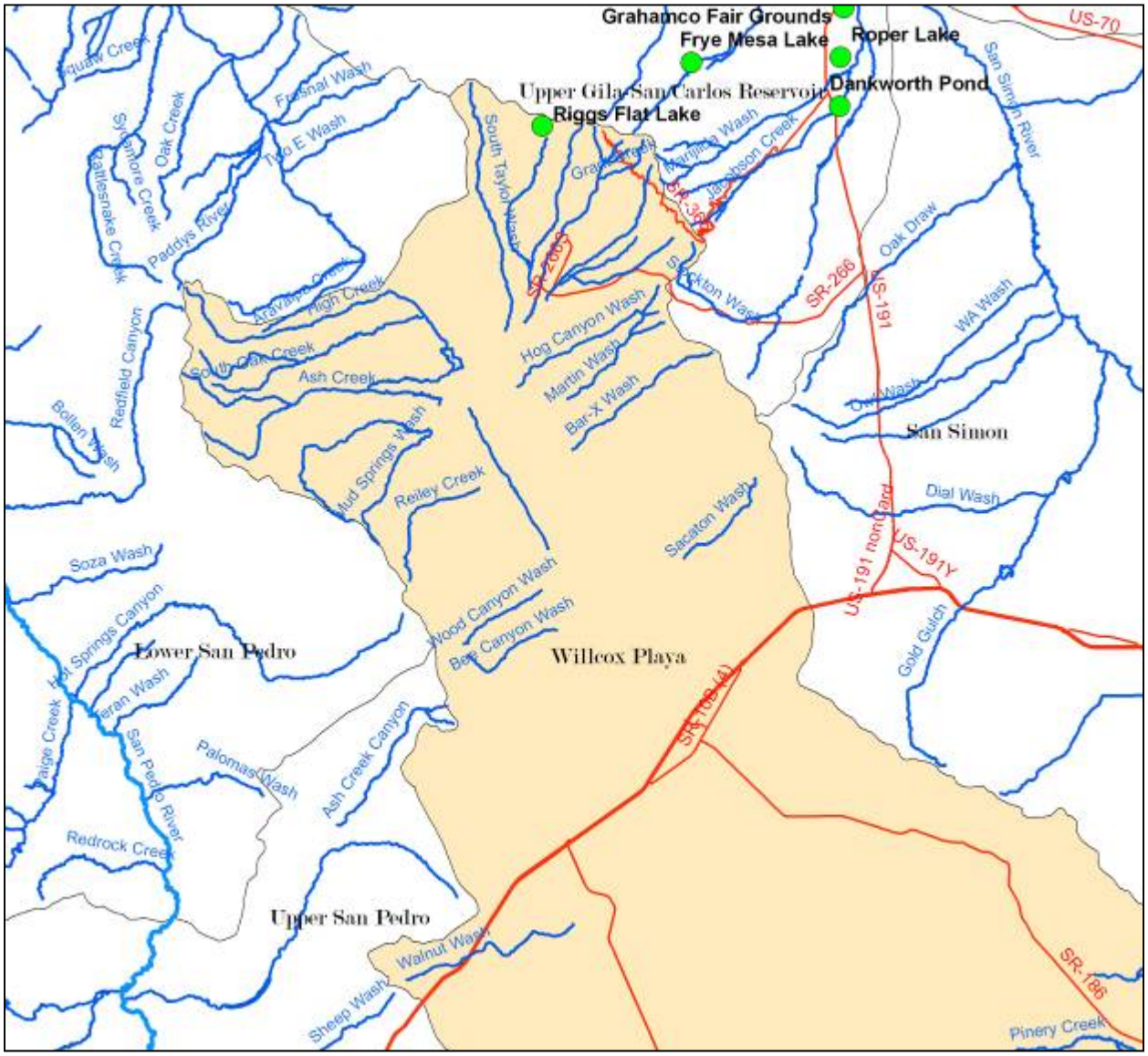

Figure 45. Willcox Playa Sub-Watershed

Riggs Flat Lake

Site Description

Riggs Flat Lake is located near Merrill Peak in the Pinaleño Mountains on the Safford Ranger District of the Coronado National Forest. Constructed in 1954, this small 11 acre man-made reservoir near the town of Safford, Arizona was formed by a concrete dam on an unnamed tributary to East Babcock Canyon. The lake is located very near the top of the watershed surrounded by alpine forests at an elevation of 8,700 feet (Figure 46). Recreation around the lake includes fishing, camping, hiking and hunting. This lake is in a Forest Service campground

where there is an improved concrete boat ramp. Due to the elevation and the poor winter access, the Forest Service closes this location from October through May each year.

Land ownership for the watershed is comprised of federally owned lands managed by the United States Forest Service, United States Military and the Department of Interior's Bureau of Land Management. Interspersed within the action area are both State and privately owned lands.

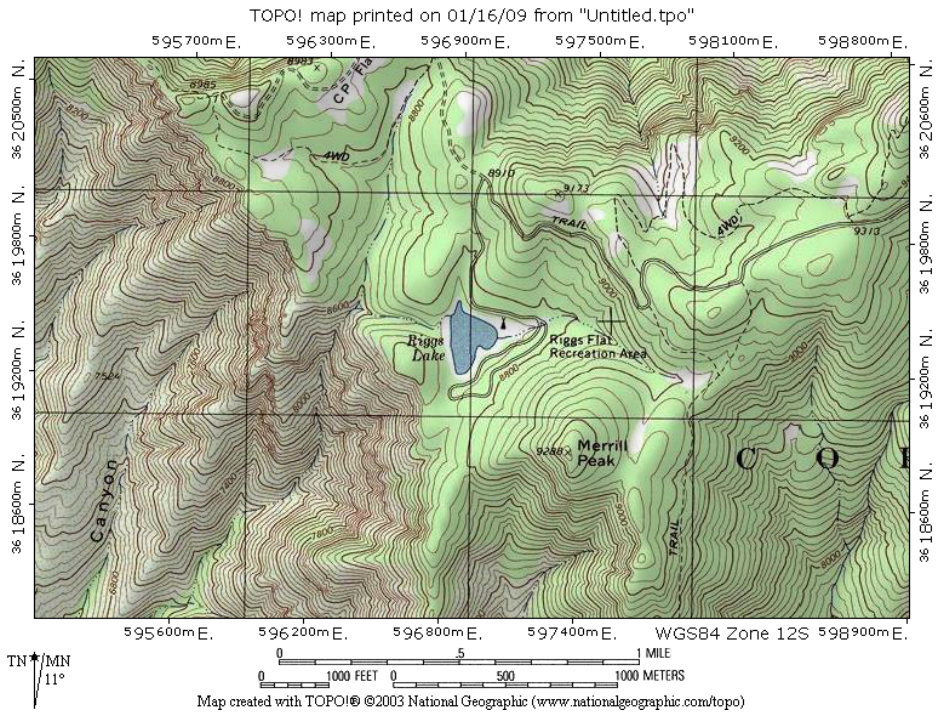

Figure 46. Riggs Flat Lake

Management of Water Body

The lake is managed primarily as an intensive use put and take rainbow trout fishery with a secondary opportunity as a put grow and take brown and brook trout fishery. Catchable rainbow trout are stocked multiple times between the months of April through October and brown and brook trout are stocked multiple times annually. Periodically, the Department has stocked large fish of all three species to promote and increase interest in the fishery. The Statewide Angler Survey conducted in 2004 found that there were 6,586 angler user days at Riggs Flat Lake (Pringle 2004). Because of the large amount of aquatic vegetation at this lake, pH levels are unusually high during the latter part of the summer, which leads to conditions that prohibit stocking catchable trout. The Department plans to mitigate this problem by introducing white amurs to reduce the overall amount of aquatic vegetation and alleviate associated water quality problems. The stocking history at this lake shows that only trout species have been stocked by the Department at this lake (Table 30).

Table 30. Historic fish stocking at Riggs Flat Lake.

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Rainbow trout	1954	2007	257	707,885
Brown trout	1969	2005	16	63,812
Brook trout	1955	2006	16	93,000
Apache trout	1970	1970	1	4,000
Total			290	868,697

Proposed Action

The Department proposes to stock rainbow trout, brown trout, brook trout and white amur for the period covered by this consultation.

The Department would stock catchable sized rainbow trout multiple times annually from April through October. The number of catchable sized rainbow trout stocked per year would range from 0 to 30,000.

The Department would stock brown trout multiple times annually from April through October. The number of fingerling brown trout stocked annually would range from 0 to 10,000. Periodically, as available, this population may be augmented with catchable sized trout; the number of catchable sized brown trout stocked would range from 0 to 10,000 annually.

The Department may stock brook trout multiple times annually from April through October. The number of fingerling brook trout stocked annually would range from 0 to 10,000. Periodically, as available, this population may be augmented with catchable sized brook trout; the number of catchable sized Brook trout stocked annually would range from 0 to 10,000.

The Department would stock white amurs ranging in size up to 15 inches in length annually from April through October to control aquatic vegetation. The number of white amurs stocked annually would range from 0 to 1,000.

Water Distribution / Connectivity

The watershed above Riggs Flat Lake encompasses approximately 11,000 acres and all of the drainages that comprise the inflow and outflow to and from Riggs Flat Lake are ephemeral. While the lake typically maintains a majority of its water, the level of the lake does fluctuate 4 to 5 feet throughout the year. Lower water levels correspond to times of little precipitation in the

summer prior to the beginning of the monsoon season. Rainfall and snow melt are the only water sources for this lake.

In the event of spill, water would flow out of the spillway and down an unnamed tributary of East Babcock Canyon for approximately 3 miles to the confluence with East Babcock Canyon. At this point, the water would flow 2 miles to the confluence with West Babcock Canyon at which point the drainage becomes Babcock Canyon. Water would then continue on 2 miles to the confluence of Jesus Canyon and then 3 miles to the confluence with Grant Creek. Grant Creek then flows 7 miles to the confluence with Ash Creek in the Sulpher Springs Valley. Water in Ash Creek flows approximately 10 miles to the Graham County and Cochise County line at which point the creek becomes poorly defined and water spreads out into sheet flow approximately 15 miles north of the Willcox Playa. The Willcox Playa is an ancient closed basin lakebed with no outflow opportunities. Any water that reaches the Willcox Playa is essentially trapped there until it evaporates.

Riggs Flat Lake terminates in sheet flow into the Willcox Playa and is not hydrologically connected to any drainage's outside of the Willcox Playa; therefore, Riggs Flat Lake is considered a closed system.

Fish Movement

Fish could only leave Riggs Flat Lake during high flow events, which cause water to flow over the spillway into the unnamed canyon below the lake. Such events typically occur during the summer monsoon season and early spring during snow melt. Fish would move downstream as described in the previous section. Fish transported downstream would be prevented from moving back upstream to the stocking location or into other tributaries by natural barriers.

The Babcock Canyon complex below Riggs Flat Lake is a series of narrow canyons dominated by steep gradient, highly confined ephemeral channels. Trout could persist for a brief time; however, they would not persist for long because the channels would dry after the flow event. Fish traveling beyond the Babcock Canyon Complex into Jesus and then into Grant Creek are subjected to the same ephemeral conditions only these canyons are less defined, have lower slope gradients and become much broader. Grant Creek, prior to the confluence with Ash Creek, is interrupted by active agricultural fields southwest of the town of Bonita, Arizona, where the channel becomes very broad with little gradient. Any fish transported this far is not likely to survive because of the presence of the active agricultural fields where the flow spreads out into sheet flow with very little depth for fish to swim or survive.

Fish are not likely to move upstream from Riggs Flat Lake due to poorly defined ephemeral stream channels upstream of the lake. However, if fish did manage to leave the lake in an upstream direction the opportunity for them to move would be at most ½ mile upstream in a small unnamed tributary that feeds the lake from the east and is at the top of the watershed.

Because of the ephemeral nature of the upstream stream channels, fish would not persist for any period of time and would perish once flows subsided and conditions began to dry following the event.

Community Description

Currently, the fish population at Riggs Flat Lake consists only of stocked trout species and fathead minnows. There are no records documenting the introduction of fathead minnows to the lake. Beyond their continuing existence as a self sustaining population, there is little known about this species at the lake. Rainbow, brook and brown trout do not reproduce at this lake because there is no suitable spawning habitat. Because the trout populations at this lake are maintained only through stocking, the Department has never conducted a fish survey at this location.

There is no definitive information to determine if Apache trout, stocked in the 1970's, persist; however, since the lake lacks habitat for natural reproduction, it is unlikely that they are present.

Consultation Species or Critical Habitat

Mexican Spotted Owl and Critical Habitat

The stocking location is within Mexican spotted owl (MSO) critical habitat (CH), occurs within a buffer, and also occurs within a PAC. There appears to be an opportunity for angler access around the perimeter of the lake based on topographic and world imagery maps.

Potential Impacts

The stocking site, extended area for fish movements from the stocking site, and/or the area of potential angler access are within boundary of at least one MSO PACs in the general vicinity of the site. There may be some disturbance of MSOs at the nest site, roosting or foraging areas within the PAC during the breeding season.

Indirect effects may include actions that can affect forest structure and maintenance of adequate prey species identified as PCEs or KHCs. These actions may include trampling of vegetation, soil compaction, removal of woody debris or other physical degradation potentially altering the productivity and succession/regeneration of the vegetation. In the designation of critical habitat (USFWS 2004) most recreational activities, including angling, were not identified as requiring restrictions to protect the PCE's of critical habitat from destruction or adverse modification. In making that statement, recreational activities, including angling were assumed to not contribute to significant habitat-affecting activities such as cutting large trees or snags, removal of large woody debris from the forest floor, altering the tree species diversity, or other large-scale changes to habitat structure. The act of a relatively small number of people walking through habitat is not likely to cause the kind of effects that would result in adverse effects to the PCEs/KHCs of MSO CH and/or restricted and protected habitats.

Mount Graham Red Squirrel and Critical Habitat

The Mount Graham red squirrel was listed as endangered in 1987. Critical habitat occurs in three areas in the Pinaleños (Hawk Peak/Mount Graham, Webb Peak, and Heliograph Peak) and covers a total of about 2,000 acres; Riggs Flat Lake, and the immediate vicinity, is not located within designated critical habitat for the squirrel.

Habitat suitability for the red squirrel depends on the ability of the forest to produce reliable and adequate conifer cone crops for food and microclimate conditions suitable for storing of closed cones in middens. These conditions are met by mature to old-growth stands that include either Douglas-fir or Engelmann spruce, or both, and have closed canopies. Habitat quality increases when large downed logs, snags, and interlocking branch networks are present. These elements provide red squirrels with adequate food resources, perching, storage and nesting sites, runways that allow cone retrieval in the winter, and escape routes for the avoidance of predators.

Red squirrels are highly territorial and maintain middens within their territories. Typically, the same midden will be used by succeeding generations of squirrels. Survival rates vary yearly and are related to the amount of cones produced. The current number of known middens, which includes those that are active, inactive, and abandoned, is 1288; only 44 located in the vicinity (within ½ mile) of Riggs Flat Lake. The population has been estimated since 1986 with estimates ranging from 99 to 562 squirrels; there is no statistical evidence suggesting a rise or decline in the population from these estimates (T. Snow pers. comm.). The fall 2009 survey estimated the population at 250 (+/- 11) squirrels.

Potential Impacts

The Mount Graham Red Squirrel Recovery Team agreed that habitat loss was the most significant reason for listing the Mt. Graham red squirrel as endangered (unpubl. meeting notes 2002). Human development, including developed recreation sites such as Riggs Flat Lake and the associated campground, is considered a threat because it includes the direct effect of removal of vegetation, which could result in decreased food sources, potential increase of tree blow-down, changes in microhabitat, and increased vulnerability to predation. Cumulative effects resulting from the presence of the lake and campground include potential for increased habitat fragmentation, potential for population isolation, and increased tourism. Increases in tourism and development may lead to noise disturbance and increased traffic. Greater traffic may lead to increasing deaths from vehicles. Additional losses to squirrel habitat could be caused by potential forest fires, road construction and improvement, new recreation development, dispersed camping, and collection of dead and down wood. Stocking of sportfish and angling at Riggs Flat Lake, along with the associated recreational opportunities in the vicinity of the lake, may result in indirect effects to Mount Graham red squirrels such as dispersed camping, increased risk of fire, removal of downed logs, and potential for increased vehicle traffic. General angler activities

(e.g. fishing, boating or canoeing, and hiking around the shoreline) would not likely effect red squirrels (T. Snow pers. comm.).