Chapter 9 Verde River Watershed

Chapter 9 Verde River Watershed ----------9-9

Upper Verde River Sub-Watershed---------- 9-11
Big Chino Wash Complex ---------- 9-13
Garrett Tank---------- 9-16
Shucking Tank---------- 9-23
Presley Tank ---------- 9-29
Stone Dam---------- 9-35
Granite Basin Lake---------- 9-44
Big Chino Wash Complex Analysis---------- 9-52
Granite Creek Complex ---------- 9-65
Goldwater Lake---------- 9-66
Watson Lake ---------- 9-80
Willow Creek Reservoir---------- 9-90
Granite Creek Complex Analysis ---------- 9-98
Sycamore Creek Complex ----------9-110
Perkins Tank ----------9-115
White Horse Lake ----------9-126
Elk Tank ----------9-132
Middle Tank----------9-138
JD Dam Lake ----------9-142
Sycamore Creek Complex Analysis ----------9-147

UPPER VERDE RIVER IMPACTS ANALYSIS ----------9-147

Middle Verde River Sub-Watershed ----------9-195
Middle Verde Complex ----------9-197
Oak Creek ----------9-197
Wet Beaver Creek ----------9-214
Deadhorse Ranch State Park Lagoons ----------9-222
Mingus Lake ----------9-230
Huffer Lake ----------9-234
West Clear Creek----------9-239
Middle Verde River ----------9-248

Middle Verde Sub-Watershed analysis ----------9-256

Lower Verde River Sub-Watershed ----------9-278
East Verde River Complex----------9-279

East Verde River ----------9-279
Green Valley Lakes (Urban Fishing Program water) ----------9-291
East Verde River Complex Analysis ----------9-296
Lower Verde River Sub-Watershed Analysis ----------9-305

List of Figures

Figure 1. Verde River Watershed. 9-10
Figure 2. Photo of Pecks Lake Diversion circa 2001 9-12
Figure 3. Big Chino Wash drainage overview indicating the partridge Creek, Big Chino and Williamson Valley was sub-drainages. 9-13
Figure 4. USGS Daily gauge discharge at Williamson Valley Wash near Paulden, Arizona 1965 – 2009. 9-15
Figure 5. USGS Daily gauge precipitation at Williamson Valley Wash near Paulden, Arizona 2002 – 2009. 9-16
Figure 6. Partridge Creek drainage. 9-17
Figure 7. Garret Tank and downstream drainage, July 2008. 9-19
Figure 8. Image of Shucking Tank, located just off-channel of Partridge creek (Copyright:© 2009 ESRI, i-cubed, GeoEye). 9-25
Figure 9. Shucking Tank in September 2006. 9-26
Figure 10. Shucking Tank, December 2004. 9-27
Figure 11. Photo of Presley Tank, September 2006 9-31
Figure 12. Photo of Presley Tank, July 2009. 9-32
Figure 13. Stone Dam topographic map (ESRI ArcGIS Online and data partners including USGS and © 2007 National Geographic Society). 9-36
Figure 14. Stone Dam photo taken January, 2007. 9-38
Figure 15. Photo of the large cracks through McLellan Dam that allow water to pass through the structure; photo taken on February, 2009. 9-38
Figure 16. Steel Dam, located down ~0.35 miles downstream of Stone Dam on Johnson Creek. Photo taken January, 2007. 9-39
Figure 17. Photo of downstream side of Steel Dam taken January, 2007. 9-40
Figure 18. Photo of Steel Dam with debris indicating water flows over the top of the dam; photo taken August, 2009. 9-40
Figure 19. Image of Granite Basin Lake (Copyright:© 2009 ESRI, i-cubed, GeoEye). Granite Basin Dam is at the upper right of the lake, water spilling over Granit Basin dam flows into Mint Wash. 9-46
Figure 20. Partridge Creek looking upstream from Interstate 40 crossing, April 2009 9-53
Figure 21. Confluence of Partridge Creek (on right) and Big Chino Wash, December 2004. 9-54
Figure 22. Confluence of Big Chino Wash (flowing left to right) and Williamson Valley Wash (bottom flow coming from left), December 2004. 9-55

Figure 23. Sullivan Dam downstream from the confluence of Big Chino Wash (flowing left to right) and Williamson Valley Wash at the upstream end of the Upper Verde reach, February 2005. 9-56
Figure 24. Discharge data from USGS gauge 09503700 located on the Verde River near Paulden, Arizona depicts high discharge events in August 2008 as well as during spring 2010. 9-57
Figure 25. Discharge data from USGS gauge 09502800 located at Williamson Valley Wash near Paulden, Arizona indicates that no discharge was registered at the gauge during August 2009. 9-58
Figure 26. Granite Creek sub-watershed location within the Verde River watershed. 9-67
Figure 27. Granite Creek sub-watershed and proposed stocking locations. 9-68
Figure 28. Image of upper (right) and lower (left) Goldwater lake (Copyright:© 2009 ESRI, i-cubed, GeoEye). 9-69
Figure 29. Dam at upper Goldwater Lake, April 2004. 9-72
Figure 30. Spillway below dam at upper Goldwater Lake, December 2009. 9-73
Figure 31. Spillway at lower Goldwater Lake, December 2009. 9-73
Figure 32. Spillway at lower Goldwater Dam, December 2009. 9-74
Figure 33. Culvert at below spillway at lower Goldwater Dam, December 2009. 9-75
Figure 34. Bannon Creek below spillway at lower Goldwater Lake, December 2009. 9-75
Figure 35. Aerial satellite image of Watson Lake and Willow Creek Lakes (Copyright:© 2009 ESRI, i-cubed, GeoEye). 9-81
Figure 36. Aerial satellite image of Watson Lake through which Granit Creek flows (Copyright:© 2009 ESRI, i-cubed, GeoEye). The dam is located at the north end of the reservoir. 9-82
Figure 37. Diversion Dam at UTM 12S 370118 mE 3830219mN (NAD27), USGS gage 09503300. Picture is from City's diversion canal. 9-85
Figure 38. Image of Willow Lake (Copyright:© 2009 ESRI, i-cubed, GeoEye). The dam and flow is from lower left to upper right with Willow Creek coming in just above the lower subdivision. 9-91
Figure 39. Satellite view of Willow Lake (left), Watson Lake (right) and Granite Creek (Copyright:© 2009 ESRI, i-cubed, GeoEye). 9-100
Figure 40. Hansen Materials on Granite Creek downstream of Highway 89A crossing, adjacent to Antelope Hills Golf Course. 9-101
Figure 41. Granite Creek water recharge basin upstream of Highway 89A crossing. The Granite Dells near Watson Lake can be seen on the skyline right. 9-102
Figure 42. Discharge measured at USGS stream on Granite Creek just upstream of Watson Lake during 1932-1947 and 1994-2009. 9-103
Figure 43. Discharge measured at USGS stream gage on Granite Creek approximately 1.5 miles downstream of Watson Reservoir during 2000-2009. 9-104
Figure 44. Del Rio Springs Ranch Pond 2009 (Copyright:© 2009 ESRI, i-cubed, GeoEye). 9-107
Figure 45. Discharge measured at USGS stream gage at Del Rio Spring during 1997-2009. 9-108

Figure 46. Overview of Verde River watershed highlighting the Sycamore Creek drainage. 9-112
Figure 47. Sycamore Creek drainage. 9-113
Figure 48. Sycamore Creek Complex. 9-115
Figure 49. Topographic map depicting Perkins Tank, which if it spills, would flow into Sunflower Flat and in turn Big Spring Canyon, and finally Sycamore Creek. 9-117
Figure 50. Sunflower Flat. 9-118
Figure 51. Initial drop into Big Spring Canyon (approximately 70 foot Vertical Drop). 9-119
Figure 52. Initial drop into Big Spring Canyon (approximately70 Foot Vertical Drop). 9-120
Figure 53. Photo depicting approximately125-150 foot vertical drop within Big Spring Canyon. 9-121
Figure 54. Plunge pool below the Big Spring Canyon drop (approximately 125-150 foot vertical drop). 9-122
Figure 55. Aerial photo of Sunflower Flat (taken from World Imagery coverage layer). 9-123
Figure 56. Map of Sycamore Creek buffered stocking complex. 9-125
Figure 57. Aerial photo of White Horse Lake (World Imagery). 9-127
Figure 58. Photo depicting the canyon drop (approximately30 foot) approximately 0.5 miles below Favour tank over which water flows before reaching Sycamore Canyon. 9-129
Figure 59. High gradient slope of unnamed tributary flowing into Sycamore canyon (approximately900 ft. drop in 1.2 miles). 9-130
Figure 60. Steep canyon slope of tributary to Sycamore Canyon. 9-130
Figure 61. Photograph of Elk Tank. 9-133
Figure 62. Elk Tank following being pumped in 2006. 9-134
Figure 63. Elk Tank water level in august 2007. 9-135
Figure 64. 100 foot drop located 0.07 miles downstream from Whitetail tank on JD Dam Wash. Note the person in the upper center of the picture for size reference. 9-137
Figure 65. Photo of Middle Tank. 9-139
Figure 66. Photo of JD Dam Lake. 9-143
Figure 67. Upper Verde Sub-Watershed and surrounding Sub-Watersheds 9-149
Figure 68. Upper Verde River Wildlife Area. 9-150
Figure 69. Locations of known springs and gauges along the upper Verde River from Sullivan Lake to Sycamore Creek (Wirt et al. 2005). 9-154
Figure 70. Pecks Diversion September 20, 2004. 9-165
Figure 71. Location of Native Fish Database sample sites as summarized in Table 43. 9-174
Figure 72. Middle Verde stocking locations and hatchery overview 9-196
Figure 73. Pecks Lake diversion on the Verde River near Clarkdale as barrier to upstream movement of fish. 9-197
Figure 74. Oak Creek and Department Hatcheries 9-199
Figure 75. Fish collection locations for data in Table 53. 203
Figure 76. Oak Creek with Grasshopper Falls location 205
Figure 77. Diversion dam on Spring Creek, upstream from Oak Creek confluence. 9-210
Figure 78. Map of Oak Creek and Lower Verde Sub-Complexes of Middle Verde buffered stocking complex: 9-211

Figure 79. Diversions above Deadhorse Ranch State Park. 9-226
Figure 80. Intake structure with screened top, middle lagoon at Deadhorse State park. 9-227
Figure 81. View of Mingus Lake from dam circa 2002. 9-230
Figure 82. Mingus Lake from dam in June 2009. 9-231
Figure 83. Channel immediately downstream from Mingus Lake Dam. 9-233
Figure 84. Approximate watershed area for Huffer Lake. 9-235
Figure 85. Wet Beaver and West Clear creeks Sub-Complex of Middle Verde buffered stocking complex. 9-238
Figure 86. East Verde River watershed overview map with proposed stocking locations in red. 9-279
Figure 87. East Verde tributaries and connectivity. 9-282
Figure 88. Daily discharge (cfs) for the East Verde River diversion from East Clear Creek during 2009. 9-284
Figure 89. Mean monthly discharge (cfs) for the USGS gage at the East Clear Creek Diversion into upper East Verde River for the period from 11-1-65 to 9-30-08. 9-285
Figure 90. Lower Verde buffered stocking complex: 9-290
Figure 91. Green Valley Lake aerial photo showing upper middle and lower lakes, and the golf course and ponds downstream. 9-293
Figure 92. Mean monthly discharge (cfs) for the USGS gage downstream at the Lower East Verde near Childs, AZ for the period from 9-1-61 to 9-30-08. 9-298
Figure 93. Mean monthly discharge (cfs) for the USGS gage on the Lower Verde River below Tangle Creek for the period from 10-1-85 to 9-30-08. 9-306

List of Tables

Table 1. Selected significant perennial stream reaches in the Verde River watershed upstream of Horseshoe Lake. 9-11
Table 2. Stocking history of Garrett Tank 1979 – 2009. 9-18
Table 3. AGFD Fish Survey data from Garrett Tank from 1982 – 2007. 9-21
Table 4. Shucking Tank fish stocking history 1992 – 2009. 9-23
Table 5. Fish Survey history for Shucking Tank, 1991 – 2009. 9-28
Table 6. Stocking history of Presley Tank 1982 – 2009. 9-30
Table 7. Fish Survey history for Presley Tank 1985 – 2009. 9-33
Table 8. Stone Dam stocking history 2007 – 2009. 9-36
Table 9. 2003 Fish captured in hoop nets and gill nets set in Stone Dam during a 2003 survey. 9-42
Table 10. Fish captured in gill nets set in Steel Dam during a 2009 survey. 9-42
Table 11. Fish captured in gill nets set in McLellan Reservoir during a 2009 survey. 9-43
Table 12. Stocking history for Granite Basin Lake, 1942 – 2009. 9-47
Table 13. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Granite Basin Lake 2003 – 2007. 9-50
Table 14. Stocking history of Goldwater Lake, 1976 - 2009. 9-70

Table 15. Species, number, relative abundance, size range and catch per unit effort of fish surveys by electrofishing at Goldwater Lake. 9-77
Table 16. Stocking history of Watson Lake 1941 – 2009 9-83
Table 17. Number, relative abundance, relative biomass and catch per unit effort of sampling at Watson Lake. 9-87
Table 18. Stocking history for Willow Creek. 9-92
Table 19. Number, relative abundance, size range and catch per unit effort of sampling by electrofishing at Willow Lake 2000-2008 9-95
Table 20. Numbers of species and relative abundance sampled by backpack electrofishing from 1 mile of Granite Creek above confluence with the Verde River, April 1999 and May 2003. 9-108
Table 21. Perkins Tank stocking history from 1968 to 2009. 9-115
Table 22. White Horse Lake stocking history from 1936 to 2009 9-128
Table 23. Elk Tank stocking history from 1989 to 2009. 9-133
Table 24. Middle Tank stocking history from 1984 to 2009. 9-139
Elk Tank, Middle Tank, and JD Dam Lake are popular catch-and-release fisheries for the local fly-fishing anglers of Williams, Flagstaff, and surrounding areas. All three tanks have catch-and-release, artificial fly and lure single barbless hook regulations. Table 25. JD Dam Lake stocking history from 1936 to 2009. 9-143
Table 26. 2007 JD Dam Lake trammel net and angling survey. 9-145
Table 27. 2008 JD Dam Lake gill netting survey. 9-145
Table 28. Historical Stocking Report Verde River – Sullivan Lake to Perkinsville. 9-150
Table 29. Historical Stocking Report Verde River – Perkinsville to Sycamore Creek. 9-151
Table 30. USGS gauge data for Granite Creek showing mean daily flows for selected months. 9-154
Table 31. USGS gauge data for Granite Creek showing mean monthly flows over 5 cfs. 9-155
Table 32. USGS gauge peak flow data for Granite Creek. 9-156
Table 33. Comparison of mean daily flows (cfs) at Williamson Valley Wash, Granite Creek, and Verde River at Paulden USGS gauges. 9-156
Table 34. Comparison of Paulden and Williamson Valley Wash gauge data to estimate potential contributions from Big Chino Wash and Granite Creek. Modified from Clark 2003a. 9-160
Table 35. USGS gauge yearly peak flow data for Williamson Valley Wash. 9-160
Table 36. USGS gauge yearly peak flow data for Verde River near Paulden. 9-161
Table 37. USGS gauge data for Verde River near Paulden showing mean monthly flows over 100 cfs (years shown are actual calendar years, not water years). 9-162
Table 38. Species and number of individuals sampled in Stillman Lake, using a canoe based electrofishing unit, 150' experimental gillnets and 3' diameter hoopnets, 2000 through 2008. 9-168
Table 39. Species and number of individuals sampled in the upper Verde River using a canoe based electrofishing unit, 2000 through 2009 (additional breakdown of sampling data by site, year and species for years 2000-2006 is provided in Table 51). 9-168

Table 40. Native Fish community summary of 7 sites sampled from 1994 to 2008 on the upper Verde River, Prescott National Forest (Rinne unpublished data); additional data breakouts by year, site and species are provided in Table 44 through Table 50. 9-169
Table 41. Nonnative Fish community summary of 7 sites sampled from 1994 to 2008 on the upper Verde River, Prescott National Forest (Rinne unpublished data) - additional data breakouts by year, site and species are provided in Table 44 through Table 50. 9-169
Table 42. All largemouth bass records for upper Verde River. 9-170
Table 43. Summary of fishes collected from the upper Verde River, above TAPCO Diversion, from the AGFD Native Fish database (data points depicted in Figure 71). Grayed rows are species proposed for stocking in the upstream watershed. 9-172
Table 44. Survey history for Burnt Ranch Site (Campbell Place). 9-184
Table 45. Survey information for FR 638 site. 9-185
Table 46. Survey information for Duff Spring Site. 9-186
Table 47. Survey information for Bear Siding (= U.S. Mine) site. 9-187
Table 48. Survey information for Perkinsville Site. 9-188
Table 49. Survey information for Black Bridge Site. 9-189
Table 50. Survey information for Sycamore Site. 9-190
Table 51. AGFD Surveys in the upper Verde River 2000-2006[1]. 9-191
Table 52 .Stocking history in Oak Creek (1933 to present). 200
Table 53. Fish collected from Oak Creek, 1987-2000 from AGFD NFDB. Collection localities depicted in Figure 75. 201
Table 54. Summary of fish collection data from Oak Creek, 1991-2007 (AGFD unpublished data). 9-206
Table 55. Stocking history in Wet Beaver Creek**.** 9-215
Table 56. Arizona Game and Fish Department Wet Beaver Creek Sampling 1985 -1998. Below, “in” or” above” indicates where the sampling site was relative to the stocked reach. 9-216
Table 57. Walker Creek 2007 Electrofishing Station 1. Upstream From Private Property Fence. 9-218
Table 58. Walker Creek 2007 Electrofishing Station 2. Upstream From Private Property/Below Diversion Dam. 9-218
Table 59. Walker Creek 2007 Electrofishing Station 3. Diversion Dam. 9-218
Table 60. Red Tank Draw 2007 Fish Survey 9-219
Table 61. Stocking history at Deadhorse State Park 9-223
Table 62. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Middle Lagoon July 2006. Effort in minutes. 9-227
Table 63. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Lower Lagoon July 2006. Effort in minutes. 9-227

Table 64. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Middle Lagoon April 2008. Effort in minutes. 9-228
Table 65. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Lower Lagoon April 2008. Effort in minutes. 9-228
Table 66. Stocking History for Mingus Lake. 9-231
Table 67. Stocking history at Huffer Lake. 9-234
Table 68. Stocking history in West Clear Creek. 9-240
Table 69. West Clear Creek Fish Composition 1994-1998 by Site Location. Downstream to Upstream 9-242
Table 70. Stocking history in the Middle Verde River 9-249
Table 71. Total numbers of rainbow trout stocked in the Middle Verde River since 1999..... 9-250
Table 72. Creel Summaries for Middle Verde River trout fishery. 9-250
Table 73. Summary of Region VI electrofishing data from the Verde River, Beasley Flat to Childs reach, 1997-1998. 9-253
Table 74. Summary of Region VI trammel and gill netting data from the Verde River, Beasley Flat to Childs reach, 1997-1998. 9-253
Table 75. Summary of Region VI seining data from the Verde River, Beasley Flat to Childs reach, 1997-1998. Parentheses indicate relative abundance. Brackets indicate CPUE. 9-254
Table 76. Region III electrofishing data from Middle Verde River 1998-2009, including species and total numbers sampled by year. 9-254
Table 77. Region III seine netting from the Middle Verde River 2003-2009, including species and total numbers sampled by year. 9-255
Table 78. Stockings of Colorado pikeminnow into the Middle Verde River 9-268
Table 79. Recaptures (post-stocking) of Colorado pikeminnow in the Lower Verde River since larger (300mm) fish began to be stocked in 1995 9-269
Table 80. Stockings of razorback suckers into the Middle Verde River. 9-271
Table 81. Recaptures (post-stocking) of razorback suckers in the Lower Verde River since larger (300mm) fish began to be stocked in 1993 9-272
Table 82. Surveys in the Lower Verde River (Childs to Horseshoe Reservoir) that did not document rainbow trout in occupied razorback sucker habitat 9-276
Table 83. Stocking History for the East Verde River. 9-280
Table 84. Summary of the most recent fish surveys in East Verde River Tributaries connected to the proposed stocking area. 9-287
Table 85. Historic Urban Fishing Program fish stocking of Green Valley Lakes 9-292
Table 86. Mean monthly discharge (cfs) for the USGS gage downstream at the Lower East Verde near Childs, AZ for the period from January 2000 to September 2008. ... 9-298
Table 87. Summary of the most recent fish surveys in East Verde River Tributaries downstream of highway 87 9-301

Chapter 9 VERDE RIVER WATERSHED

Physical geographic description

Drainage area

The Verde River watershed (Figure 1) is located in north-central Arizona and drains an area of approximately 6623 square miles. The area includes the 2,153 square miles of the Big Chino watershed that drains into the Verde River mainstem above Sullivan Dam. The river flows eastward from Sullivan Dam to Perkinsville, then heads southeastward to its confluence with Fossil Creek, where it continues southward until its joins the Salt River (ADWR 2003). Perennial sections of the mainstem Verde River are divided up into three reaches for this consultation. The Upper Verde is defined as that part of the watershed above and including Sullivan Dam to the mouth of Sycamore Creek; the Middle Verde is defined as the mouth of Sycamore Creek to Childs Power Plant; and the Lower Verde is defined as Childs Power Plant to Horseshoe Lake Dam, and includes Horseshoe Lake.

The Verde River is intermittent immediately below Sullivan Dam and begins flowing at the upstream end of Stillman Lake, about 1mile downstream of the dam. Perennial flow extends approximately 140 miles from this area to its confluence with the Salt River just east of Phoenix. Within the Middle reach, numerous agriculture diversions exist. The Pecks Lake Diversion, also called the TAPCO Diversion Dam, near the community of TAPCO is a significant diversion owned by the Freeport McMoran Corporation located in the vicinity of Clarkdale. The Department conducted research from 1994 to 1996 and determined that it was an effective barrier to upstream trout movement (Kubacki 1998). Other diversion dams exist in the Middle reach, providing water for the following ditch systems: Cottonwood, Woods, Ok and Eureka.

Range of Elevations

Elevations in the watershed range from 7,400 feet at Mount Floyd in Big Chino Wash; 7,273 feet at Hide Mountain in Williamson Valley Wash; 4,366 at Sullivan Dam; 3,868 at Perkinsville; 3,449 at Peck Diversion; and down to 1300 feet at the Salt River Confluence.

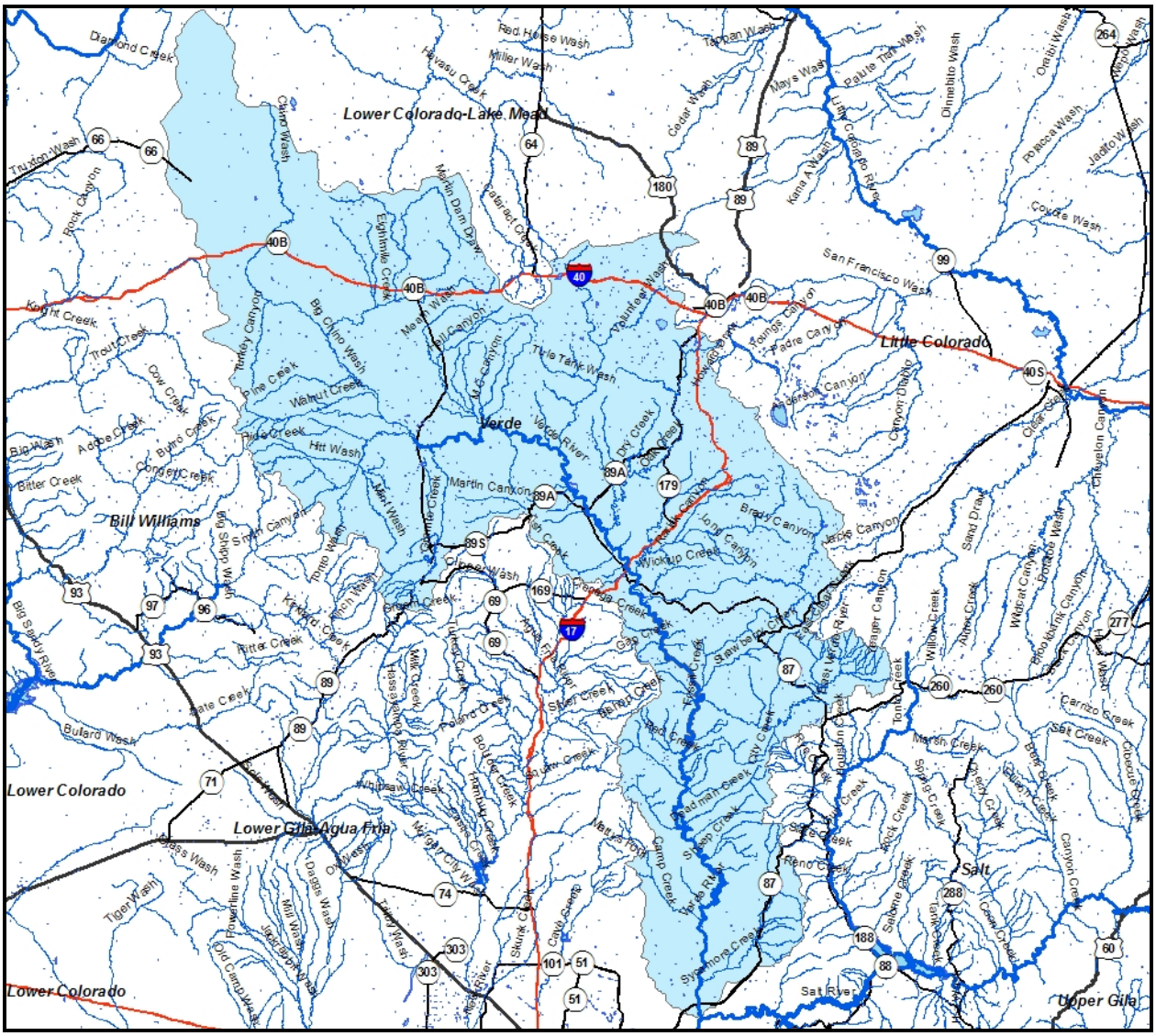

Figure 1. Verde River Watershed.

Tributaries

Several major perennial tributaries drain the area north and east of the Verde River and flow in a southwesterly direction. Groundwater discharge maintains perennial flow in these tributaries and in the Verde River mainstem. The largest of the perennial stream reaches in the Verde River watershed are listed in Table 1 (ADWR 2003). Other tributaries in the watershed not listed below have less than 2 miles of perennial water. Most are intermittent or ephemeral.

Table 1. Selected significant perennial stream reaches in the Verde River watershed upstream of Horseshoe Lake.

Reach	**Length (mi)**
Sycamore Creek (North of Cottonwood)	2
Oak Creek	33
Wet Beaver Creek	20
West Clear Creek	37
Fossil Creek	9
East Verde River	40

Vegetation

Extensive reaches of riparian vegetation are found along the Verde and several tributary streams, composed mainly of mixed broadleaf, cottonwood/willow, mesquite, and strand vegetation. Conifer and oak riparian habitat is found within the higher elevation areas of West Clear Creek and the East Verde River (ADWR 2007).

Twenty four stocking locations are proposed for the Verde watershed. These include tanks at Garrett, Presley, Elk, Perkins, Middle, Scholze, JD Dam, Stone Dam and Huffer; lakes at Granite Basin, White Horse, Mingus, Deadhorse, Stoneman, Watson, Willow, Goldwater; and stream reaches at Middle Verde, Wet Beaver Creek, Oak and West Fork of Oak Creek, West Clear Creek, Dude Creek, and East Verde River. Proposed stocking actions in the watershed will be evaluated as three reaches, the Upper Verde, which consists of the Big Chino Wash complex, Granite Creek Complex, and Sycamore Creek Complex for a total of 13 stocking sites; Middle Verde at 8 stocking sites; and the Lower Verde at 3 stocking sites. Of these, proposed stocking regime changes are at 19 of the locations, and additionally, we propose three new locations for stocking.

UPPER VERDE RIVER SUB-WATERSHED

Physical geographic description

Drainage Area

The Upper Verde Watershed contains 14 proposed stocking locations. These locations form three distinct groups; Big Chino Wash including Garrett, Shucking, Presley, Stone Dam and Granite Basin Lake; Granite Creek including Watson, Willow Creek, and Goldwater; and Sycamore Creek at Scholz, White Horse, Elk, Middle, JD Dam, and Perkins. One major and several minor

diversion dams exist in the Upper Verde River. The Peck's Lake diversion (Figure 2) is located upstream of Clarkdale and also may be known as the TAPCO diversion. This diversion dam forms the downstream extent of what is herein considered the Upper Verde Watershed.

Figure 2. Photo of Pecks Lake Diversion circa 2001.

Range of elevations

Elevations in the watershed range from over 7,600 feet near Mingus Mountain down to approximately 3,300 feet at the Pecks Lake diversion Dam.

Tributaries

The significant tributaries in this sub-watershed are the Big Chino Wash including Williamson Valley Wash, Granite Creek, Sycamore Creek and Hell Canyon. The Big Chino and Granite Creek flow into the Upper Verde at the upstream end of the reach near Sullivan Dam, and Sycamore Creek flows into the Upper Verde, and defines the downstream end of the Upper Verde reach.

BIG CHINO WASH COMPLEX

Physical Geographic Description

Drainage area and elevations

Big Chino Wash drains a surface area of 2,153 square miles, nearly one third of the entire Verde River Watershed. Elevations range from a high of over 7,000 feet near Granite Basin Lake down to about 4,366 feet above sea level at Sullivan Dam (Figure 3). The significant tributaries in the Big Chino Complex are intermittent Partridge Creek, intermittent Big Chino Wash, and Williamson Valley Wash, which is interrupted perennial and ephemeral.

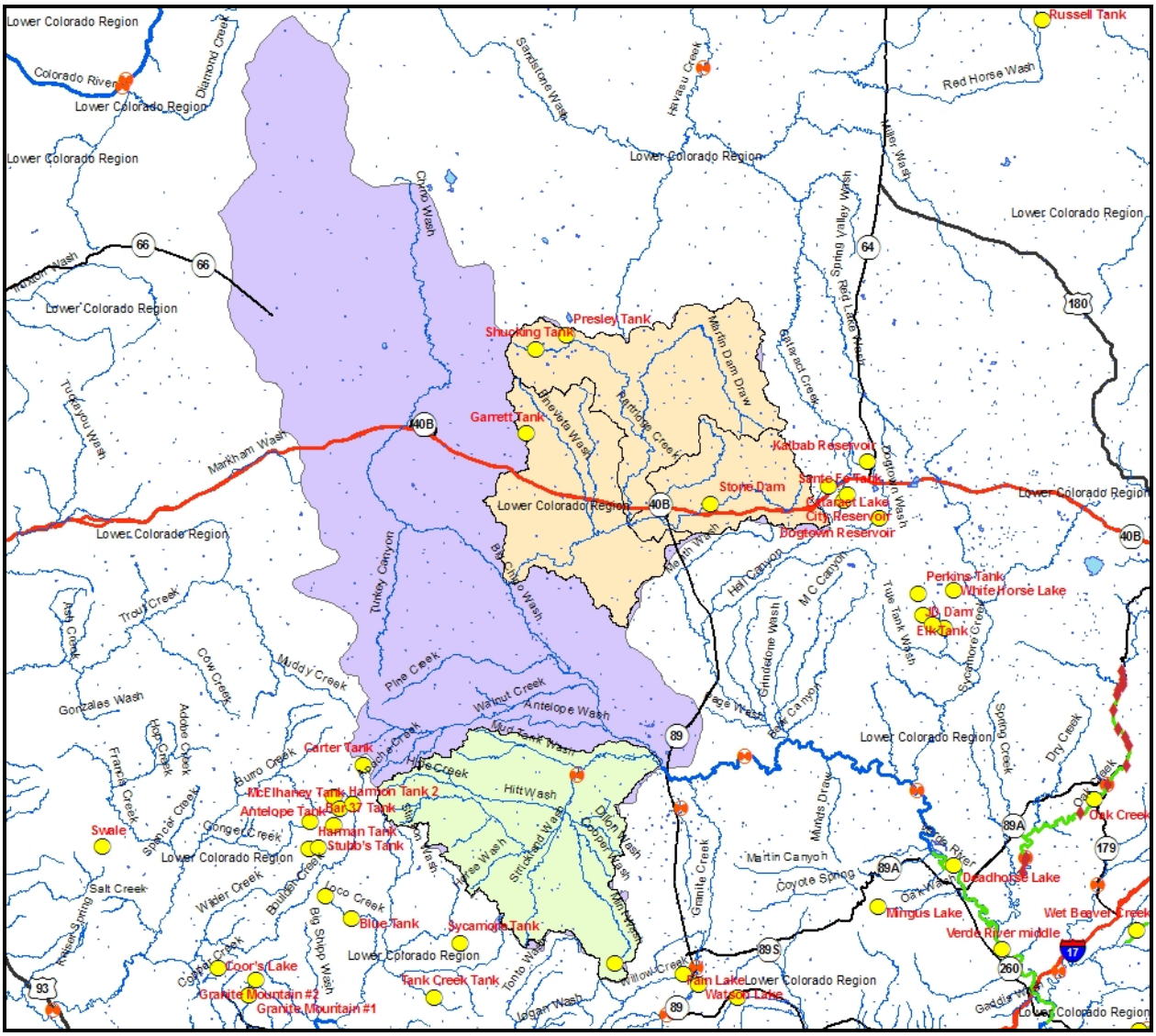

Figure 3. Big Chino Wash drainage overview indicating the partridge Creek, Big Chino and Williamson Valley was sub-drainages.

There were two USGS stream gauges in the watershed, 09502800 Williamson Valley Wash near Paulden, and 09502750 Walnut Creek near Ashfork; the Walnut Creek gage only operated for one year, between August 1991 and September 1992. The Williamson Valley Wash gauge is located approximately 12.5 miles upstream from its confluence with Big Chino Wash. The gauge measures runoff from a 255 square mile area and is located as 4,455 feet above sea level. Daily gauge discharge data are available from 1965 to 2009, and daily precipitation data are available from 2002 to 2009 (Figure 4 and Figure 5).

Big Chino Wash only flows in response to broad-scale precipitation events and spring-runoff in years of normal to above normal snowfall in the watershed. Many flood events in the desert southwest can by characterized as “local”. A local event can be heavy rain or snow water equivalent occurring in a relatively small area of a watershed. USGS gauge 09503700 near Paulden is the first gauge in the Verde River main stem. From this gauge, precipitation event magnitudes can be extrapolated for widespread non-local events. For this to be done on local tributary events such as the Big Chino, one must use other gauges and tools. Major tributaries to the upper Verde include Williamson Valley Wash, Big Chino Wash, Walnut Creek, and Granite Creek. USGS gauge 09502800 is situated just above the mouth of Williamson Valley Wash near Paulden. A gauge was installed in 1999 just downstream of Watson Lake on Granite Creek (USGS 09503300). Rainfall and snow water equivalent records are another way to look at possible “local” events. Records are kept for Prescott (upper Granite Creek), Seligman (Big Chino Wash), and a site on Walnut Creek. With these data sources, it is possible to look at precipitation events in tributaries and make assumptions about periodicity, location and magnitude.

Small headwater channels of a drainage network are important in determining the amount of sediment transported downstream during storm events. This increased sediment load can have negative effects on channel stability, fish, invertebrates, and overall stream productivity. High sediment loads can often result in fish mortality as a result of decreased dissolved oxygen concentrations, concurrent with increased suspended sediments (Bozek and Young 1994; Waters 1995; Rinne and Carter 2008). Fine clay sediments transported with runoff often prohibit fish survival in pools following runoff events.

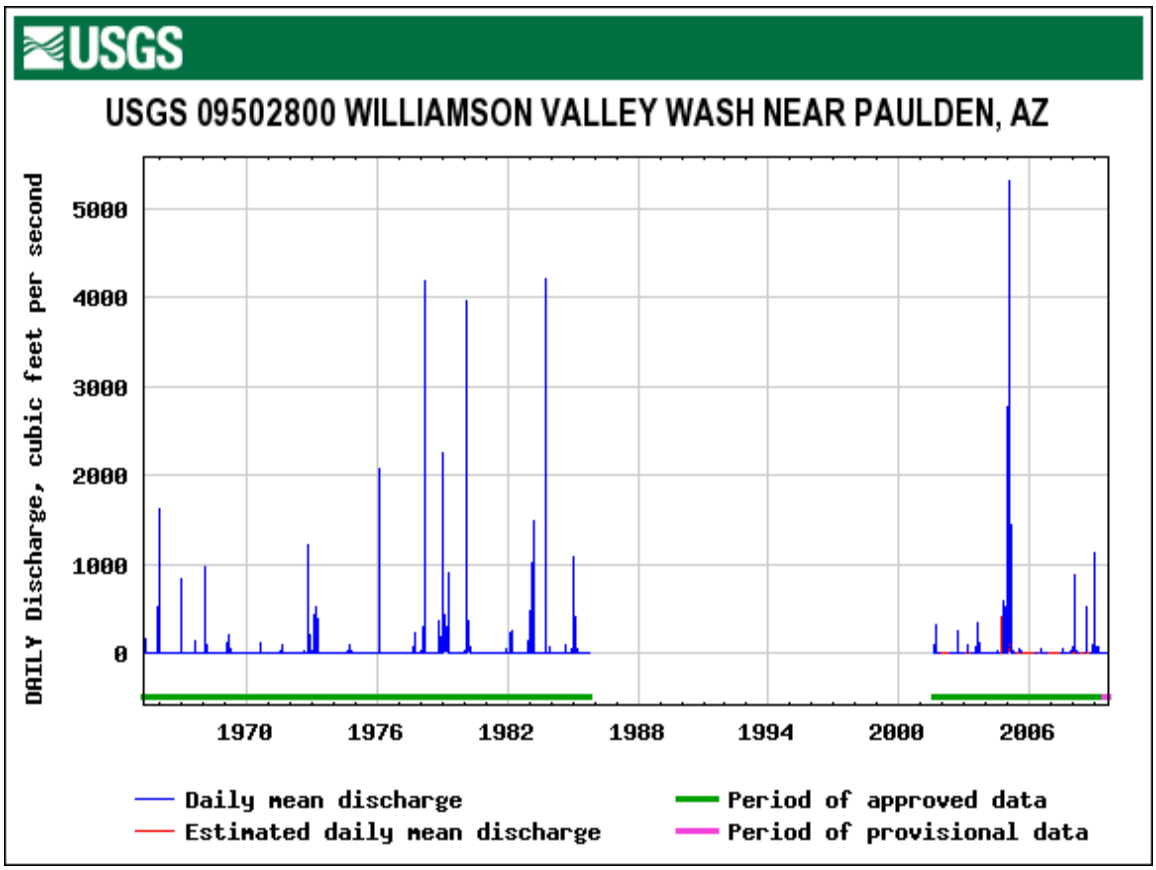

Figure 4. USGS Daily gauge discharge at Williamson Valley Wash near Paulden, Arizona 1965 – 2009.

The Big Chino Complex contains five proposed stocking locations: Garrett, Shucking and Presley tanks, Stone Dam and Granite Basin Lake. These locations are contained within two distinct tributaries, Partridge Creek and Williamson Valley Wash. The Big Chino Wash originates east of the Aubrey Cliffs area northwest of Seligman. Big Chino Wash flows southeast to Paulden during spring-runoff in years of normal to above normal snowfall in the watershed or in response to heavy broad-scale precipitation events; otherwise it is dry.

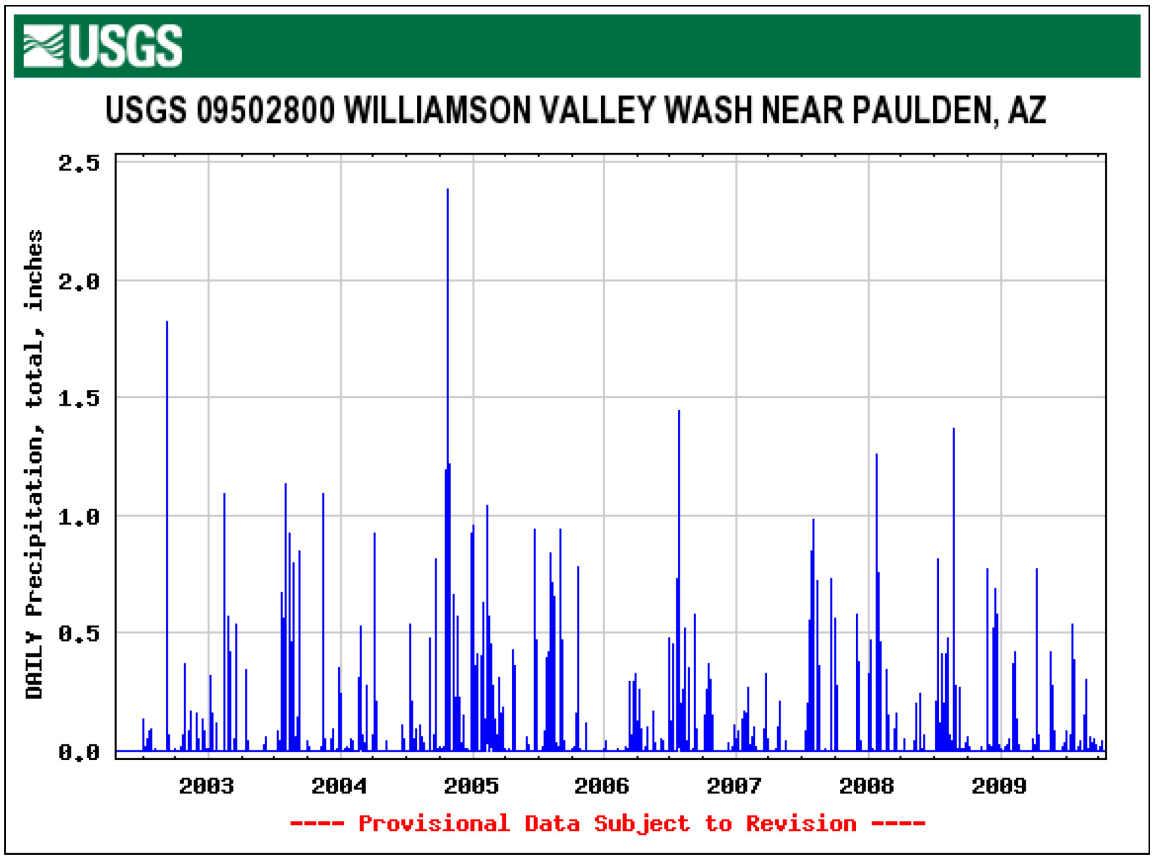

Figure 5. USGS Daily gauge precipitation at Williamson Valley Wash near Paulden, Arizona 2002 – 2009.

Garrett Tank

Site Description

Garrett Tank is a 1.5 acre impoundment located roughly 8 miles east of Seligman, on a small unnamed tributary to Pineveta Wash, which is a tributary to Partridge Wash, approximately 6 miles south of Mt. Floyd (Figure 6). This water is primarily used for livestock and is on private land surrounded by a checkerboard of State Trust Land and adjacent private sections. The tank is on the Diamond 7 Ranch, with access permission granted via a letter of support signed by the ranch in 1996. It is not known when the tank was created but it has provided fishing opportunities since at least the late 1970's. Garrett Tank can be accessed by 3 miles of dirt road from Route 66 near Seligman, and currently has no recreational facilities.

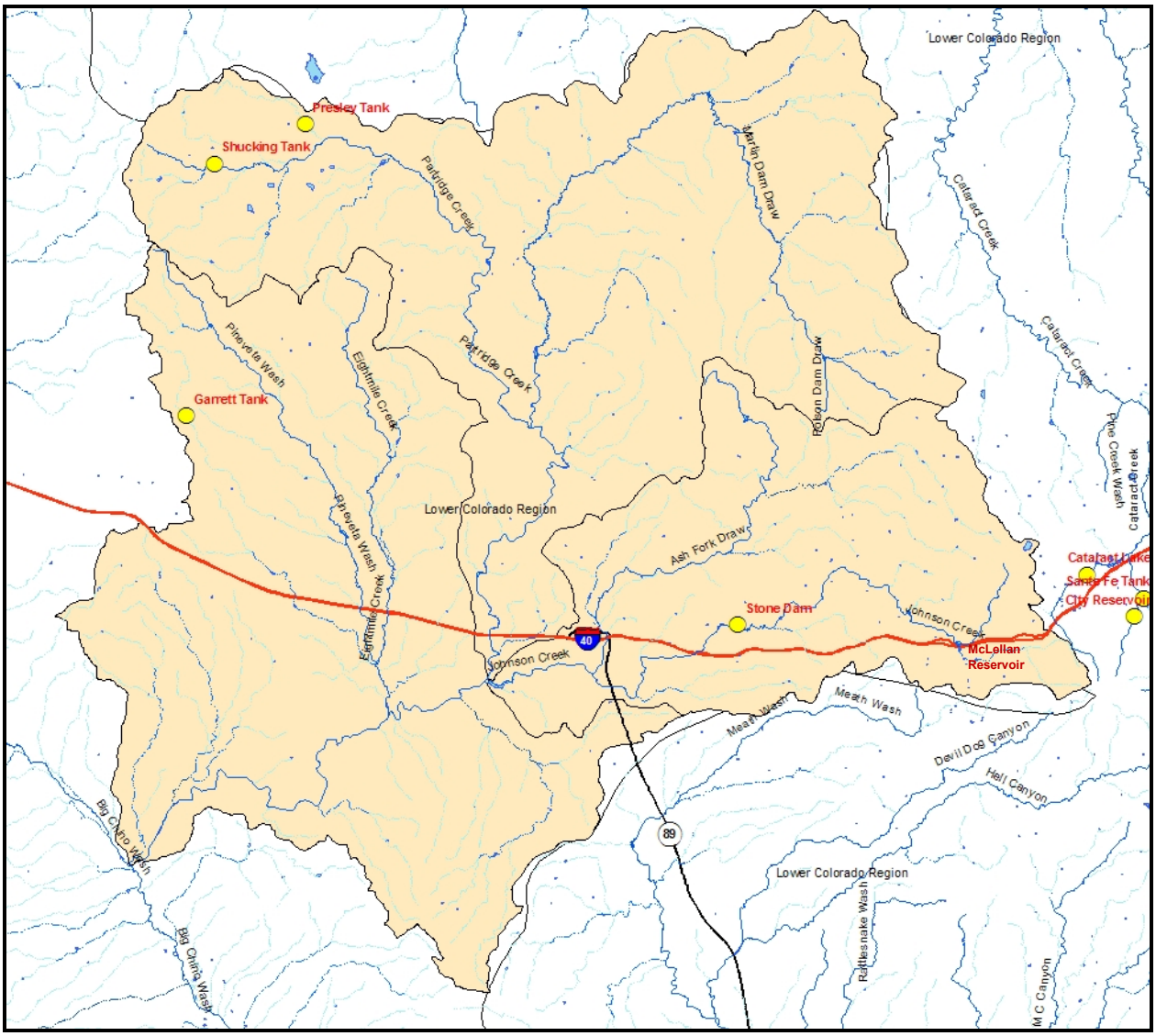

Figure 6. Partridge Creek drainage.

Management of Water Body

Garrett Tank is managed primarily as a warm water self-sustaining largemouth bass and bluegill fishery, and a put-and-take channel catfish and rainbow trout fishery. Since local recreational fishing opportunities are few in the area, the tank is utilized for angling retention and recruitment activities and the Department uses the tank during "National Fishing Week" and "Kiddy Fishing Derbies" in summer months. To increase angler success, catchable sized channel catfish have been stocked annually since 1996 for such events with approximately 200 catchable 2 pound (average size) channel catfish (Table 2).

No formal creel data have been gathered for Garrett Tank. Anecdotal information from Officer Tim Pender (Wildlife Manager for Game Management Unit 10) regarding fishing pressure at Garrett Tank indicates that fishing is typically by local residents of Seligman and Ash Fork. Fishing in Garrett Tank is highest after the catfish stockings for "Free Fishing Day". Rainbow trout are not expected to persist in Garrett Tank due to the high water temperatures in the summer, and would be considered a put-and take-fishery only. The channel catfish fishery will continue to be primarily a put-and-take fishery with some over wintering of individuals. Black crappie is a new species proposed for stocking in this water.

The Department conducts periodic sampling using hoop-nets or gill nets to monitor populations. Largemouth bass do not appear to grow to a quality size of 300 mm in Garrett Tank, and just barely reach a stock size of 200 mm (Gabelhouse 1984). While largemouth bass persist in Garrett Tank, they do not appear to be an important component in the fishery, and are not requested for additional stockings, as these resources are better utilized elsewhere.

Table 2. Stocking history of Garrett Tank 1979 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Bluegill	1987	1994	4	5,500
Channel catfish	1979	2009	17	5,942
Largemouth bass	1985	2000	2	1,402
Rainbow trout	1991	1998	4	4,467
Total			16	14,011

As with all the small ponds or cattle waters in the area, Garrett Tank evaporates periodically, to the point where warm water sport fish species may stunt or die. Future management would focus on providing stock sizes of channel catfish, black crappie, and bluegill for anglers to enjoy. Periodic stocking to maintain sizes usable to anglers may be necessary due to drying and/or catastrophic wildfire.

Proposed Action

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

Catchable and fingerling bluegill sunfish and black crappie stockings would occur in spring, summer, or fall, depending on stock availability and costs; numbers would not exceed 500 per acre for fingerlings and 50 per acre for catchables annually.

The Department proposes to stock catchable sized channel catfish and catchable sized rainbow trout. Rainbow trout and channel catfish stockings would be used to support angler retention and recruitment activities. Rainbow trout stocking would only occur in the winter months of December through March, in support of fishing workshops for area anglers. Catfish stockings would occur during the summer months of May through August. Numbers of catfish and trout stocked would not exceed 100 per acre of each species twice annually.

Water distribution/connectivity

Garrett Tank is located in the headwaters of the Partridge/Big Chino Wash drainage, upstream of the Verde River. It is separated from the Verde River by approximately 52 miles of ephemeral channel. The tank is primarily fed by spring snow melt. There are no other tanks upstream from Garrett Tank and rarely, the tank may catch runoff from localized thunderstorms. Garrett Tank has a fairly large capacity to hold water, and during most spring-runoff events the tank is able to retain most if not all flows. Figure 7 shows the tank and surrounding habitat.

Figure 7. Garret Tank and downstream drainage, July 2008.

If the tank fills to the point of spilling, water flows to the southwest down an access road roughly one-quarter mile before reaching an unnamed wash. From here the water continues 6.8 miles into Pineveta Wash, then 5.4 miles down Pineveta Wash, through Little Pineveta Tank, 8.5 miles downstream from Garrett Tank, and Williscraft Tank, which is 0.75 miles upstream from its

confluence with Partridge Creek. It flows into Partridge Creek for 13.2 miles along the intermittent, ephemeral channel into Big Chino Wash, and 26.5 miles along Big Chino Wash to Sullivan Lake at the upstream end of the Upper Verde Reach.

Garrett Tank spilled in 2005 and water flowed down and connected to Pineveta Wash. It is assumed flow continued to Partridge Creek though no data exists to confirm this. Garrett Tank has never gone completely dry as far as records show. It did get extremely low in 2002 and 2003 before filling again in 2004. Williscraft Tank is thought to completely dry on a frequent basis; there is no information about Little Pineveta Tank. See the Big Chino Complex section for discussion of downstream water distribution and connectivity for Partridge Creek downstream to Big Chino Wash and the Upper Verde River.

There are no known downstream water users, since surface water is not available during most months of the year. The Yavapai County Flood Control District (YCFCD) plans to install rain gauges and stream flow meters in Partridge Creek due to increased development in the area. YCFCD also indicated that accuracy of flow meters is extremely variable due to the high sediment loads carried in Partridge Creek (M. Massis, pers. comm.). The purpose of these gauges is not to measure permanent flow but to predict flood events downstream of the gauges.

Fish Movement

There are no known barriers to downstream fish movement from Garrett Tank. Upstream movement of fish is possible temporarily but persistence is not possible due to the lack of permanent surface water. Movement of stocked fish would only occur during extreme storm events when the tank spills, typically during spring; it generally takes multiple storm events in a row that saturate stream channels to result in flow events sufficient to move fish (Figures 4 and 5 and pers. com. Andy Clark). Fish leaving Garret Tank could move downstream to Little Pineveta Tank or Williscraft Tank and persist there if the tanks have water, serving as a source of fish to downstream locations. Garrett Tank spilled most recently in 2005. It is presumed water made it to Pineveta Wash and possibly transported fish.

Of the species proposed for stocking, small channel catfish would be the most likely to move downstream in these events, because the spill would likely be shallow and muddy. Adults would be unlikely to physically leave the tank under these conditions due to the shallowness of water flow over the tank. Garrett Tank would be most likely to spill in spring prior to spawning of stocked fish; small age classes of channel catfish have not been documented in Garrett Tank since 1988 (Table 3).

Potential for fish movement from Pineveta Creek into Partridge Creek, downstream to Big Chino Wash and subsequently the Upper Verde River is discussed further in the Big Chino Wash Complex section.

Community Description

Garrett Tank currently supports viable populations of bluegill and channel catfish (Table 3). Sampling gear used to survey include experimental monofilament gillnets measuring 150' long, 6'tall with six panels that go from 1" to 3" mesh, and hoop nets that measure 2.5' at the opening and are 10' long. Depending on depths of the tanks, nets are set adjacent to the shore and are usually completely submerged. A weighted bottom line and a top line that floats usually keep the gill nets upright in a position to capture fish. In both cases, netting is a passive capture technique and requires fish to move into the nets.

Recruitment of bluegill sunfish and largemouth bass has been documented historically from netting surveys; however hoop net surveys in August 2006 yielded no largemouth bass. In June 2007, a fish kill was reported and investigated, where channel catfish and bluegill sunfish were documented dead and dying in the tank. A high pH of over 9 and low dissolved oxygen of less than 4 ppm were identified as contributing factors. No largemouth bass mortalities were recorded. Channel catfish recruitment has not been documented in Garrett Tank.

The aquatic community is restricted to the tank itself. There are no emergent aquatic plant species or trees near the water edge. Floating aquatic vegetation does occur within the tank and is thought to be Sago pondweed. Shaggy bark juniper is the predominant tree species around and downstream of the tank. Neither waterdogs nor crayfish have ever been documented in Garrett Tank.

Williscraft Tank, which interrupts the flow in Pineveta Wash, 0.75 miles upstream from its confluence with Partridge Creek, historically supported populations of largemouth bass, channel catfish, redear sunfish, and fathead minnow. The tank dried completely in 1980 and was not restocked, due to private land issues; it is currently not proposed for stocking.

Table 3. AGFD Fish Survey data from Garrett Tank from 1982 – 2007.

Year	Capture Method	Species	Num.	TL (mm)
1982	Seine Net	none	-	-
1985	Seine Net / Gill Net*	Channel catfish	15	205-440
		Green sunfish	1	150
1986	Seine net / Gill Net	Largemouth bass	9	142-211
		Channel catfish	4	304-432
1987	Seine Net	Largemouth bass	20	85-220
		Channel catfish	9	308-397
1988	Hoop net / Seine Net	Bluegill	27	69-145
		Largemouth bass	150	20-32
		Channel catfish	1	156

1989	Hoop Net	Largemouth bass	1	270
		Bluegill	20	155-197
1991	Hoop Net / Seine Net	Largemouth bass	3	194-284
1992	Hoop Net / Angling	Largemouth bass	26	YOY - 354
		Channel catfish **	2	-
1995	Hoop Net	Largemouth bass	1	217
		Bluegill	19	104-128
1997	Hoop Net	Largemouth bass	15	167-234
		Green sunfish	1	192
		Bluegill	74	99-201
1998	Hoop Net	Yellow bullhead	1	291
		Largemouth bass	23	162-240
		Bluegill	40	130-196
2002 (June)	Hoop Net	Bluegill	206	99-260
		Largemouth bass	57	200-235
2006 (August)	Hoop Net	Bluegill	48	28-150
2007 (Sept)	Hoop Net	Bluegill	35	50-145

*Water quality data also collected
** Channel catfish were collected via angling, and are assumed to be of catchable size.

Other tanks exist on channels that flow into Pineveta Wash and Partridge Creek; for example, Potts Tank, Pineveta Tank, Tom Locket Tank, Dawson Tank, and Georgia Tank. These tanks are located primarily on private land as well as State Trust Land, are not stocked by AGFD, and there is no information on whether or not they have fish present.

No recent surveys have been done in Pineveta Wash, Partridge Creek, or Big Chino Wash because the only time these drainages have water to support fishes is during high precipitation events resulting in run-off. These events are infrequent, as documented by multiple years of gauge data for Williamson Valley Wash, the closest and only gauging station in the Big Chino watershed. Conducting surveys that coincide with surface flow is extremely difficult due to lack of instantaneous information on when such flows exist, difficulty sampling effectively during high flow conditions, sediment loads that make it difficult to discern fish, and concern for survey crew safety.

Consultation Species and/or Critical Habitat
There are no consultation species in the immediate vicinity of Garrett Tank. Consultation species, including Gila Chub, found downstream in Big Chino Wash, are discussed in the Big Chino Wash Complex Analysis section.

Shucking Tank

Site Description

Shucking Tank is a 2 acre livestock water tank located roughly 17 miles east of Seligman (Figure 6). Similar to Garrett Tank, Shucking Tank sits on private land owned by the Diamond 7 Ranch, and is surrounded by a checkerboard of State Trust Land and adjacent private sections. The tank is located in the upper most portions of the Partridge Creek Drainage and Big Chino Wash Complex. It is unknown when this tank was created but it has been providing fishing opportunities for more than 20 years. Permission for public access was provided by the ranch via a letter of support in 1996. Shucking Tank can be accessed by 12 miles of dirt road from Route 66 near Seligman, and currently has no recreational facilities.

Management of Water Body

Shucking Tank is managed primarily as a self-sustaining warm water fishery with largemouth bass and bluegill, and secondarily as a put-and-take rainbow trout and channel catfish fishery. Bluegill and largemouth bass have been stocked on a supplemental basis since 1992 (Table 4). As with all the small ponds or cattle waters in the area, Shucking Tank dries periodically to the point where warm water sport fish species may stunt or die.

Management objectives center on providing stock sizes of channel catfish, largemouth bass, black crappie, and bluegill sunfish for anglers to enjoy. Periodic stocking to maintain sizes usable to anglers may be necessary due to drying and/or catastrophic wildfire. Rainbow trout are not expected to persist in Shucking Tank due to the high water temperatures, and would be considered a put-and-take fishery only. It is expected that the channel catfish fishery will be a put-and-take fishery, as well with some over wintering of individuals. The Department conducts periodic sampling using hoop-nets or gill nets to monitor populations.

Table 4. Shucking Tank fish stocking history 1992 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Bluegill	1992	2007	7	5,000
Channel catfish	1992	1994	2	500
Largemouth bass	1994	1994	1	300
Total			11	25,715

Proposed action

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

Catchable and/or fingerling largemouth bass, bluegill sunfish, and black crappie stockings would occur in spring, summer or fall, depending on stock availability and costs. Numbers of each species would not exceed 500 per acre for fingerlings and 50 per acre for catchables annually.

The Department proposes to stock catchable channel catfish and rainbow trout. Rainbow trout and channel catfish stockings would be used to support angler retention and recruitment activities. Rainbow trout stocking would only occur in the winter months of December through March, in support of fishing workshops for area anglers. Catfish stockings would occur during the summer months of May through August. Numbers of catfish and rainbow trout stocked would not exceed 100 per acre (for each species) twice annually.

Water Distribution/Connectivity

Shucking Tank is separated from the upper Verde River by approximately 73 miles of ephemeral channels. The tank is located just off-channel in the headwaters of Partridge Creek (Figure 8). Two small tanks, Smith Tanks, are located approximately 2 miles upstream from Shucking Tank. These tanks are not known to hold water every year or through dry periods (A. Clark, pers. comm.). Partridge Creek is dry except during high run-off events or infrequent thunderstorms, when it is expected water would flow though Shucking Tank and downstream. Inputs to Shucking Tank would occur in storm or snowmelt runoff events. If Smith Tanks filled and overflowed, flows would travel the approximate 2 miles downstream to Shucking, as well as from the 2.5 miles of Partridge Creek headwaters that flows parallel to Smith Tanks, and enters Shucking Tank. If water did spill from Shucking Tank, it would leave the tank as sheet flow because there is no dam structure that regulates flow. Water would flow into Partridge Creek and travel 41.5 miles to Big Chino Wash, over Sullivan Dam and into the Upper Verde River.

In 1998, Tim Pender, former wildlife manager for the area, said that Shucking Tank had not overflowed during the 24 years he worked in the area (AGFD Memo, T.A. Liles to K. Young, June 2, 1998). Figure 9 shows a photo of Shucking Tank taken during September 2006, following the driest period of the year. Figure 10 is a photo of Shucking Tank taken December 2004, when high precipitation and flooding occurred (Figures 4 & 5). A spill at this tank has not been recorded by the Department, although it did fill completely in December 2004 (V. Gouldsbury, pers. comm.; Figure 10).

The Big Chino Complex Analysis contains the discussion of downstream water distribution and connectivity for Partridge Creek downstream to Big Chino Wash and the Upper Verde River.

There are no known downstream water users, since surface water is not available during most months of the year. The YCFCD plans to install rain gauges and stream flow meters to predict flood events, but has indicated that accuracy of flow meters is extremely variable due to the high sediment loads carried in Partridge Creek (M. Massis, pers. comm.).

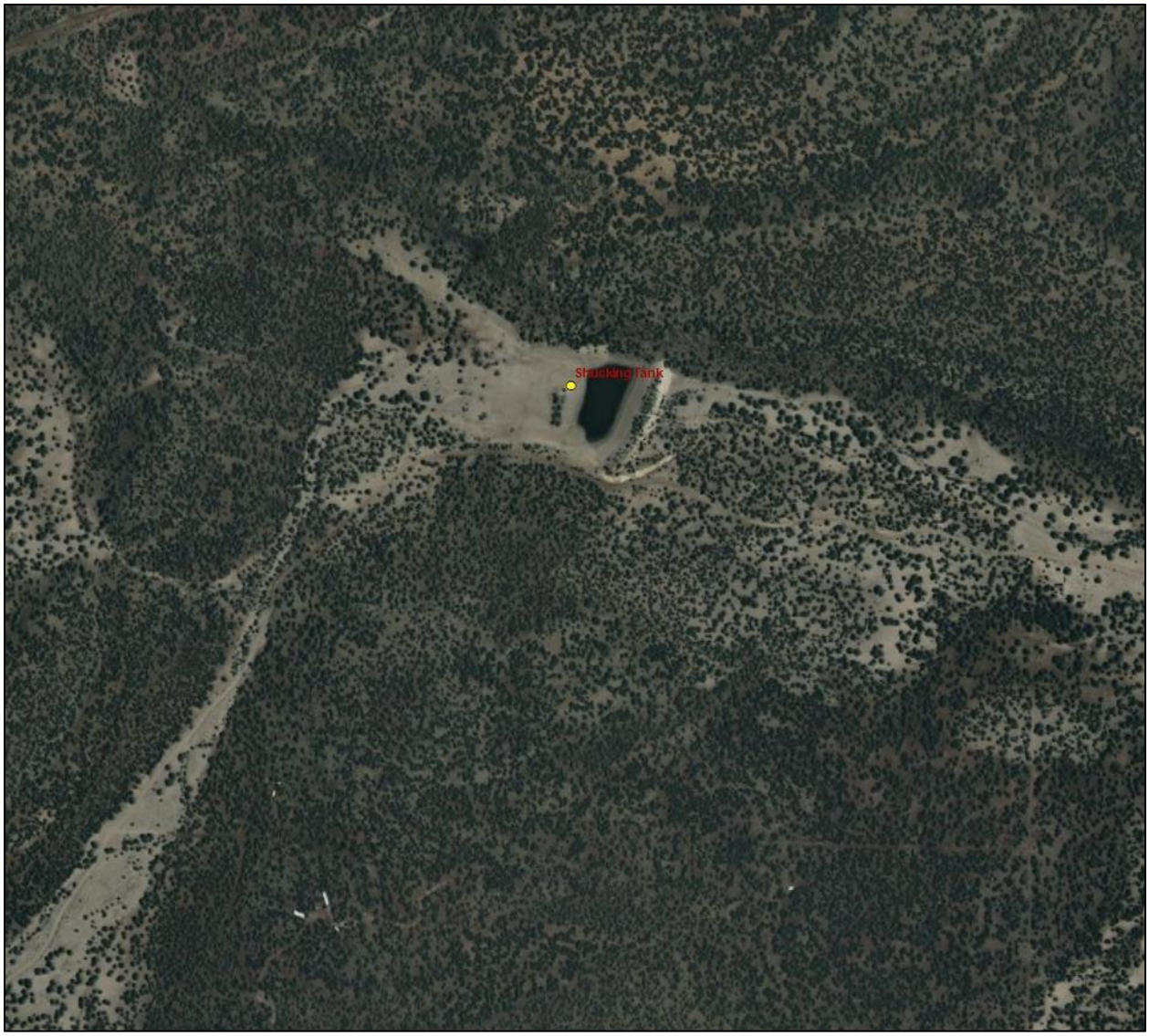

Figure 8. Image of Shucking Tank, located just off-channel of Partridge creek (Copyright:© 2009 ESRI, i-cubed, GeoEye).

Figure 9. Shucking Tank in September 2006.

Figure 10. Shucking Tank, December 2004.

Fish Movement

Movement of stocked fish would only occur during extreme storm events when the tank spills, typically during spring, and it generally takes multiple storm events in a row that saturate stream channels to result in flow events sufficient to move fish (Figures 4 and 5 and pers. com. Andy Clark). There are no known barriers to upstream or downstream fish movement from Shucking Tank; however, upstream movement is not possible due to the lack of permanent surface water, except for possibly during a storm, even when the tributaries are flowing. If fish moved upstream, the only place they could persist would be in Smith Tanks, as long as the tanks maintain water.

Fish leaving Shucking Tank in a flood event could move downstream via Partridge Creek and up any of the tributaries along the creek if water is present. Many of the tributaries to Partridge Creek have in-channel tanks, and there are several tanks located on Partridge Creek itself. Martin Dam Draw is a tributary that joins Partridge Creek half way between Shucking Tank and the confluence of Partridge Creek and the Big Chino. Johnson Creek and Pineveta Creek enter,

Partridge Creek 13 and 17 miles (respectively) downstream of the Martin Dam Draw confluence. Both of these tributaries have multiple tanks in their drainages.

Of the species proposed for stocking, small fish would be the most likely to move downstream in flood events because the spill would likely be shallow, wide and muddy, and adults would be unlikely to physically survive if they leave the tank under these conditions.

Potential for fish movement from Partridge Creek, downstream to Big Chino Wash and subsequently the Upper Verde River is discussed in the Big Chino Wash Complex section.

Community Description
Shucking Tank currently does not support viable populations of any fish species; however, historically the tank supported populations of bluegill and largemouth bass. Recruitment of bluegill and largemouth bass has been documented historically, although fish have not been detected in surveys of Shucking Tank since 2006 (Table 5).

The tank went completely dry in 2003. Waterdogs were the only aquatic species documented during a survey in 2006. Bluegills were stocked in 2007. The tank was again surveyed in 2009 and no fish or waterdogs were captured. Water quality measurements have not been taken, and it is unknown why the tank does not maintain viable populations of fish.

The tank is surveyed using experimental monofilament gillnets measuring 150’ long, 6’tall with six panels that go from 1” to 3” mesh, and hoop nets that measure 2.5’ at the opening and are 10’ long set in evening hours and allowed to fish overnight. Depending on depths of the tank, nets are set adjacent to the shore and are typically completely submerged. A weighted bottom line and a top line that floats typically keeps the gillnet upright in a position to capture fish. In both cases, netting is a passive capture technique in that it requires fish to move into the net. The tank is managed as a self-sustaining warm water fishery for bluegill and largemouth bass, and recruitment of these two species has been assumed historically, although no fish currently inhabit the tank.

The Department believes that Shucking Tank is holding water of sufficient quantity and quality to provide fishing opportunities. If largemouth bass are stocked, it is believed they will establish. There are no emergent aquatic plant species or trees near the water edge. Floating aquatic vegetation does occur within the tank and is thought to be Sago pondweed. Shaggy bark juniper is the predominant tree species around and downstream of the tank. Crayfish have never been documented from Shucking Tank.

Table 5. Fish Survey history for Shucking Tank, 1991 – 2009.

Year	Method	Species	Num.	TL (mm)

1991	Hoop Net / Seine*	Largemouth bass	1	349
1992	Hoop Net / Seine*	Bluegill	-	-
1995	Hoop Net	Bluegill	54	112-144
1997	Hoop Net	Largemouth bass	1	241
		Bluegill	10	99-200
1998	Hoop Net	Bluegill	40	102-142
2006	Hoop Net / Gill Net**	none	-	-
2009	Hoop Net / Gill Net	none	-	-

* Water quality data collected
** Waterdogs documented as being present

Consultation Species and/or Critical Habitat
There are no consultation species in the immediate vicinity of Shucking Tank. Consultation species includes Gila Chub, found downstream in the Big Chino Wash, and are discussed in the Big Chino Wash Complex Analysis section.

Presley Tank
Site Description
The proposed stocking site is a 4 acre livestock water tank located in the upper portion of the Partridge Creek Watershed in an unnamed tributary that flows into Partridge Creek, about 4.5 miles downstream from Shucking Tank (Figure 6). Similar to both Garrett and Shucking Tanks, Presley Tank is also located on the Diamond 7 Ranch with access permission granted via a letter of support signed by the ranch in 1996. Presley Tank is a remote tank and does not have any recreation facilities. It is accessed by more than 15 miles of dirt road from Interstate 40 near Ash Fork.

Management of Water Body
Presley Tank is managed primarily as a self-sustaining warm water fishery with largemouth bass, black crappie, and bluegill sunfish, and secondarily as a put-and-take rainbow trout and channel catfish fishery. As with all the small ponds or cattle waters in the area, Presley Tank dries periodically to the point where warm water sport fish species may stunt or die.

Bluegill and largemouth bass have been stocked on a supplemental basis for almost 30 years (Table 6). Access to all of the Diamond 7 stock ponds is currently open. Presley was first stocked with 75 largemouth bass transplanted from Heifer Tank in 1982. The tank dried to the point of completely killing the fishery in 1989 (Table 7). Five hundred channel catfish were re-stocked in October 1991. Conditions at Presley Tank caused another fish kill in 2002, but the tank did not go dry. The 2002 event may not have been a complete kill, because two large bluegill were collected during a 2006 survey (Table 7).

Management objectives center on providing stock sizes of channel catfish, largemouth bass, black crappie, and bluegill for anglers to enjoy. Black crappie is a new species proposed for stocking in this water. Periodic stocking to maintain sizes usable to anglers may also be necessary due to drying and/or catastrophic wildfire. Rainbow trout and channel catfish stockings may occur to support angler recruitment and retention activities. Rainbow trout are not expected to persist in Presley Tank and would be considered a put-and-take fishery only. It is expected the channel catfish fishery would be a put-and-take fishery as well with some over-wintering of individuals. The Department conducts periodic sampling using hoop-nets or gillnets to monitor populations.

Table 6. Stocking history of Presley Tank 1982 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Bluegill	1987	2008	5	12,853
Channel catfish	1984	1994	3	3,700
Largemouth bass	1982	2008	4	4,368
Tadpole	1982	1982	2	10,000
Total			14	25,715

Proposed action

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

Catchable and/or fingerling largemouth bass, bluegill, and black crappie stockings would occur in spring, summer, or fall depending on stock availability and cost of fish. Numbers of fish of each species would not exceed 500 per acre for fingerlings and 50 per acre for catchables annually.

The Department proposes to stock catchable channel catfish and rainbow trout. Rainbow trout and channel catfish stockings would be used to support angler retention and recruitment activities. Rainbow trout stocking would only occur in winter months in support of fishing workshops for local kids. Catfish stockings would occur during summer months. Numbers of catfish and trout stocked would not exceed 100 per acre of each species, twice annually.

Water Distribution/Connectivity

Presley Tank is separated from the Upper Verde River by approximately 69 miles of ephemeral channels. Presley Tank is located on a headwater tributary of Partridge Creek approximately 4.5 miles downstream from Shucking Tank, and approximately 0.8 miles up the tributary. As with other tanks in the area, Presley Tank is primarily fed by spring snow melt. Rarely, the tank may

catch runoff from localized thunderstorms. There are no tanks upstream of Presley Tank. In 1998, Tim Pender, the former wildlife manager for the stocking area, said that the tank had not overflowed during the 24 years he worked in the in the area (AGFD Memo, T.A. Liles to K. Young, June 2, 1998). Figure 11 and Figure 12show photos of Presley Tank taken during September 2006 and July 2009, and depict water levels during the driest period of the year.

If water did spill from the tank, it would flow 0.8 miles down an unnamed dry wash to Partridge Creek. See the Big Chino Complex section for discussion of downstream water distribution and connectivity for Partridge Creek downstream to Big Chino Wash and the Upper Verde River.

Fish Movement

Movement of stocked fish would only occur during extreme storm events when the tank spills, typically during spring, and it generally takes multiple storm events in a row that saturate stream channels, to result in flow events sufficient to move fish (Figures 4 and 5 and pers. com. Andy Clark). There are no known barriers to upstream or downstream fish movement from Presley Tank, however, upstream movement is not possible due to the lack of permanent surface water, except for possibly during a storm event when the tributaries are flowing.

Figure 11. Photo of Presley Tank, September 2006

Figure 12. Photo of Presley Tank, July 2009.

Of the species proposed for stocking, small fish would be the most likely to move downstream in these events, because the spill would likely be shallow and muddy and adults would be unlikely to physically leave the tank under these conditions. Recruitment of bluegill and largemouth bass has been documented historically.

If Presley Tank were to spill and result in fish escapement, fish could travel 0.8 miles downstream to Partridge Creek. From this point, fish could potentially move upstream towards Shucking Tank or continue downstream in Partridge Creek. Potential for fish movement from Partridge Creek, downstream to Big Chino Wash and subsequently the Upper Verde River is discussed in the Big Chino Wash Complex section.

Community Description

Presley Tank currently supports viable populations of bluegill (Table 7). Recruitment of bluegill and largemouth bass has been documented historically from netting surveys; however, surveys conducted in August 2006 and July 2009 yielded only bluegill and no largemouth bass. As with all small tanks in the region, fish are surveyed using experimental monofilament gillnets measuring 150’ long, 6’tall with six panels that go from 1” to 3” mesh, and hoop nets that

measure 2.5' at the opening and are 10' long. Depending on depths of the tanks, nets are set adjacent to the shore and are typically completely submerged. A weighted bottom line and a top line that floats typically keeps the gill nets upright in a position to capture fish. In both cases, netting is a passive capture technique in that it requires fish to move into the nets.

The aquatic community is restricted to the tank itself. There are no emergent aquatic plant species or trees near the water edge. Floating aquatic vegetation does occur within the tank and is thought to be Sago pondweed. Shaggy bark juniper is the predominant tree species around and downstream of the tank (Figure 11 and Figure 12). Crayfish have never been documented from Shucking Tank.

Table 7. Fish Survey history for Presley Tank 1985 – 2009.

Year	Method	Species	Num.	TL (mm)
1985	Gill Net*	Channel catfish	12	300-350
1986	Gill Net / Seine	Largemouth bass	15	96-155
1987	Gill Net / Hoop Net / Electrofishing	Largemouth bass	9	110-160
		Channel catfish	10	221-417
1988	Hoop Net	Largemouth bass	5	165-210
		Bluegill	18	102-234
		Channel catfish	2	318-322
1989**	Hoop Net	Bluegill	1	127
1987	Hoop Net	Channel catfish	1	574
		Largemouth bass	1	350
		Green sunfish	32	129-191
		Bluegill	163	110-207
1998	Hoop Net	Largemouth bass	2	370-395
		Green sunfish	2	118-142
		Bluegill	323	103-200
2006	Gill Net / Hoop Net	Bluegill	2	220-235
		waterdogs	-	-
2009	Gill Net / Hoop Net	Bluegill	105	64-185

* Water Quality measurements taken
** Fishkill occurred earlier in the year

Consultation Species/Critical Habitat

There are no consultation species in the immediate vicinity of Presley Tank. Consultation species, including Gila Chub, found downstream in the Big Chino Wash, are discussed in the Big Chino Wash Complex Analysis section.

Stone Dam

Site Description

Stone Dam was built in 1910 and impounds, on average, 5 surface acres with a maximum 18 surface acres at spill level (Figure 6 and Figure 12). It is located approximately 5 miles east of the town of Ash Fork at an elevation of approximately 5,500 feet. Stone Dam is located on private land owned by the Ash Fork Development Association and is a popular fishery with anglers coming from the surrounding area. Stone Dam was originally developed by the Santa Fe Railroad to provide water for its steam engines. Angler access is by primitive roadway with a primitive boat launch located on the south west corner of the reservoir by the dam. Angler use is primarily by residents of Ash Fork and the surrounding communities.

Management of Water Body

Historically Stone Dam was not managed by the Department as a fishery, since it is located on private property. In June of 2003, local Wildlife Manager Tim Pender approached the Department's Region II fisheries staff to conduct a fish survey on the reservoir. The survey occurred concurrently with cleanup activities sponsored by the Ash Fork Development Committee as part of the Department's Adopt a Lake Program. Results from the survey indicated a fish community of black crappie, bluegill, largemouth bass, and golden shiners. The Ash Fork Development Committee agreed to let AGFD manage the water and the fishery for public use.

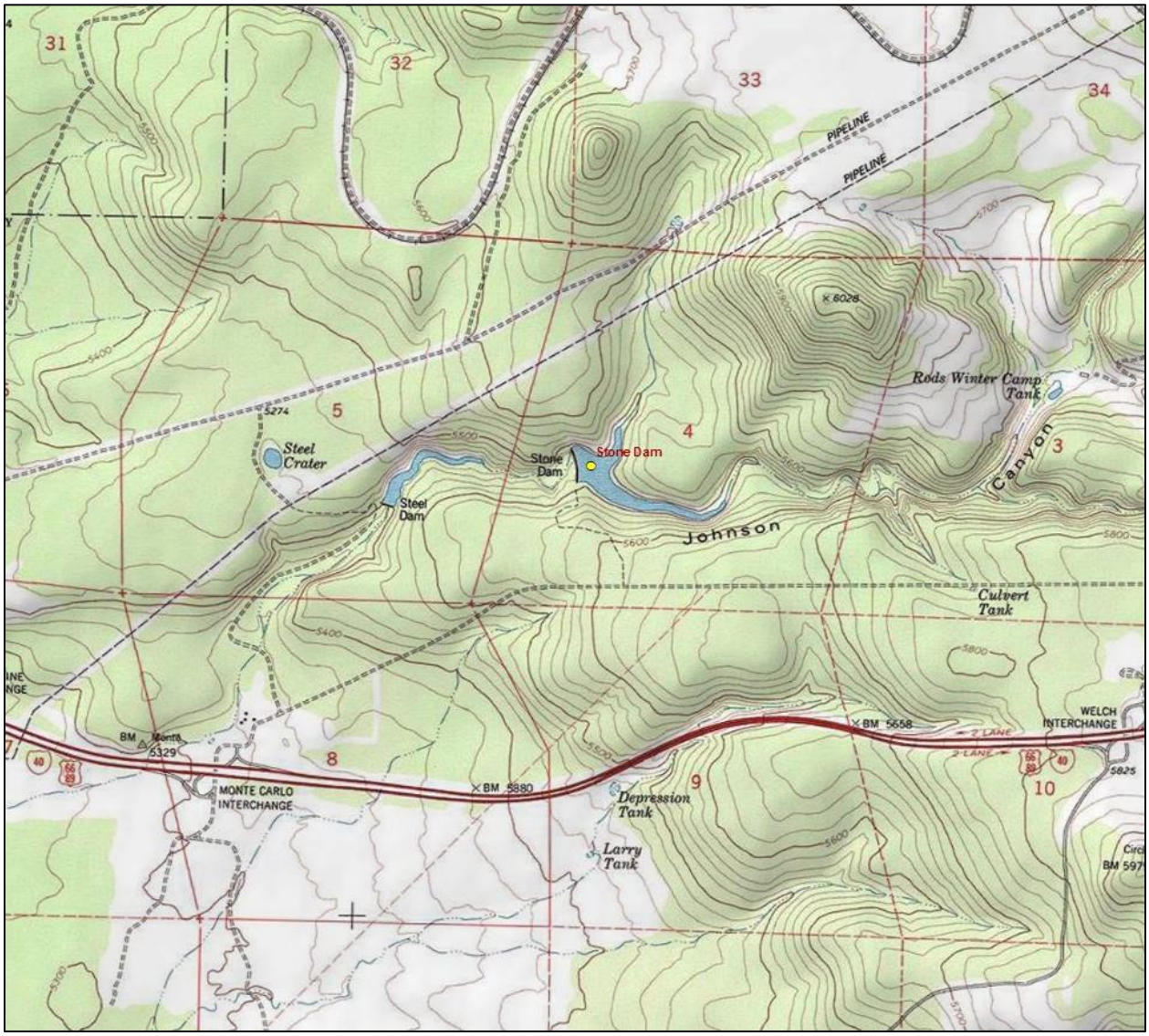

Figure 13. Stone Dam topographic map (ESRI ArcGIS Online and data partners including USGS and © 2007 National Geographic Society).

Stone Dam is currently managed primarily as a warm water put-and-take channel catfish fishery, with a self-sustaining warm water fishery for largemouth bass and bluegill (Table 8). Current management focuses on stocking catchable channel catfish during the spring and summer. Management of the self-sustaining warm water fishery may include periodic stockings of fingerling or catchable fish to maintain sizes usable to anglers.

Table 8. Stone Dam stocking history 2007 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Channel catfish	2007	2009	3	1,450
Total			3	1,450

Proposed action

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

Catchable channel catfish would be stocked from April to July each year; numbers of catchable channel catfish stocked may be from 0 - 1,500 annually.

Largemouth bass (fingerlings, sub-catchables, catchables), channel catfish (fingerlings, sub-catchables), bluegill (fingerlings, sub-catchables), and redear sunfish (fingerlings, sub-catchables, catchables) would be stocked as needed at spring, summer, or fall to augment the warm water fishery, or to reestablish the fishery after 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

Stone Dam (Figure 14) is separated from the upper Verde River by approximately 39 miles of ephemeral channels. The dam is located on Johnson Creek about 9.15 miles upstream from its confluence with Partridge Creek. Water enters the reservoir through intermittent snowmelt and thunderstorm runoff from ephemeral Johnson Creek. The headwaters of Johnson Creek originate on Hearst Mountain and travel 0.75 miles to Sereno Tank, which is less than an acre in size. From Sereno Tank, Johnson Creek continues 1 mile to Big Supai Tank, which is about 2.45 acres in size. Johnson Creek continues 1.69 miles to perennial McLellan Reservoir. A tributary on the south side of McLellan Reservoir collects water from the northwest facing slopes of Bill Williams Mountain about 3 miles to the east. The portion of the Bill Williams Mountain watershed that flows into McLellan Reservoir includes five small, less than 1 acre tanks: three unnamed tanks, Hat Tank, and Stump Tank, and 1 spring, Bard Spring. McLellan Reservoir is located approximately 9.5 miles upstream of Stone Dam and approximately 5 miles west of the city of Williams on Interstate 40.

The concrete dam on McLellan Reservoir is severely cracked across a large portion of the structure, about 2 feet down from the top of the dam (Figure 15). These cracks allow water to travel through the dam, as opposed to cresting the structure during most high flow events. Only during extreme runoff events will lake level crest and top the dam on McLellan Reservoir.

Figure 14. Stone Dam photo taken January, 2007.

Figure 15. Photo of the large cracks through McLellan Dam that allow water to pass through the structure; photo taken on February, 2009.

Outflow from Stone Dam exits the reservoir on the south side of the dam down a natural rock face. In the event of flooding, outflow from Stone Dam can flow down Johnson Creek 0.35 miles into Steel Dam Reservoir (Figure 16 and Figure 16). During intense runoff, flows may top the dam. Steel Dam is about 5 surface acres, and can reach a maximum of 10 surface acres when full. Steel Dam is constructed from 3/8 inch steel plates that are scallop-shaped and sloped downstream to allow flow to exit the reservoir over the top of the structure; no spill way exists, however it does appear to spill occasionally. The dam can withstand up to 6 feet of water topping the dam (Figure 18). When water does spill, there is a 46 ft drop.

From Steel Dam Reservoir, Johnson Creek continues 8.71 miles to Jumbo Tank, which has a maximum surface acreage of 33.66 acres when full. From Jumbo Tank it is about 0.1 miles to ephemeral Partridge Creek. See the Big Chino Complex section for discussion of downstream water distribution and connectivity for Partridge Creek downstream to Big Chino Wash and the Upper Verde River.

Figure 16. Steel Dam, located down ~0.35 miles downstream of Stone Dam on Johnson Creek. Photo taken January, 2007.

Figure 17. Photo of downstream side of Steel Dam taken January, 2007.

Figure 18. Photo of Steel Dam with debris indicating water flows over the top of the dam; photo taken August, 2009.

Fish Movement

The aquatic communities in the tanks upstream of McLellan Reservoir are unknown. There is potential, however, during wet climactic cycles, for fish from McLellan Reservoir to travel upstream into these small tanks, and or terminate in the headwaters of the drainage. Similarly, fish from these tanks could travel downstream into McLellan Reservoir. When McLellan Reservoir receives a significant enough precipitation event or series of events to cause the reservoir to spill through the cracks or over the top of the dam, there is potential for fish to be washed downstream into Stone Dam. Upstream movement of fish stocked in Stone Dam is limited to the 9.45 miles of Johnson Creek between Stone Dam and McLellan Reservoir, which serves as a barrier to upstream fish movement, since the vertical drop on the downstream side is 10-15 feet. When the reservoir tops, it flows over the middle of the dam, dropping vertically, preventing the upstream movement of fish (Figure 15). Downstream movement of stocked fish out of Stone Dam would only occur during extreme storm or run-off events when the reservoir fills and spills; typically during spring. There is a good chance McLellan Reservoir could fill and spill from snow-melt off the west and northwest side of Bill Williams Mountain without flowing through any tanks. This part of the drainage comes in from the south side of McLellan and contributes the bulk of its inflow. It generally takes multiple storm events in a row to saturate the stream channels upstream of the reservoir, to result in the dam topping sufficiently to move fish (Figures 4 and 5 and A. Clark pers. comm.). There are no known barriers to downstream fish movement from Stone Dam other than stocked fish would have to traverse Steel Dam, with a 46 foot drop, and Jumbo Tank, both of which are downstream of Stone Dam on Johnson Creek. Similarly the 46 vertical foot dam on Steel Dam acts a barrier to the upstream movement of fish from downstream sources.

Fish would likely not persist very long in ephemeral Johnson Creek or Partridge Creek, even if some did make it through Steel Dam and Jumbo Tank to where Johnson Creek joins Partridge Creek. Normally dry pinion-juniper woodland washes do not maintain water long enough for fishes to persist. Small, headwater channels of a drainage network are important in determining the amount of sediment transported downstream during storm events. This increased sediment load can have negative effects on channel stability, fish, invertebrates, and overall stream productivity. High sediment loads can often result in fish mortality as a result of decreased dissolved oxygen concentrations concurrent with increased suspended sediments (Bozek and Young 1994; Waters 1995; Rinne and Carter 2008). Fine clay sediments transported with runoff often prohibit fish survival in pools following runoff events.

Potential for fish movement from Partridge Creek, downstream to Big Chino Wash and subsequently the Upper Verde River will be discussed in the Big Chino Wash Complex section.

Community Description

Stone Dam was surveyed in 2003 by the Department using 6 hoop nets and 1 gill net (Table 9). A total of 69 fish were captured in the gill net over the 16 hours that it was set. The majority of the fish caught were golden shiners, with largemouth bass being the second most common. In the hoop nets, a total of 78 fish were captured in 80 hours of effort; the dominant species caught was bluegill, followed by black crappie; adult fish of both species were notably small in size. The results of the survey indicate a fish community dominated by stunted pan fish, bluegill and black crappie, and golden shiner. Green sunfish, northern pike, bullhead catfish of an unknown species have historically been present in Stone Dam, but were not detected in the most recent surveys.

The aquatic species compositions of the three reservoirs on Johnson Creek indicate that there is little to no movement of fish between these reservoirs. Species unique to McLellan Reservoir at the upstream end and Steel Dam at the downstream end suggest that fish movement is limited or non-existent. Certain fish species found in McLellan Reservoir are not found in downstream Stone or Steel Reservoir, and similarly certain species in Steel Reservoir are not found in upstream Stone or McLellan Reservoir. (Tables 9, 10, and 11)

Table 9. 2003 Fish captured in hoop nets and gill nets set in Stone Dam during a 2003 survey.

Year	Method	Species	Num.	TL (mm)
2003	Gill Net / Hoop Net	Black crappie	33	160-280
		Bluegill	48	91-168
		Largemouth bass	14	151.4 (mean)
		Golden shiner	52	163-204

Results of a survey conducted in 2009 by the Department on Steel Dam indicate a fish community dominated almost exclusively by green sunfish and golden shiner (Table 10). Two experimental 150’ 6 panel gill nets were set on the reservoir for a 24 hour period. Stunted green sunfish and large adult golden shiners dominated the system.

Table 10. Fish captured in gill nets set in Steel Dam during a 2009 survey.

Year	Method	Species	Num.	TL (mm)
2009	Gill Net	Green sunfish	172	66-157
		Bluegill	13	70-234
		Golden shiner	432	96-116

The Department conducted a fish survey of McLellan Reservoir in 2009 and found a fish assemblage of golden shiner, yellow perch, bullhead catfish, black crappie, bluegill, and

largemouth bass (Table 11). Three 150' 6-panel experimental monofilament gill nets were set for a 24 hour period. McLellan is not managed as a fishery by the Department; however, anglers have reported catching bluegill, green sunfish, bullhead catfish, yellow perch, and northern pike in the reservoir.

Table 11. Fish captured in gill nets set in McLellan Reservoir during a 2009 survey.

Year	Method	Species	Num.	TL (mm)
2009	Gill Net	Black crappie	7	175-214
		Bluegill	3	127-218
		Golden shiner	162	111-239
		Largemouth bass	1	97
		Yellow perch	14	180-232
		bullhead species	5	266-303

Consultation Species/Critical Habitat

There are no consultation species in the immediate vicinity of Stone Dam. Consultation species, Gila chub are found downstream in Big Chino Wash, and are discussed in the Big Chino Wash Complex Analysis section.

Granite Basin Lake

Site Description

Granite Basin Lake is a 2 acre impoundment at the headwaters of Mint Wash, an ephemeral stream northwest of Prescott (Figure 18) on the Prescott National Forest. The concrete dam forming the lake was built in 1939 by the Civilian Conservation Corps (CCC). Because of the lake's position between drainages and because it sits high in the Mint Creek drainage, Granite Basin Lake has a tendency to collect sediments from the surrounding mountains quickly, due to the steep gradients. Figure 19 provides an aerial photo of the watershed. Granite Basin Lake was dredged by the Department and the Prescott National Forest in 1992. The depth of the lake was approximately 22 feet after the project. Following the high flow event in February of 1993 the approximate depth was 19 feet; as of August 2008, the depth is estimated at less than 10 feet. Granite Basin is located within a Prescott National Forest Recreation site. Restrooms, picnic areas, and some camping sites are available. Access is available on paved road, and there is a boat ramp is available. Boats are restricted to a single motor only.

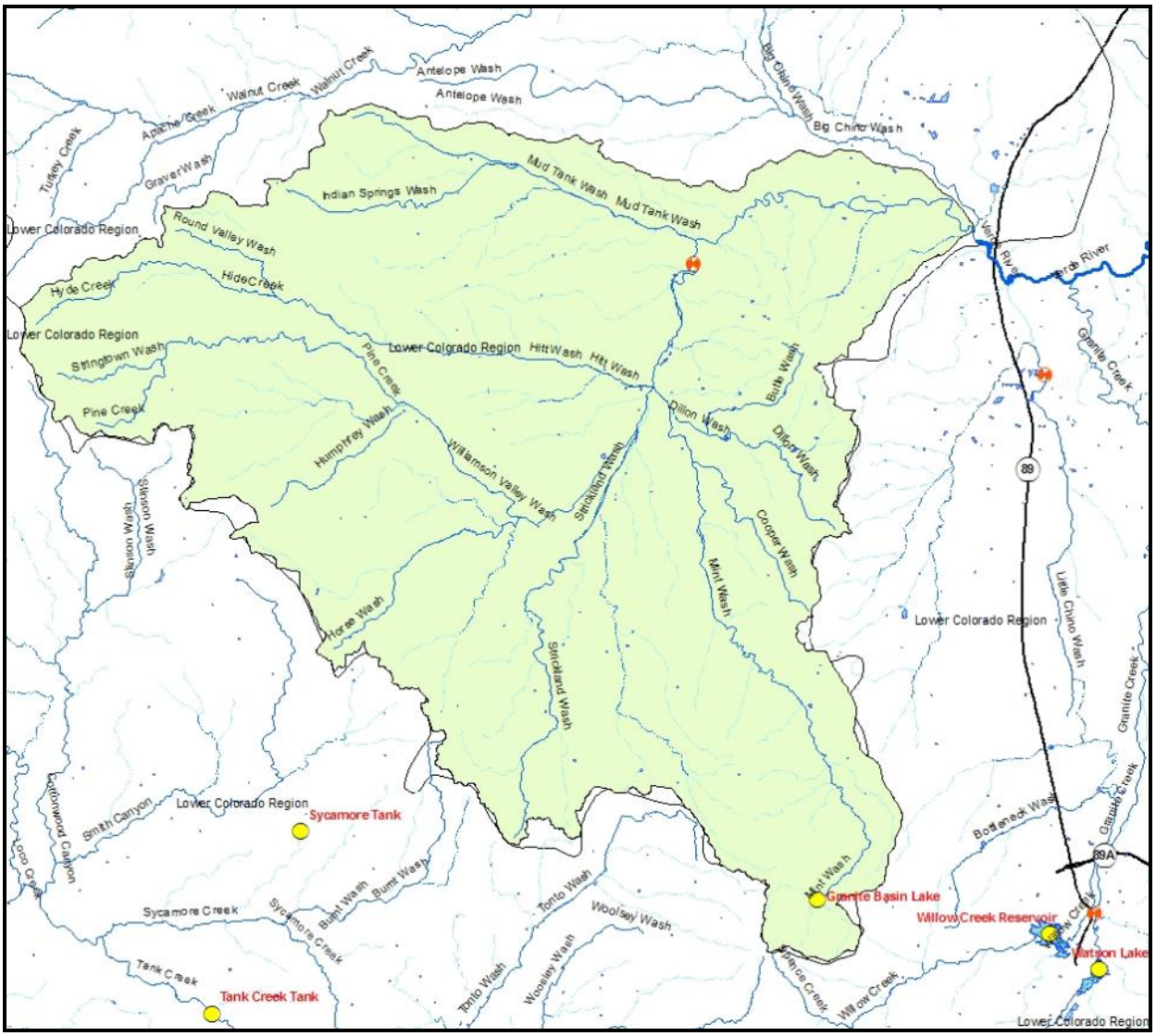

Figure 18. Williamson Valley Wash drainage flows into the Big Chino sub-watershed from the south just upstream from Sullivan Dam on the Upper Verde River.

Figure 19. Image of Granite Basin Lake (Copyright:© 2009 ESRI, i-cubed, GeoEye). Granite Basin Dam is at the upper right of the lake, water spilling over Granit Basin dam flows into Mint Wash.

Management of Water Body

Granite Basin Lake is managed as a self-sustaining warm water fishery for largemouth bass and bluegill. Sedimentation is slowly filling the lake, and aquatic weeds are problematic in low water years, as they will cover the entire surface of the lake. The Department has used a "weed harvester" boat to open up areas for boat launching and angling. Future management objectives will focus on providing stock sizes of largemouth bass and bluegill for anglers to enjoy. Periodic stocking to maintain sizes usable to anglers may be necessary due to drying and/or catastrophic

wildfire. Granite Basin angler use days in 2001 were estimated at 1,167 (Pringle 2004). Periodic sampling will be conducted using electrofishing or gill nets to monitor populations.

Table 12 provides a summary of stocking by AGFD in Granite Basin Lake.

Table 12. Stocking history for Granite Basin Lake, 1942 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Black crappie	1965	1966	4	5,600
Bluegill	1968	2001	3	12,049
Brown trout	1952	1953	4	2,300
Channel catfish	1965	1999	17	18,925
Largemouth bass	1950	1999	8	4,800
Rainbow trout	1942	1963	138	200,064
Tadpole	1968	1978	3	6,000
Total			177	249,738

Proposed Action

The Department proposes to stock bluegill and largemouth bass for the period covered by this consultation.

Supplemental stockings of fingerlings or catchables largemouth bass or bluegill sunfish may be conducted periodically as needed for augmentation of a self-sustaining bluegill and largemouth bass fishery or to reestablish the fishery after catastrophic events catastrophic events. Stockings would occur in spring, summer, or fall, depending on stock availability and costs. Numbers of fish stocked annually would not exceed 1,000 per acre for fingerlings and 100 per acre for catchables of each species.

Water Distribution/Connectivity

Granite Basin Lake is separated from the Upper Verde by 31 miles of mostly ephemeral stream channel. Granite Basin Lake is an impoundment on Mint Wash, an ephemeral stream northwest of Prescott. The wash drains 16 miles to Williamson Valley Wash, which is an interrupted perennial system that flows an additional 15 miles to the Upper Verde River. All of the tributaries to Mint Wash, including Jerome Canyon, Cooper Wash, Dillon Wash, and numerous unnamed tributaries, are ephemeral.

Spills over Granite Basin Dam have been observed in 2005 and 2008 (A. Clark, pers. comm.). Prior to these spills, documented spills have been rare to infrequent (A. Sillas, pers. comm.). In years with below normal snow and winter rains the lake will shrink and can be only 6-feet deep.

During the last 10 years, average lake levels have been several feet below the dam. Water spilling over the dam falls roughly 30 feet onto bedrock. The average elevation in the watershed is 5,800 feet above sea level. Snow accumulations are typically light, but heavy winter storms can occur. Spills, when they infrequently occur, are typically a result of spring run-off. The relatively small watershed area, 2,935 acres, above the lake, contributes high sediment loads typically during summer rain events. Water rights are held by the Prescott National Forest. Several large communities exist downstream on Mint Wash; American Ranch represents the largest.

Pine Creek, and the drainage containing Wickiup Canyon and Humphrey Creek, meet to form the headwaters of Williamson Valley Wash. Horse Wash flows into Williamson Valley Wash upstream of the confluence of Mint Wash and Williamson Valley Wash. Hitt Wash enters Williamson Valley Wash from the north in the same location Mint Wash enters from the south, and Mud Tank Wash meets Williamson Valley Wash downstream. Stringfield, Scissor, Twin Cedar, and Pemberton tanks exist in parallel drainages to Mint Wash, and the nature of these streams is unknown. Several large ponds exist on the Las Vegas Ranch and the Bar Cross Ranch near the confluence of Mint Wash and Williamson Valley Wash. These are on private land and the spill history and fish community presence/absence of these ponds is unknown.

USGS gauge 09502800 Williamson Valley Wash near Paulden, collects daily discharge and precipitation data (Figure 4; Figure 5) and is located on Williamson Valley Wash, approximately 12.5 miles upstream from its confluence with Big Chino Wash. This gauging station is one of only two gauges within the Big Chino Wash watershed, but the other (09502750 Walnut Creek near Ash Fork) was only operated for one year. Daily gauge discharge data from 1965 to 2009, and daily precipitation data from 2002 to 2009 at the Williamson Valley Wash gauge indicate that single precipitation events do not alone result in increases in discharge at the gauge location. Multiple storm events that occur close in time to one another to are more likely to result in the reservoir filling and spilling than single precipitation events unless except in extreme precipitation events.

Fish Movement

Escapement of stocked fish out of Granite Basin Lake is only possible when the lake spills, typically during spring. If Granite Basin were to spill, fish leaving the lake would fall 30 feet onto bedrock and move downstream via Mint Wash to Williamson Valley Wash, to Big Chino Wash, to Sullivan Lake. Because Granite Basin Lake sits at the upper-most end of the ephemeral Mint Wash drainage, and there are several sediments trap structures upstream of the lake, upstream movement of fish from Granite Basin Lake is unlikely. Even if they were able to move upstream, fish would not persist because the stream is ephemeral (Figure 20).

Downstream transportation of viable stocked sport fish species out of Granite Basin Lake may occur, but fish are not likely to persist in the ephemeral reaches downstream. Results from ten years of sampling the Upper Verde River from Granite Creek to Sycamore Creek and from available survey data from Williamson Valley Wash, indicate that the species proposed for stocking either don't access these areas or do not persist if they do. Mint Wash was sampled by Bagley (2002) immediately below Granite Basin Lake and at Mint Spring about 2 miles below the lake; no fish were collected at either location (Table 14). Below the lake, habitat was described as isolated intermittent plunge-pools; the largest was 2 meters x 2 meters x 1 meter deep. At Mint Spring, a few small plunge-pools were present, but most of the wash was dry, and Mint Spring was also dry. Bagley (2002) also sampled the cienega habitat at Williamson Valley Wash. The aquatic assemblage at that time consisted of Gila chub, longfin dace, fathead minnow, mosquitofish, and bullfrogs (Table 14). In January 2003, Gila chub were again documented in Williamson Valley Wash on private land by a private consultant. Longfin dace and mosquitofish were also reported. At that time, the surveyor made the following comment "Non-natives do not seem to be a problem. Flooding was the controlling factor for fishes in Williamson Valley Wash".

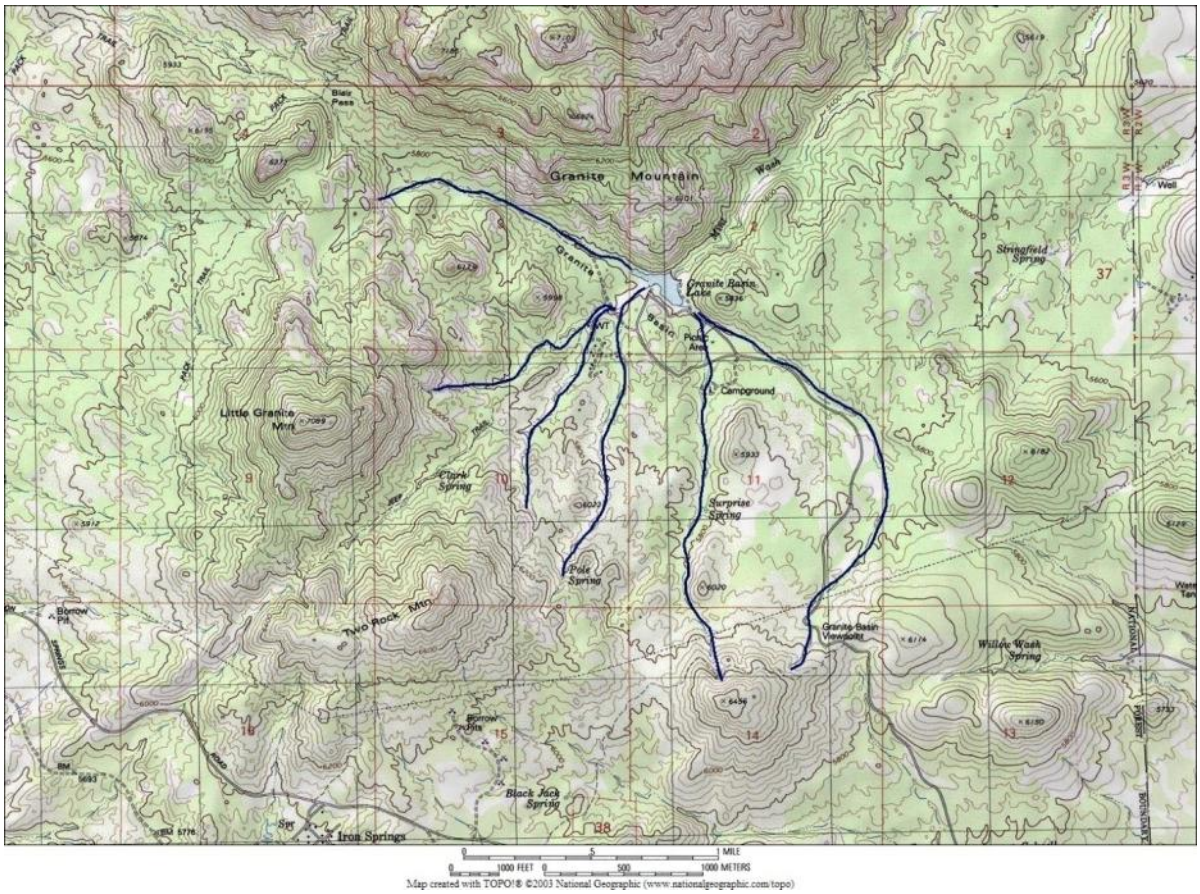

Figure 20. Topographic map of Granite Basin Lake drainage.

Community Description

Granite Basin Lake is a relatively small lake flanked on two ends by extensive cattail beds. In years with below normal snow and winter rains the lake will shrink and can be only 6-feet deep. Aquatic vegetation tends to take over in these conditions and fishing access is difficult. Waterfowl use the lake extensively in normal years but really become numerous in dry times. Bluegill and largemouth bass are the predominant species present at Granite Basin Lake (Table 13). Granite Basin Lake is typically surveyed by electrofishing. Because the lake is small, the entire shoreline is sampled. Only largemouth bass and bluegill have been captured in the electrofishing surveys, but yellow bullhead and channel catfish have been recorded by anglers.

Table 13. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Granite Basin Lake 2003 – 2007.

Survey Year: 2003						
Total=74	Total Weight=7732 grams			Total effort units = 32 minutes		
Common Name	# Sampled	# Measured	% of Total	CPUE	Weight Sampled (g)	% of Total
Largemouth Bass	33	33	45%	1.03	5741	74%

Bluegill	41	41	55%	1.28	1991	26%
Survey Year: 2004						
Total=46	Total Weight=14298 grams			Total effort units = 20 minutes		
Common Name	# Sampled	# Measured	% of Total	CPUE	Weight Sampled (g)	% of Total
Largemouth Bass	9	9	20%	0.45	3534	69%
Bluegill	37	37	80%	1.85	1591	31%
Survey Year: 2005						
Total=138	Total Weight=11677 grams			Total effort units = 15 minutes		
Common Name	# Sampled	# Measured	% of Total	CPUE	Weight Sampled (g)	% of Total
Largemouth Bass	29	29	21%	1.93	6473	71%
Bluegill	109	109	79%	7.27	2700	29%
Survey Year: 2006						
Total=53	Total Weight=2504 grams			Total effort units = 15 minutes		
Common Name	# Sampled	# Measured	% of Total	CPUE	Weight Sampled (g)	% of Total
Largemouth Bass	10	10	19%	0.67	1865	74%
Bluegill	43	43	81%	2.87	639	26%
Survey Year: 2007						
Total=51	Total Weight=4985 grams			Total effort units = 15 minutes		
Common Name	# Sampled	# Measured	% of Total	CPUE	Weight Sampled (g)	% of Total
Largemouth Bass	12	12	24%	0.80	3459	69%
Bluegill	39	39	76%	2.60	1526	31%

Consultation Species/Critical Habitat

Consultation species found in the immediate vicinity of Granite Basin Lake include bald eagle as discussed immediately below. Gila Chub found downstream in the Williamson Valley Wash are discussed in the Big Chino Wash Complex Analysis section.

Bald Eagle

Potential Impacts

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

BIG CHINO WASH COMPLEX ANALYSIS

Water distribution and connectivity, fish movement and aquatic community descriptions were discussed for Stone Dam, Garrett, Shucking and Presley tanks up to the point where they flow into Partridge Creek, and for Granite Basin Lake up to the point where Williamson Valley Wash meets Big Chino Wash. Downstream connectivity for Partridge Creek to Big Chino Wash and the Upper Verde River is discussed below.

Impacts to sensitive species in the Big Chino Wash Complex are also discussed below and impacts to sensitive species in the Upper Verde River from proposed sport fish stockings in the Big Chino Complex are discussed comprehensively in combination with Granite Creek and Sycamore Creek complexes in the Upper Verde Complex Analysis.

Water Distribution/Connectivity

Water from Garrett Tank flows to the southwest down an access road roughly one-quarter mile before reaching an unnamed wash; water continues 6.8 miles into Pineveta Wash, then 5.4 miles along Pineveta Wash, through Little Pineveta Tank, 8.5 miles downstream from Garrett Tank on Pineveta Wash, and Williscraft Tank, 0.75 miles upstream from its confluence with Partridge Creek, into Partridge Creek. From that point water would flow 13.2 miles down intermittent and ephemeral Partridge Creek into Big Chino Wash and then 26.5 miles along ephemeral Big Chino Wash to Sullivan Lake at the upstream end of the Upper Verde River. Water from Shucking and Presley Tanks must flow 41.5 and 37 miles respectively down Partridge Creek before reaching Big Chino Wash.

Water from Stone Dam must flow approximately 9 miles down Johnson Creek, through Steel Dam Reservoir and Jumbo Tank before reaching Partridge Creek. From this point it is 18.58 downstream to the confluence with Big Chino Wash.

Partridge Creek has both intermittent and ephemeral reaches, with isolated shallow pools that persist during years with average precipitation, and no pools in years with below average precipitation, and a channel that is typically dry (Figure 20). These pools are not known to support any aquatic vertebrates (AGFD Memo, T.A. Liles to K. Young, June 2, 1998); however, recent surveys to look for pools have not been conducted, since the stream channel is typically dry (A. Clark, pers. comm.) Very little aquatic vegetation is present in the Partridge Creek drainage because of lack of consistent water. Mud, Field Dam, Buster Brown Tank, Sixshooter Tank, Presley Tank, Seven Ranch Tank, Flagstone Tank, Grove, Goldtrap Tank, Heifer, Jumbo and multiple other downstream tanks exist on side channels that flow in to Partridge Creek or are on Partridge Creek itself. All of these tanks are known to dry during arid periods.

Figure 20. Partridge Creek looking upstream from Interstate 40 crossing, April 2009.

From the confluence with Partridge Creek, Big Chino Wash continues approximately 29.5 miles to Sullivan Lake. Big Chino Wash is mostly ephemeral with a few isolated off-channel pools and ponds throughout this stretch to Sullivan Lake on the Upper Verde River.

Spills originating from Granite Basin Lake would flow down Mint Wash 16 miles to Williamson Valley Wash, which is an interrupted perennial system that flows an additional 15 miles to the Upper Verde River. Mint Wash has both canyon-bound reaches and wide alluvial reaches in the 16 miles upstream of Williamson Valley Wash. Spills have been observed in 2005 and 2008 at Granite Basin Lake. Spills typically occur during spring months and result from snow runoff.

During winter to spring, when flows in Big Chino Wash and Williamson Valley Wash connect, they tend to disperse and braid and spread into an alluvial fan rather than channelize. Both washes flow through very wide valley floodplains with sandy alluvial soils and low gradients. During the winter of 2004-2005, Partridge Creek, Big Chino Wash (Figure 21), Williamson Valley Wash (Figure 22), and the upper Verde River were hydrologically connected for a short period of time. Figure 23 depicts the February 2005 combined flows from the Big Chino and Williamson Valley Wash, topping Sullivan Dam at the upstream end of the Upper Verde reaches. Flows at the stream gauge on the Verde River near Paulden peaked on January 12, 2005 at 12, 300 cfs. On February 12, 2005, a peak stream flow was recorded at 8,340 cfs at the Williamson Valley gauge. Sullivan Lake on average covers about 14 surface acres. Outflow from Sullivan Lake continues about 2 miles down Spring Canyon to the headwaters of the Verde River. On

August 24-25, 2009, over 3 inches of rainfall fell in localized areas between Chino Valley and the upper Verde River. Readings at the Paulden gauge peaked at 2,610 cfs following that event (Figure 24; Figure 25). No other gauges in the area recorded higher stream flows. Of the several events that occurred between July 2009 and May 2010, only the extremely large event that occurred during February 2010 was either large enough in magnitude or spatial coverage to result in a discharge sufficient to detect a flow response at both the Paulden and Williamson Valley Wash gauges. These data further indicate the localized nature of flooding in the Verde River drainage.

Figure 21. Confluence of Partridge Creek (on right) and Big Chino Wash, December 2004.

Figure 22. Confluence of Big Chino Wash (flowing left to right) and Williamson Valley Wash (bottom flow coming from left), December 2004.

Figure 23. Sullivan Dam downstream from the confluence of Big Chino Wash (flowing left to right) and Williamson Valley Wash at the upstream end of the Upper Verde reach, February 2005.

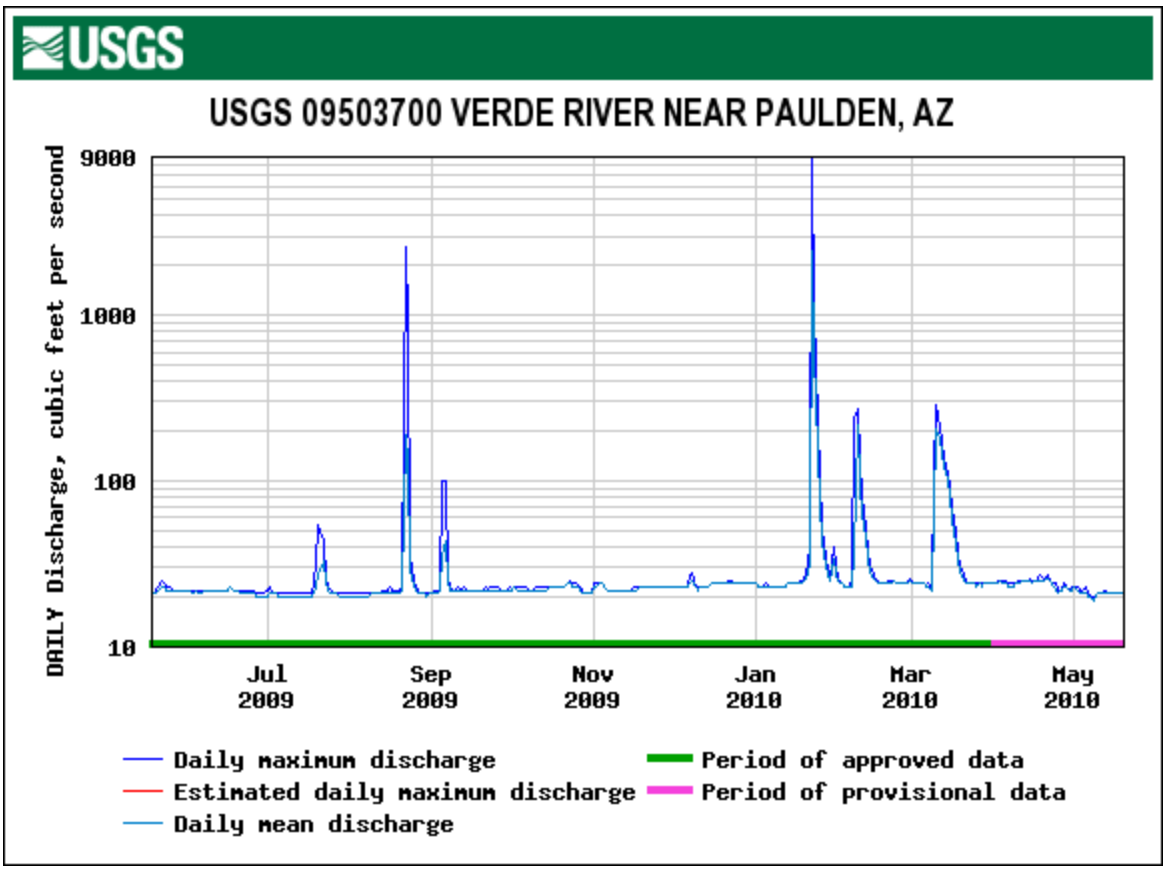

Figure 24. Discharge data from USGS gauge 09503700 located on the Verde River near Paulden, Arizona depicts high discharge events in August 2008 as well as during spring 2010.

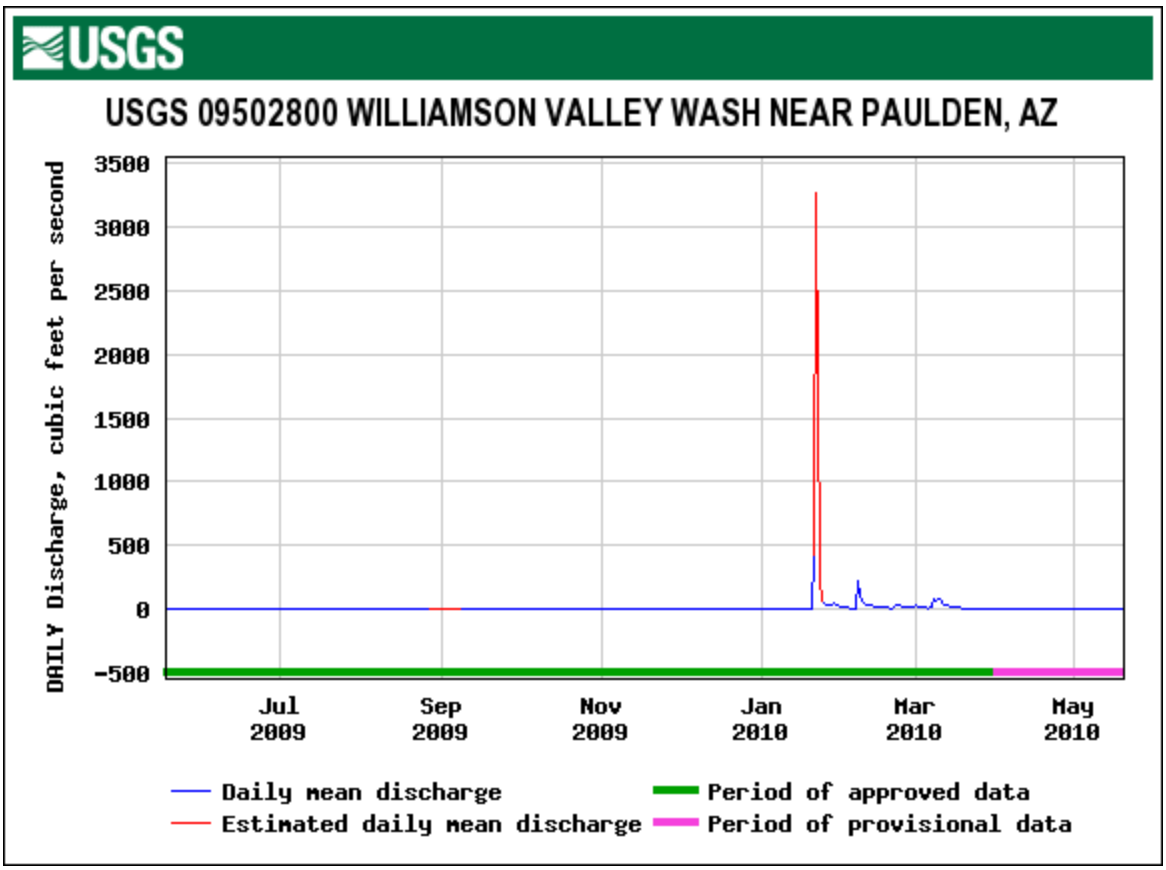

Figure 25. Discharge data from USGS gauge 09502800 located at Williamson Valley Wash near Paulden, Arizona indicates that no discharge was registered at the gauge during August 2009.

Fish Movement

Movement of stocked fish out of the five reservoirs can only occur when the reservoirs spill, which only happens infrequently after sustained high precipitation events, typically during spring. In addition, it generally takes multiple and consecutive storm events that saturate stream channels to result in flow events sufficient to both result in measurable stream discharges and to move fish (Figures 4 and 5 and pers. com. Andy Clark). Fish being transported downstream in these events could persist in downstream tanks or pools as long as they held water, and in some instances could serve as a downstream source of fish to the upstream tanks.

When Partridge Creek flows, it is assumed the flows could carry fish that have escaped upstream stocking locations, downstream to where Partridge Creek joins Big Chino Wash and on downstream to the Upper Verde River. Most of the smaller tanks in the area completely dry with some frequency; however, fish washed downstream in flood events could persist in tanks as long

as they maintain water. It is unlikely fish would persist in Partridge Creek outside of the various tanks in the watershed, because normally dry pinion-juniper woodland washes do not maintain water long enough for fishes to persist; but it is unknown if any perennial pools persist year round.

If stocked fish escape from tanks in the Partridge Creek drainage and are transported downstream in a flow event that connects to Big Chino Wash, they could then move upstream or downstream, accessing other tributaries of Big Chino Wash such as Williamson Valley Wash. However, it is more likely that fish would be washed downstream into Sullivan Lake. There are no known barriers to upstream movement of fish in Williamson Valley Wash during times when the stream connects to Big Chino Wash. Transportation of viable stocked sport fish species to the Upper Verde River may possibly occur during persistent and extreme precipitation events. However, with the exception of channel catfish, which maintains an existing reproducing population in upper reach of the Verde River, results from ten years of sampling the Upper Verde River from Granite Creek to Sycamore Creek show that the proposed stocked species either do not access the Upper Verde River, or if they do, they do not persist (See Upper Verde Impacts Assessment).

Community Description

No recent surveys have been done in Partridge Creek or Big Chino Wash because there is no evidence of fishes moving into the Upper Verde to support priority for a survey to be conducted. The only time these drainages have water to support fishes is during persistent, high precipitation events resulting in runoff. These events are infrequent, and conducting surveys that coincide with surface flow is extremely difficult due to lack of instantaneous information on when such flows exist, difficulty sampling effectively during high flow conditions, sediment loads that make it difficult to discern fish, and concern for survey crew safety.

Other tanks exist on channels that flow into Partridge Creek; for example, Seven Ranch, Flagstone, Goldtrap, Heifer, Cable, Cow Crossing Buck, Garden tanks, Williscraft, Jumbo, and others. These tanks are located primarily on private and State Trust Land, are not stocked by the Department, and there is no information on whether or not they have fish present. Of the multiple tanks located on Partridge Creek and its tributaries, the Department only stocks Garrett Tank, Shucking Tank, Presley Tank, and Stone Dam. Other tanks are known to dry periodically, but fish presence is unknown

Fish species collected at various locations within the Verde River drainage, AZ, as reported by Bagley (2002) are indicated in Table 14.

Table 14. Fishes collected from the Verde drainage in 2000-2001. Streams are identified from south to north along the east side of the Verde drainage, then north to south along the west side.

*Locations within one stream are listed from downstream to upstream. Native species are indicated by *.*

Location	**Species**												
	Brown trout	**Gila chub***	**Longfin dace***	**Speckled dace***	**Red shiner**	**Fathead minnow**	**Sonora sucker***	**Desert sucker***	**Yellow bullhead**	**Mosquitofish**	**Smallmouth bass**	**Green sunfish**	**NO FISH**
Oak Creek @ Cave Spring Campground	X			X									
West Fork Oak Creek ½ mi above Oak Creek	X			X				X					
West Fork Oak Creek @ FS Rd 231													X
Lockwood Spring (West Fork Oak Creek)													X
West Fork Oak Creek @ Flag Tank													X
Spring Creek @ Willow Point Road		X	X	X			X	X					
Sycamore Creek Verde-Parsons Spring							X	X	X		X	X	
Grindstone Wash T20N R1E Sec 34													X
Bear Canyon @ Road 71													X
Bear Canyon @ Road 354													X
Bear Canyon @ Bear Springs													X
Williamson Valley Wash, Simmons		X	X			X				X			
Apache Creek @ Walnut Creek				X									
Apache Creek @ 4 mi from Walnut Creek				X									

Location	Species												
	Brown trout	Gila chub*	Longfin dace*	Speckled dace*	Red shiner	Fathead minnow	Sonora sucker*	Desert sucker*	Yellow bullhead	Mosquitofish	Smallmouth bass	Green sunfish	NO FISH
Apache Creek @ Apache Springs													X
North Fork Walnut Creek @ Apache Creek				X									
North Fork Walnut Creek @ South Fork Walnut Creek				X									
North Fork Walnut Creek above South Fork													X
South Fork Walnut Creek ½ mile above North Fork				X									
Mint Wash @ Mint Spring													X
Mint Wash below Granite Basin Lake													X
Granite Creek 1 mile above Verde River			X		X	X	X			X		X	

The only known occurrences of listed fish species in the Big Chino sub-watershed is the endangered Gila chub population located in a small reach on Williamson Valley Wash, approximately 15 miles upstream from its confluence with Big Chino Wash, that supports perennial surface flow and cienega habitat. Gila chub critical habitat is designated along Williamson Valley Wash for a 4 mile stretch between the confluence of Mint Wash and Mud Tank Wash.

The nearest documented occurrence of Gila chub to one of the five proposed stocking locations is about 17 miles downstream of Granite Basin Lake in Williamson Valley Wash. In 1990, Dave Gori with TNC surveyed pools and cienega-type habitat in Williamson Valley Wash and collected Gila chub (139+31 juveniles), longfin dace (79), fathead minnow(3) and green sunfish (1) (HDMS 2009). Williamson Valley Wash was again sampled in 1992 by Rob Bettaso and Allison Anderson to collect genetic samples for Dean Hendrickson at the University of Austin.

The only fish reported from those collection attempts was Gila chub; however, collection of other species was not reported or recorded (Weedman et al. 1996). Gila chub were also detected within Williamson Valley Wash in June 2001 (Bagley 2002); other species captured included longfin dace, fathead minnow, mosquitofish and bullfrogs. In January 2003, Gila chub were again documented in Williamson Valley Wash on private land by a private consultant. The data is privately kept and unavailable for inclusion in this document. None of the sport fish proposed to be stocked into any of the five locations in the Big Chino watershed have been detected in the portion of Williamson Valley Wash inhabited by Gila chub.

The South Fork of Walnut Creek and the mainstem Walnut Creek are tributaries to Big Chino Wash, and speckled dace have been documented in both since 2000 (Morgan 2000; Bagley 2002). Granite Creek from its mouth to 1 mile upstream is mostly perennial, and is inhabited by longfin dace, Sonora and desert sucker, green sunfish, and bullfrogs (Bagley 2002; see Granite Creek Complex). There have been no surveys in the Big Chino upstream from the confluence of Walnut Creek. The Department's Region 3 indicated that surveys have not been conducted because the system is dry outside of run-off and extreme storm events (A. Clark, pers. comm.).

Consultation Species and/or Critical Habitat
Gila chub and bald eagle are the only listed species with occurrences in the Big Chino Sub-Watershed. Potential impacts to bald eagles are addressed in the Granite Basin Lake site analysis. Impacts to listed species such as spikedace, razorback sucker, and garter snakes that occupy areas in the Upper Verde River and/or downstream, are addressed in the Upper, Middle and Lower Verde River Analyses.

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.

Gila Chub
A Gila Chub population exists in a small reach on Williamson Valley Wash, approximately 15 miles upstream from its confluence with Big Chino Wash. This reach supports perennial surface flow and cienega habitat and is located on private property.

Gila chub critical habitat is designated on along Williamson Valley Wash for a 4.4 mile stretch between the confluence of Mint Wash and Mud Tank Wash (from the gauging station in T17N, R3W, sec. 7 SE\1/4\ upstream to the crossing of the Williamson Valley Road in T17N, R4W, sec. 36 NE\1/4\). Within the critical habitat areas, the primary constituent elements identified are the following:

(i) Perennial pools, areas of higher velocity between pool areas, and areas of shallow water among plants or eddies all found in small segments of headwaters, springs, or cienegas of smaller tributaries;

(ii) Water temperatures for spawning ranging from 17 to 24° C (62.6 to 75.2° F), and seasonally appropriate temperatures for all life stages (e.g. varying from approximately 10°C to 30°C);

(iii) Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (e.g. ranging from 6.5 to 9.5), dissolved oxygen (e.g. ranging from 3.0 to 10.0) and conductivity (e.g. 100 to 1000 mmhos);

(iv) Food base consisting of invertebrates (e.g., aquatic and terrestrial insects) and aquatic plants (e.g., diatoms and filamentous green algae);

(v) Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, and a high degree of streambank stability and healthy, intact riparian vegetative community;

(vi) Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives are kept at a level that allows Gila chub to continue to survive and reproduce; and

(vii) Streams that maintain a natural flow pattern including periodic flooding.

Potential impacts

Potential impacts to Gila chub could result if stocked fish species escape from Granite Basin Lake, and less likely, Garrett Tank, Shucking Tank, Presley Tank, or Stone Dam. There is a low possibility stocked fish could be transported during flood flows through the ephemeral Mint Wash or Partridge Creek and then move upstream into Williamson Valley Wash. Impacts could occur if they occupy for a time, or become established in the occupied or designated critical habitat. Of the species proposed to be stocked, channel catfish are the only species likely to establish in a riverine environment, and are in fact already established in the Verde River. Channel catfish are not proposed for stocking at Granite Basin Lake, but they are proposed at the remaining 4 stocking locations in the Partridge Creek drainage. Potential impacts could include predation of adult catfish on Gila chub (all life stages), and competition for food and/or for space between small catfish and chub in the limited aquatic habitats that would remain after flooding ceased could occur.

Spills are infrequent at Granite Basin Lake but do occur, and could result in largemouth bass escapement. Only small sizes of bass would likely to survive the fall of 30 feet to bed rock below the dam. Plunge pools predominate for several miles below the dam and surveys of these habitats did not detect bass or channel catfish (Bagley 2002). This habitat could facilitate bass movement through a system but is not conducive to largemouth bass survival. Plunge pools typically are deep cold habitats with little vegetation. Frequency of flows would have to be consistent in order to transport bass out of these pools and down Mint Wash. High flows during flood events tend to reduce non-native fish numbers in other places in Arizona (Minckley et al. 1986). Largemouth bass would have to survive 4 miles of wide sandy wash with extensive braiding to Gila chub occupied areas of Williamson Valley Wash. The likelihood of stocked fish movement is very small because largemouth bass have been present in Granite Basin Lake since at least 1950 despite numerous high flow events between 1950 and 2009; established largemouth bass populations have not been detected anywhere in the Big Chino Complex or the upper Verde River. The only locations largemouth bass maintain viable populations are Granite Basin Lake and Presley Tank. It is unlikely largemouth bass washing into Mint Wash from Granite Basin during flood events would survive, because they do not in most other stream areas of Arizona. Potential impacts from largemouth bass could include predation of adult bass on Gila chub (all life stages), and competition for food and/or for space between small bass and chub in the limited aquatic habitats that would remain after flooding ceased could occur. Bluegill sunfish are not expected to survive transport downstream from Granite Basin as they are more suited to lacustrine systems, and would not be likely to survive transport though sediment laden waters; no impacts are anticipated from bluegill sunfish.

The cienega habitats that contain Gila chub in Williamson Valley Wash are on private lands and access has been denied. It is unclear how flood flows interact with this chub occupied habitat. Mint Wash is a narrow canyon for the first several miles, then draining into wide alluvial grassland. While individual bass may occasionally overcome the obstacles and reach the Gila chub occupied areas of Williamson Valley Wash to have direct impacts through predation or indirect impacts through competition and crowding to Gila chub, it is unlikely these isolated effects will result in the decline of Gila chub in the complex due to short duration and low frequency of this occurring. Of the species proposed to be stocked into the five locations, channel catfish are the only species that are likely to persist and become established in a riverine environment. However, in the 44 years since channel catfish were first stocked into any of the five locations (1965 in Granite Basin Lake), none have ever been recorded in Williamson Valley Wash.

Bluegill sunfish, redear sunfish, black crappie, and rainbow trout proposed for stocking in the Partridge Creek sub-drainage are not expected to survive transport from stocking locations to the confluence of with Williamson Valley wash, then upstream (Stone Dam – approximately 37

miles; Garrett Tank – approximately 50 miles; Presley Tank – approximately 67 miles, Shucking Tank – approximately 71 miles), then upstream Williamson Valley wash, approximately 11 miles to critical habitat, and occupied habitat. Timing of transport would be during high flow/runoff events where by increased sediment load would be expected to result in fish mortality as a result of decreased dissolved oxygen concentrations, concurrent with increased suspended sediments (Bozek and Young 1994; Waters 1995; Rinne and Carter 2008). Fine clay sediments transported with runoff often prohibit fish survival in pools following runoff events. It would be more likely for transported fish to be washed downstream with the flows rather than back upstream into Williamson Valley Wash into occupied Gila chub habitat.

Critical habitat

If stocked fish were to be exposed to the Williamson Valley wash designated critical habitat principal component elements (iv) and (vi) may be affected. Stocked fish species may compete for food including aquatic invertebrates and terrestrial and aquatic insects if the food base is in limitation. Also, presence of non-native stocked species results in habitat that is not devoid of non-native species; however given the long history of stocking non-native fish in 5 proposed stocking locations, and the continued persistence of Gila Chub in Williamson Valley wash it is assumed that any exposure of non-native fishes to date has and would likely continue to be kept at a level that allows Gila chub to continue to survive and reproduce.

GRANITE CREEK COMPLEX

Granite Creek has a drainage area of 359 square miles (approximately 229,829 acres) and drains into the upper Verde River approximately 2 miles downstream from Sullivan Dam, the upstream end of the Upper Verde River reach (Figure 26). The drainage begins at 6,237 feet in elevation along the northeast slopes of the Sierra Prieta range, southwest of Prescott and flows northeast towards the Verde River. Of the three stocked drainages in the Upper Verde sub-watershed, the Granite creek drainage covers the smallest area and its headwaters originate just southwest of Prescott, AZ.

Granite Creek runs exclusively in response to snowmelt runoff or large runoff events and is typically wetted from March to June annually. During drought periods the creek may be dry to intermittent. The only major tributary, greater than 10 miles in length, is Willow Creek. Willow Creek courses 10.5 miles from the slopes of the Sierra Prieta Mountains until it hits Willow Creek Dam, forming Willow Creek Lake, or Willow Lake. There are three discharge gauges in the Granite Creek drainage; historical discharge frequency and magnitude is discussed in further detail in the Granite Creek complex analysis below.

The Granite Creek Complex contains 3 lakes proposed for stocking sport fish (Figure 27), all in close proximity to the City of Prescott. Watson Lake is located on Granite Creek, Goldwater

Lake is located on Bannon Creek, a tributary to Granite Creek upstream from Watson Lake, and Willow Lake is a located on a Willow Creek, which flows into Granite Creek just downstream from Watson Lake.

Goldwater Lake

Site Description

Goldwater Lake is the most upstream of the three proposed stocking locations in the Granite Creek complex (Figure 27). Created in the 1930's as a water supply reservoir for the City of Prescott (City), Goldwater Lake sits at approximately 6,800 feet in elevation nearly 4 miles south of downtown Prescott (Figure 28). Two dams situated in the headwaters of Granite Creek on a drainage known as Bannon Creek create an upper 22 acre reservoir and a lower 8.5 acre reservoir.

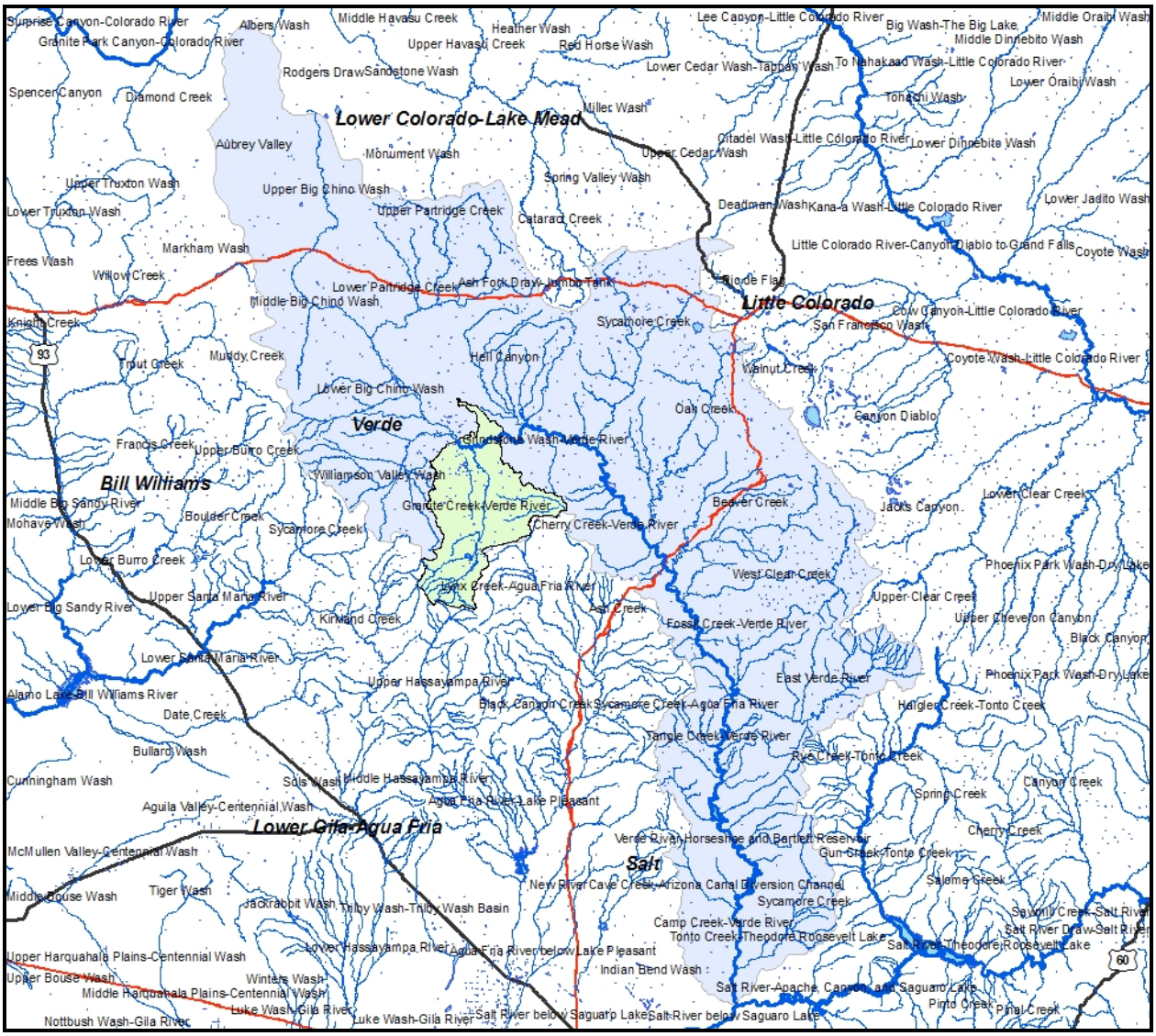

Figure 26. Granite Creek sub-watershed location within the Verde River watershed.

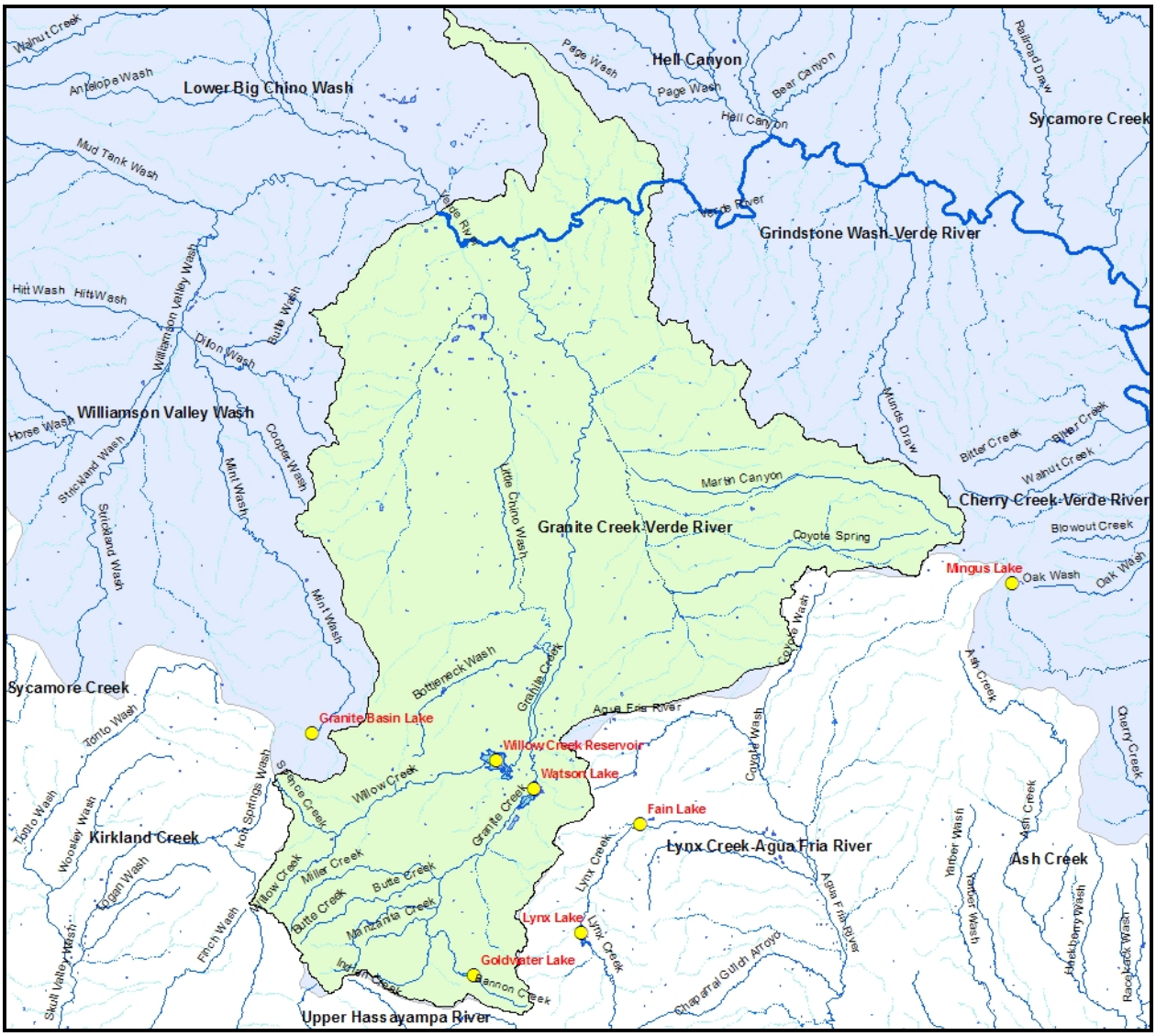

Figure 27. Granite Creek sub-watershed and proposed stocking locations.

Figure 28. Image of upper (right) and lower (left) Goldwater lake (Copyright:© 2009 ESRI, i-cubed, GeoEye).

In 1976, the City created a day-use recreation area at the upper lake. As a result of this development, the Arizona Game and Fish Department (Department) began managing the upper lake as an intensive use, warm water recreational fishery with an emphasis on sunfish and catfish. By the late 1990's, Goldwater offered a launch ramp and two fishing piers located on the southeast side of the lake. Goldwater Park currently offers a trail enabling anglers to access almost the entire lake. Operated as a City Park, Goldwater offers picnic areas, restrooms and a group site. Only boats with a single electric motor are allowed.

Management of Water body

Prior to 2003 Goldwater Lake was managed solely as an intensive use warm water recreational fishery with an emphasis on sunfish and catfish. In 2003, the Department changed the emphasis of the fishery to a "two-story" concept to provide both a warm and cold water fishery and began stocking catchable sized rainbow trout (Table 14). This change was done in response to the increasing population of the area and low catch rates. No fish have been stocked by the Department in the lower lake since it is not open to the public; however, populations of largemouth bass, bluegill, and black crappie are known to persist in the lower lake even though the lower lake has not been sampled (A. Clark pers. comm.).

During most months, angler comments point to Goldwater Lake being the most popular trout fishery in the Region; a year-long creel survey is underway to quantify angler use. The 2001 statewide angler use survey based on angler license sales estimated that Goldwater Lake supported 7,230 angler use days (Pringle 2004). Historically, trophy sized largemouth, state record bluegill and redear sunfish bass have been found at this lake. The City of Prescott houses an employee at the lake; this employee spends some amount of time each year trapping and removing crayfish.

Table 14. Stocking history of Goldwater Lake, 1976 - 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Black crappie	1978	1995	2	2,565
Bluegill	1994	2008	6	6,760
Channel catfish	1976	2008	12	24,271
Largemouth bass	1977	2008	2	264
Rainbow trout	2003	2007	89	112,020
Redear sunfish	1978	1995	5	19,590
Tadpole	1978	1978	1	2,000
Total			75	126,370

The Department plans to manage Goldwater Lake primarily as a year round self-sustaining largemouth bass (average size of not less than 12 inches), bluegill sunfish and black crappie (feature species) fishery, and secondarily as a spring through fall intensive use, put-and-take rainbow trout fishery. Stocking would consist of adult bass typically in the spring months. Since largemouth bass prey on crayfish, future management actions include attempts to reduce the crayfish population by stocking 12-14 inch largemouth bass.

The Department plans to manage for a self sustaining bluegill population that offers anglers an average size of not less than 6 inches. If results of netting and/or electrofishing surveys detect a lower average size, surveys would be scheduled for the next season or the following year to confirm a possible problem. If subsequent surveys confirm low average size, supplemental stockings would be considered.

A self-sustaining black crappie population that offers anglers an average size of not less than 10 inches is desired. If results of netting and/or electrofishing surveys detect a lower average size, surveys would be scheduled for the next season or the following year to confirm a possible problem. If subsequent surveys confirm low average size, supplemental stockings would be considered. Black crappie stockings would consist of adult black crappie typically in the summer months. Need would be determined by angler and netting surveys as previously described.

Triggers that may result in supplemental stockings of largemouth bass, bluegill, black crappie may include: a trend of low catch rates of a certain species in population surveys or creel surveys, fish kills, low numbers or quality of prey species, or significant increases in angler utilization.

Proposed Action

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

Subcatchable and catchable largemouth bass would be stocked during the spring; numbers of fish stocked would be from 0 - 50 fish per acre annually.

Catchable bluegill would be stocked during summer months; numbers of fish stocked would be from 0 - 10 fish per acre annually.

Catchable black crappie would be stocked during summer months; numbers of fish stocked would be from 0 - 100 fish per acre annually.

Catchable rainbow trout would be stocked bi-monthly from February through November; numbers of fish stocked would be 0-400 fish per acre per stocking event.

Water Distribution / Connectivity

Bannon Creek upstream of Goldwater Lake is the only inflow, and only flows in response to run-off events. The City of Prescott does not keep formal records of Goldwater Lake spill events, and the spill frequency of upper or lower Goldwater Lakes is not known; however Department personnel observations suggest that spills of the upper lake do occur, however at low frequency (A. Clark pers. comm.). The watershed collected by Goldwater Lake is small (Figure 27). Water sources are limited to run-off following extreme storm events. Water spilling from upper

Goldwater is captured by lower Goldwater Lake (Figure 29 and Figure 30). A large dam and spillway backs up lower Goldwater Lake and spills would involve sheet flow and again are infrequent (Figure 31, Figure 32 and Figure 33). Bannon Creek downstream of upper Goldwater Lake, through lower Goldwater Lake, has ephemeral water flow for 2.5 miles, into Granite Creek. From this point Granite Creek has ephemeral water flow for 6 miles into Watson Lake (Figure 34). Manzanita Creek, Aspen Creek, Butte Creek and Miller Creek all flow into Granite Creek downstream from the Bannon Creek confluence. Prescott Reservoir and several other smaller water bodies exist on Aspen Creek. See the water distribution/connectivity section under Watson Lake for Granite Creek water distribution and connectivity downstream of Watson Lake.

Figure 29. Dam at upper Goldwater Lake, April 2004.

Figure 30. Spillway below dam at upper Goldwater Lake, December 2009.

Figure 31. Spillway at lower Goldwater Lake, December 2009.

Figure 32. Spillway at lower Goldwater Dam, December 2009.

Figure 33. Culvert at below spillway at lower Goldwater Dam, December 2009.

Figure 34. Bannon Creek below spillway at lower Goldwater Lake, December 2009.

Fish Movement

Movement of stocked fish would only occur during years of heavy snowfall and previous year conditions allowed both lakes to remain relatively full. Spills out of upper and lower Goldwater would typically be in spring. Water spilling over either dam would involve sheet flow and include large drops into altered streambeds. It generally takes multiple storm events in a row fill both reservoirs and saturate stream channels to result in flow events sufficient to move fish.

It is unknown if fish move out of upper Goldwater Lake into lower Goldwater when the reservoir spills; however, a netting survey of lower Goldwater Lake in August 2009 yielded no fish. Largemouth bass were visually documented in lower Goldwater Lake just weeks before this survey by the Department's Regional Fish Program. If fish did escape the upper lake during run-off events, they would move into the lower lake. A visual survey of Granite Creek in May of 2007 near Miller Valley Road did not detect any fish and habitat was primarily riffles and small shallow pools (Chmiel 2007b). If stocked fish escaped the lower lake, they could travel approximately 2.5 miles downstream Bannon Creek to Granite Creek, then an additional approximately 6 miles downstream to Watson Lake. Normally dry pinion-juniper woodland

washes do not maintain water long enough for fishes to persist. Small, headwater channels of a drainage network are important in determining the amount of sediment transported downstream during storm events. This increased sediment load can have negative effects on channel stability, fish, invertebrates, and overall stream productivity. High sediment loads can often result in fish mortality as a result of decreased dissolved oxygen concentrations, concurrent with increased suspended sediments (Bozek and Young 1994; Waters 1995; Rinne and Carter 2008). Fine clay sediments transported with runoff often prohibit fish survival in pools following runoff events. Given the number of additional streams that would flow into Granite creek below Goldwater Lake it is likely that during run-off events significant enough to result in stream flow, the water flows would have high sediment loads that would likely decrease fish survival during transport, particularly for stocked rainbow trout. See the fish movement section under Watson Lake for movement of fish out of Watson Lake into downstream Granite Creek, and the upper Verde River.

Community Description

The fishery at Goldwater Lake has the potential to offer outstanding angling opportunities. Water quality and chemistry are both conducive to trout survival and good sunfish growth. Oxygen levels are low during summer months, but limited data collected shows it stays above lethal levels (A. Clark pers. comm.). Factors limiting the fishery in the past have been a very large population of crayfish and a growing transient population of double-crested cormorants.

Of the 8 fish species captured in recent surveys in Goldwater Lake, largemouth bass, channel catfish and green sunfish are the predominant species (Table 15). Goldwater Lake does not host any fish species not found in Watson Lake downstream. Crayfish are very abundant.

The relatively low incidence of small age classes of largemouth bass in samples prior to 2009 suggests the crayfish are preying on eggs and harassing spawning adults. One hundred one-pound average largemouth bass were stocked in late summer 2008. This stocking may have produced enough reproducing bass to account for the large numbers of young bass sampled in September 2009 (Table 15). The crayfish are obvious prey items for adult bass but are in such great numbers that recruitment of young size classes may be hampered. The effects of large numbers of crayfish may have an even higher impact on recruitment of bluegill and green sunfish populations since abundance of sunfishes seems lower than expected given the available habitat. A sharp decline in green sunfish is noted between the 2000 and 2003 surveys. Rocky habitats are favored by both sunfishes and crayfish, and crayfish may be competing better than bluegill and green sunfish for available space. Angling pressure and no supplemental stockings since 2001 may have contributed to declines in sunfishes.

Aquatic plant abundance and diversity is low, with only two species, Eurasian water milfoil and northern water milfoil being recorded in a 2004 survey (Robinson et al. 2007). Rooted aquatic vegetation can be troublesome for anglers during summer months, but most likely is quality habitat used by bass and sunfishes. Observations made in July 2005 indicated much of the area around the piers was denuded of vegetation, presumably by crayfish. As one walks along the shoreline in between the piers, the bottom moves as hundreds of crayfish flee to deeper water. As of summer of 2009, aquatic vegetation continues to be limited around the lake (A. Clark pers. comm.). Crayfish trapping by the Department and by the City has been successful on a small scale; however, these activities are time consuming and must be done on a long term and consistent basis to be effective. Re-building a population of largemouth bass large enough to limit the crayfish population may be a better solution.

There are no endangered, threatened or candidate fish species or critical habitat in Granite Creek above Watson Lake. Goldwater Lake is located in the bald eagle DPS. Goldwater Lake is located within Mexican spotted owl critical habitat.

Table 15. Species, number, relative abundance, size range and catch per unit effort of fish surveys by electrofishing at Goldwater Lake.

June 2000					
N= 70.0	Total Weight (grams)= 29,820			Total effort units (minutes) = 29	
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Size Range (mm)**
Black Crappie	16	16	9.41%	0.12	56-100
Golden Shiner	1	1	0.59%	0.01	111
Largemouth Bass	28	28	16.47%	0.22	175-460
Bluegill	2	2	1.18%	0.02	65-207
Green Sunfish	110	110	64.71%	0.85	54-200
Channel Catfish	12	12	7.06%	0.09	153-542
Goldfish	1	1	0.59%	0.01	180
June 2001-target Largemouth bass collected for ADEQ contaminants study					
N=5	Total Weight=3083			Total effort units (minutes) = 18	
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Size Range (mm)**
Largemouth Bass	5	5	100	.27	310-415
June 2003					
N=11	Total Weight=7807			Total effort units (minutes) = 46	

Common Name	Num. Sampled	Num. Measured	% of Total	CPUE	Size Range (mm)
Largemouth Bass	6	6	54.55%	0.13	410-470
Green Sunfish	5	5	45.45%	0.11	80-95
May 2006					
N=137	Total Weight=22209			Total effort units (minutes) = 45	
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Size Range (mm)**
Black Crappie	1	1	0.73%	0.02	95
Rainbow Trout	20	20	14.60%	0.44	185-315
Largemouth Bass	5	5	3.65%	0.11	375-535
Green Sunfish	109	109	79.56%	2.42	80-155
Channel Catfish	2	2	1.46%	0.04	620-625
May 2007					
N=95	Total Weight=14985			Total effort units (minutes) = 42	
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Size Range (mm)**
Rainbow Trout	20	20	21.28%	0.48	220-280
Largemouth Bass	2	2	2.13%	0.05	420-470
Bluegill	1	1	1.06%	0.02	185
Green Sunfish	70	70	74.47%	1.67	52-183
Channel Catfish	1	1	1.06%	0.02	770
Goldfish	1	1	1.06%	0.02	402
September 2008					
N=421	Total Weight=21533			Total effort units (minutes) = 30	
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Size Range (mm)**
Rainbow Trout	8.00	8.00	1.90%	0.27	228-375
Largemouth Bass	0.00	0.00	0.00%	0.00	0
Bluegill	7.00	7.00	1.66%	0.23	125-155
Green Sunfish	404.00	404.00	95.96%	13.47	52-175
Channel Catfish	2	2	0.48	.07	755-840
September 2009					
N=159	Total Weight=18073			Total effort units (minutes) = 30	

Common Name	Num. Sampled	Num. Measured	% of Total	CPUE	Size Range (mm)
Rainbow Trout	6.00	6.00	3.77%	0.20	235-257
Largemouth Bass	93.00	4.00	58.49%	3.10	100-349
Bluegill	0.00	0.00	0.00%	0.00	0
Green Sunfish	50.00	4.00	31.45%	1.67	100-180
Channel Catfish	8.00	8.00	5.03%	0.27	426-616
Smallmouth Bass	1.00	1.00	0.63%	0.03	280
Red Shiner	1	0.00	0.63%	0.03	>100

Consultation Species or Critical Habitat

Potential impacts to bald eagle and Mexican spotted owl and critical habitat are discussed immediately below. Consultation species and critical habitats potentially impacted downstream are located in the Upper Verde River and are addressed in the Upper Verde River analysis. Northern Mexican and narrow-headed gartersnakes are analyzed within the Granite Creek Complex analysis and also addressed in the Upper Verde River analysis.

Bald Eagle

Lynx Breeding Area is located approximately 4.2 miles from Goldwater Lake and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2001 and were last observed 21 May, 2009. Nest watchers were able to observe the prey types and in some cases species that were delivered to the nest by the eagles. Observed prey in 2006 included: birds (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 show 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. Goldwater Lake has monofilament bins present currently.

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.

Mexican Spotted Owl
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.

Watson Lake
Site Description
Watson Lake is a 200 surface-acre reservoir located on Granite Creek approximately 9 miles downstream of Goldwater Lake (Figure 27). Watson Lake was created in 1912 on land acquired by the Arizona Land and Irrigation Company in the early 1900's. The dam took 2-years to complete and Watson Lake filled for the first time in 1915. The Arizona Land and Irrigation Company transferred all of its rights, title and interest in Watson Lake to the Hassayampa Alfalfa Farms in 1914. The entity that was Hassayampa Alfalfa Farms became the Chino Valley Water District (CVID) in 1925.

Historically both Willow Lake and Watson Lake were used for agricultural purposes around the town of Chino Valley. In December of 1998, the City of Prescott (City) purchased both reservoirs and the water rights, to provide recreation to area residents (Figure 35). In addition to recreation, the city now uses water in Watson and Willow to help achieve aquifer recharge goals that could factor into future "safe-yield" determinations as part of the Prescott Active Management Area (AMA). The capacity of Watson Lake is 4,600 acre-feet. Storage beyond this capacity is to be released into Willow Lake between April and October annually to meet aquifer recharge goals and from spilling into Granite Creek. A 4-inch pipe aqueduct exists that can

divert water from Watson to Willow Lake. The spillway elevation at Watson Lake is considered by the City to be equivalent to the 100-year floodplain. The City of Prescott (City) is anticipating keeping the level of water at Watson Lake as full as possible at its conservation pool or greater which is 5,161 feet above mean sea level (Logan Simpson Design 2000). This elevation is the same as the spillway elevation.

Watson Lake is a popular city park with restroom, picnic, playground, and other recreational facilities available to visitors (Figure 36). The City has invested significant resources into installing a second boat launch and floating mooring pier associated with the launch. Parking areas for boaters have also been expanded and improved. There are no motor restrictions on this lake.

Figure 35. Aerial satellite image of Watson Lake and Willow Creek Lakes (Copyright:© 2009 ESRI, i-cubed, GeoEye).

Figure 36. Aerial satellite image of Watson Lake through which Granit Creek flows (Copyright:© 2009 ESRI, i-cubed, GeoEye). The dam is located at the north end of the reservoir.

Management of Water Body

Currently, Watson Lake is managed as a self-sustaining warm water fishery with largemouth bass, black crappie, channel catfish, and bluegill. The Department hatchery program has stocked fish into Watson Lake for more than 60 years; 9 fish species have been stocked, including black crappie, bluegill, and rainbow trout (Table 16). Trout stockings have been sporadic and typically associated with high water events. Watson Lake was historically operated as a water retention basin for Chino Valley Irrigation District (CVID), so water conditions were frequently lethal to fish. Water releases from Watson Lake to the CVID was through a series of canals that often transported fish down into areas around Chino Valley and Paulden (N. Freeman, pers. comm.). Stockings were either to reestablish populations of warm water species or for short-term put-and-take trout fisheries. High numbers of these species have been stocked in the past, few individuals of stocked species have been found in downstream reaches of the Verde River since 1998 when the City acquired the lakes (AGFD Nongame database records; A. Clark, pers. comm.). This suggests a lack of suitable habitat in the Verde River as high water temperatures likely limit trout

persistence, minimal lentic habitat needed to support black crappie, bluegill, or largemouth bass is eliminated when flooding events scour the channel, and lack of connection due to the City's typical management of the lakes. Because of water recharge efforts as well as sand and gravel operations in Granite Creek, water does not typically flow from Watson Lake to the Verde River during most years.

Creel surveys have not been conducted at Watson Lake; however, the 2001 statewide angler use survey based on angler license sales estimated that Watson Lake supported 4,196 angler use days (Pringle 2004).

Table 16. Stocking history of Watson Lake 1941 – 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Black crappie	1967	1997	4	3,288
Bluegill	1941	1997	11	79,205
Channel catfish	1960	1998	14	96,366
Gila topminnow	1970	1970	1	1,360
Largemouth bass	1941	1999	15	60,438
Plains red shiner	1958	1958	1	1,800
Rainbow trout	1961	1962	12	12,000
Redear sunfish	1949	1967	2	10,570
Tadpole	1968	1973	3	22,000
Threadfin shad	1958	1973	4	5,100
Total			67	292,127

Future management objectives would center on infrequent stockings of stock sizes of black crappie and bluegill to augment self-reproducing populations. This most often would involve adult-sized fish. A seasonal rainbow trout put-and-take fishery would also be established. Winter-time stockings of catchable-sized rainbow trout would be utilized to increase angler opportunity in the Prescott area since the growing population has resulted in growing demand for angling opportunities. Rainbow Trout are not expected to reproduce in Watson Lake due to thermal limitations and predator loads. Periodic stocking to maintain sizes usable to anglers may be necessary due to drying and/or catastrophic flooding events. Periodic sampling to monitor populations would occur to evaluate what species are in need of augmentation.

Proposed Action

The Department proposes to stock bluegill sunfish, black crappie and rainbow trout for the period covered by this consultation.

Catchable sized rainbow trout would be stocked in winter months, typically for November to March annually; number of trout stocked would be from 0 - 15,000 fish annually.

Bluegill (fingerling, catchable) and black crappie (fingerling, catchable) may be stocked as needed at any time during the year to augment or to recover the fishery following catastrophic events. Numbers of fingerling bluegill would be from 0 - 200,000 fish annually; numbers of catchable bluegill would be from 0 – 2,000 fish annually. Numbers of fingerling black crappie would be from 0 - 200,000 fish annually; numbers of catchable black crappie would be from 0 – 2,000 fish annually.

Water Distribution / Connectivity

Water flows into Watson Lake following storm events extreme enough to result in runoff. Often multiple successive storm events are required before flows sufficient to connect to Watson Lake occur. Several streams flow into Granite Creek downstream of its confluence with Bannon Creek (upon which Goldwater Lake is located); these include Manzanita Creek, Aspen Creek, Butte Creek and Miller Creek as well as 2 unnamed streams. Runoff also flows directly into Watson Lake from a small tributary to the southeast. The Sun Dog Water Treatment facility is located just upstream of Watson Lake adjacent to Granite Creek. Settling ponds associated with this facility are fed by municipal sewer water and are not known to contribute fishes or aquatic life to Granite Creek or Watson Lake.

Releases to meet City recharge objectives do not flow down Granite Creek proper except briefly, immediately below Watson Dam to just upstream of where Willow Creek flows into Granite Creek (also upstream of USGS gauge 09503300, Figure 42, Granite Creek below Watson Lake near Prescott, AZ). Water spilling over the dam at Watson falls roughly 8 feet onto rocks before continuing downstream to a diversion dam.

In agreements with Salt River Project, Arizona Department of Water Resources and Chino Valley Water District, water may be released from Watson Lake via release valve or spill annually between April and October to meet water recharge objectives for the City; these releases are captured by open canal via a diversion dam (Figure 37) and carried by culverts to the water recharge facility near the Prescott Airport. Because the City manages Watson Lake at or near conservation pool, typically lake levels are within several feet of the dam. Water has spilled at Watson recently in 2005 and 2008 (C. Dotseth, pers. comm.). If spills over the dam occur outside of the April to October window, flow does not count toward the City's recharge objectives. This credit is extremely important to the area because it could help determine further "safe yield" determinations by the Arizona Department of Water Resources. Spills occurring outside of the City's releases must overcome the city diversion structures, sand and gravel pits

and other modifications to the Granite Creek streambed to reach the upper Verde River. This has been known to occur in 1993 and 2005.

An in-depth analysis of Granite Creek flow and connectivity downstream of Watson Lake to the upper Verde River is discussed in the Complex Analysis section.

Figure 37. Diversion Dam at UTM 12S 370118 mE 3830219mN (NAD27), USGS gage 09503300. Picture is from City's diversion canal.

Fish Movement

During runoff events sufficient enough to result in Granite Creek connecting to Watson Lake, fish in Watson Lake could move upstream into Granite Creek. Watson and Willow Lakes are directly in or adjacent to the stream course of Granite Creek. This placement makes them more prone to contributing non-native fishes to the upper Verde. City water management strategies result in maintenance of water levels for both reservoirs within several feet of their spillways and may make flooding more common. The city stands to lose a great deal, however, if any water is allowed to flow very far down Granite Creek below Watson Lake. Some flexibility does exist in the management of these reservoirs. Changes in water release since the City acquired these lakes may make downstream movement of fishes less likely than in years prior to 1998, when open canals carried water and fish from Watson Lake to the Chino Valley area into close proximity to

the upper Verde. Recipients of Watson and Willow Lake releases were agricultural in nature and had less control over where water ended up in the Chino Valley/Paulden area. Now, the City measures and monitors release in order to maximize the water recharge credits (C. Dotseth personnel comm.). Various private farm ponds harbored non-native fishes from Watson and Willow Lakes in the past. Many of these ponds are not in use today because agricultural uses have been reduced and water that used to be available is now used by Prescott.

The Granite Creek and Willow Creek watersheds are similar but distinct. Willow Lake is much larger than Watson yet its watershed is much smaller. Currently, water can be diverted from Watson to Willow in order to lower levels in Watson and prevent spilling through an aqueduct between the two. Three sand and gravel facilities operate in Granite Creek. One of these facilities is located upstream of Watson Lake and two are located just downstream of Watson Lake, one in the vicinity of the Prescott Airport (Hansen Materials), and one downstream of the town of Chino Valley. Settling ponds are present at all three facilities. These ponds could harbor non-native fish populations but no data are available to confirm this. Prescott receives credit for ground water recharge in the vicinity of the Prescott Airport. There is also a water treatment plan as well as a town park located upstream of Watson Lake.

Granite Creek has flooded to a sufficient magnitude to allow transport of fishes to the upper Verde River several times in the past 30 years (Clark 2003b). There are no known City records of spill events to indicate how often Watson Lake spills. Because the 23-miles of Granite Creek below Watson Lake is a wide sandy alluvium containing two sand and gravel operations which impede flow, and because the City of Prescott will keep as much water as possible, escapement of fish out of Watson Lake, through Granite Creek to the upper Verde River is only likely to occur during large high flow events.

See the Granite Creek Complex Analysis for a description and evaluation of fish movement from Watson Lake into downstream Granite Creek downstream.

Community Description

Watson Lake has two distinct regions; the inflow from Granite Creek is marked by a huge stand of cottonwood trees dubbed “Watson Wood”. This southern portion of the lake is shallow, weedy, and typically is home to millions of small bodied fishes such as red shiner, golden shiner, fathead minnow, and some longfin dace (A. Clark, pers. obs.). Hundreds of various bird species frequent this area as well. The northern region of Watson is characterized by the “Granite Dells” area. Huge boulders of granite are evident in this deeper part of the lake. Of the ten fish species captured in recent surveys, largemouth bass, yellow bullhead, and green sunfish are the predominant species (Table 17).

See the Granite Creek Complex analysis for a description of aquatic community assemblage in Granite Creek downstream from Watson Lake.

Watson Lake is within the bald eagle distinct population segment (DPS).

Table 17. Number, relative abundance, relative biomass and catch per unit effort of sampling at Watson Lake.

July 1999 (electrofishing)						
N= 37	Total Weight= 3050			Total effort units = 88 min.		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Green Sunfish	34	34	92%	0.39	2290	75.08%
Largemouth Bass	1	1	3%	0.01	710	23.28%
Fathead Minnow	1	1	3%	0.01	30	0.98%
Yellow Bullhead	1	1	3%	0.01	20	0.66%
Bluegill	100's	0				
Red Shiner	1000's	0				
May 2000 (electrofishing)						
N=339	Total Weight=27350			Total effort units = 171 min		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Fathead Minnow	1	1	0%	0.01	30	0.11%
Yellow Bullhead	4	4	1%	0.02	1470	5.37%
Green Sunfish	170	170	50%	0.99	13730	50.20%
Bluegill	76	76	22%	0.44	2670	9.76%
Largemouth Bass	18	18	5%	0.11	6840	25.01%
Golden Shiner	70	70	21%	0.41	2610	9.54%
June 2003 (electrofishing)						
N=387	Total Weight=3988			Total effort units = 171 min		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Green Sunfish	67	67	89%	1.49	1181	29.61%
Largemouth Bass	314	2	3%	0.04	1263	31.67%
Yellow Bullhead	6	6	8%	0.13	1544	38.72%
June 2005 (electrofishing)						
N=65	Total Weight=6858			Total effort units = 45 min		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Yellow Bullhead	7	7	10.77%	0.16	1148	16.74%

Red Shiner	1	1	1.54%	0.02	8	0.12%
Channel Catfish	1	1	1.54%	0.02	4794	69.90%
Green Sunfish	29	29	44.62%	0.64	516	7.52%
Bluegill	1	1	1.54%	0.02	9	0.13%
Largemouth Bass	23	23	35.38%	0.51	326	4.75%
Golden Shiner	2	2	3.08%	0.04	27	0.39%
Black Crappie	1	1	1.54%	0.02	30	0.44%
April 2007 (electrofishing)						
N=75	Total Weight=6801			Total effort units = 47 min		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Black Bullhead	15	15	20%	0.32	3307	48.63%
Green Sunfish	53	53	70.67%	1.13	1649	24.25%
Bluegill	1	1	1.33%	0.02	56	0.82%
Largemouth Bass	6	6	8%	0.13	1789	26.30%
September 2008 (Fishes < 100mm TL were counted, but not measured.)						
N=331	Total Weight=29653			Total effort units = 46 min		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Yellow Bullhead	42	42	12.69%	0.91	11985	40.42%
Green Sunfish	28	15	4.53%	0.61	563	1.90%
Bluegill	12	12	3.63%	0.26	476	1.61%
Largemouth Bass	380	243	73.41%	8.26	15609	52.64%
Golden Shiner	8	8	2.42%	0.17	326	1.10%
Black Crappie	14	11	3.32%	0.30	694	2.34%
October 2008 (electrofishing)						
N=36	Total Weight=694			Total effort units =36 min		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Weight Sampled (g)**	**% of Total**
Black Crappie	24	24	66.67%	0.30	256	36.89%
Yellow Bullhead	3	3	8.33%	0.04	235	33.86%
Largemouth Bass	3	3	8.33%	0.04	61	8.79%
Green Sunfish	6	6	16.67%	0.07	142	20.46%

Consultation Species or Critical Habitat

Potential impacts to bald eagle and Western yellow-billed cuckoo are discussed below. Consultation species and critical habitats potentially impacted downstream are located in the

Upper Verde River and are addressed in the Upper Verde River analysis. Northern Mexican and narrow-headed gartersnakes are analyzed within the Granite Creek Complex analysis and also addressed in the Upper Verde River analysis.

Bald Eagle

Lynx Breeding Area is located approximately 5.3 miles from Watson Lake and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2001 and were last observed 21 May, 2009. Nest watchers were able to observe the prey types and in some cases species that were delivered to the nest by the eagles. Observed prey in 2006 included: birds (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 show that the nest has been successful in 2007, 2008, and 2009 (Jacobson et al 2006, 2007; McCarty and Jacobson 2008, 2009).

Sullivan Breeding Area is approximately 15.6 miles from Watson Lake and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2007 and were last observed at the breeding area in 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Sullivan Breeding Area productivity data show that the nest failed in 2007, failed in 2008, and failed again in 2009 with one nestling gone 11 April, 2009-21 April, 2009 before they were 3 weeks old. The second nestling dies in the nest at 4-5 weeks old (Jacobson et al 2006, 2007; McCarty and Jacobson 2008, 2009). Watson Lake does have monofilament bins present.

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.

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.

Western Yellow-Billed Cuckoo

A documented occurrence was recorded in Granite Creek over 4 miles south of the lake in 1991. Documented occurrences have been recorded in the Upper Verde River.

Potential Impacts

There may be some limited amount of habitat degradation and some amount of disturbance to nesting cuckoos from anglers using or creating new trails to access the stocking site.

Potential impacts to migrant cuckoos can occur statewide and are most frequently found in the riparian zones along aquatic habitats (rivers, creeks, etc.), it is difficult to identify areas where they could not occur during migration. Additionally, the habitat requirements for migrant cuckoos are not as specific as nesting birds and specific stopover locations used are unpredictable in timing, duration, location, and abundance.

Willow Creek Reservoir

Site Description

Willow Creek Reservoir, locally known as just Willow Lake, was impounded in 1936 by the Chino Valley Water District (CVID) and is located in Prescott, AZ. The far eastern portion of the lake is privately owned. Willow Lake is located in close proximity to Watson Lake (Figure 35).Willow Lake dam impounds Willow Creek, creating the reservoir, which drains into Granite Creek 1.3 miles downstream of the Watson Lake spillway (Figure 38).

Historically both Willow Lake and Watson Lake were used for agricultural purposes around the town of Chino Valley. In December of 1998, the City of Prescott (City) purchased both reservoirs and the water rights, to provide recreation to area residents. In addition to recreation, the city now uses water in Watson and Willow to help achieve aquifer recharge goals that could factor into future “safe-yield” determinations as part of the Prescott Active Management Area (AMA). Willow Lake’s storage right capacity is 5,980 acre-feet. The spillway pool elevation is 5,140.5 feet above sea level, providing approximately 342 surface-acres of water storage. The conservation pool level is at 5,136 feet. The spillway elevation at both lakes is currently considered to be equivalent to the 100- year floodplain limit. Willow Lake can be filled by a 4-inch pipe aqueduct that can divert water (operating one way) from Watson to Willow Lake. Watson is at a higher elevation, but Willow Lake has a larger basin and often can take excess water from Watson. Willow Lake is relatively shallow with an average depth of less than 15-feet. The City is anticipating keeping the level of water at both of these lakes at their conservation pool elevation or greater (Logan Simpson Design 2000).

The City of Prescott has invested significant resources into installing a boat launch and floating pier associated with the launch. Parking areas for boaters have also been expanded and improved.

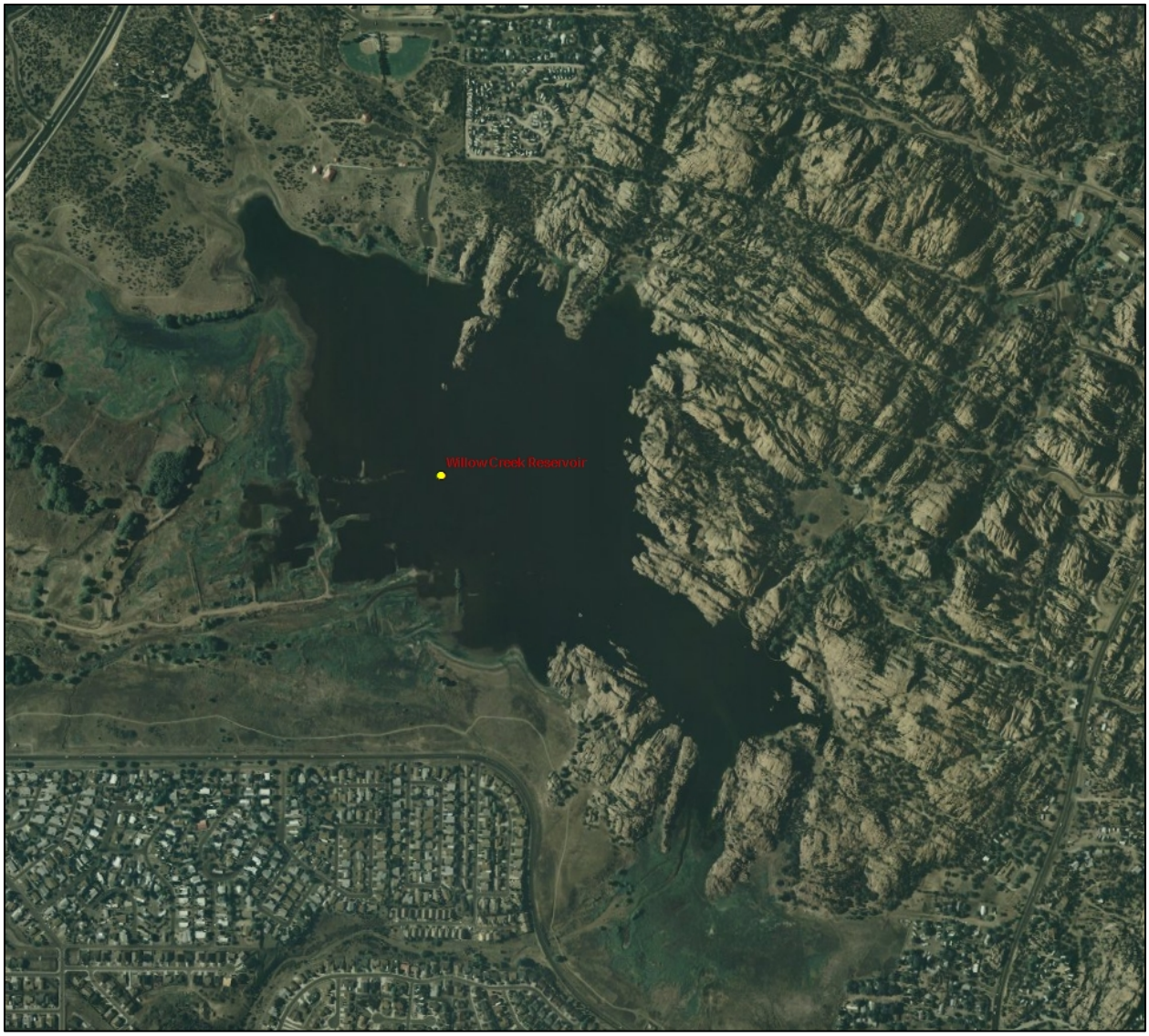

Figure 38. Image of Willow Lake (Copyright:© 2009 ESRI, i-cubed, GeoEye). The dam and flow is from lower left to upper right with Willow Creek coming in just above the lower subdivision.

Management of Water Body

Currently Willow Lake is managed as a self-sustaining warm water fishery with largemouth bass, black crappie, channel catfish, and bluegill. The Department's hatchery program has stocked fish into Willow Lake for more than 60 years; 5 fish species have been stocked, including brook trout and rainbow trout (Table 18). The City has stocked additional species, including black crappie, channel catfish, and bluegill in the past. Trout stockings have been sporadic and typically associated with high water events. Because Watson and Willow Lakes were historically operated as a water retention basin for Chino Valley Irrigation District, water

conditions were frequently lethal to fish. Water releases from Watson Lake to the CVID was through a series of open canals and culverts that often transported fish (N. Freeman pers. comm.; see Watson Lake section for detailed description). Stockings were either to reestablish populations of warm-water species, or for short-term put-and-take trout fisheries.

Willow Creek Reservoir currently has an aquatic weed problem that makes boating and fishing very challenging. From late April through October floating mats of pondweed, as well as a dozen other weed species, dominate the lake (Robinson 2005). Like Watson Lake, the inflow area is shallower and altered by sand and gravel operations and other developments. The deeper parts of the lake are near the dam. This area is the only place with open water during summer months.

Creel surveys have not been conducted at Willow Lake; however, the 2001 statewide angler use survey based on angler license sales estimated that Willow Lake supported 65,090 angler use days (Pringle 2004).

Future management objectives will center on infrequent stockings of stock sizes black crappie, and bluegill to augment self-reproducing populations. A seasonal rainbow trout put-and-take fishery would also be established. Winter-time stockings of catchable-sized rainbow trout would be used to increase angler opportunity in the Prescott area since the growing population has resulted in growing demand for angling opportunities. Rainbow trout are not expected to reproduce in Willow Lake due to thermal limitations and predator loads. Periodic stocking to maintain sizes usable to anglers may be necessary due to drying and/or catastrophic flooding events. Periodic sampling to monitor populations would occur to evaluate what species are in need of augmentation.

Table 18. Stocking history for Willow Creek.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Brook trout	1978	1995	44	339,057
Brown trout	1977	1995	40	600,020
Cutthroat trout	1972	1995	15	495,706
Rainbow trout	1968	2007	798	3,134,732
Largemouth Bass	1939	1999	10	58,475
Total			907	4,627,990

Proposed Action

The Department proposes to stock bluegill sunfish, black crappie and rainbow trout for the period covered by this consultation.

Catchable sized rainbow trout would be stocked in winter months, typically for November to March annually; number of trout stocked would be from 0 - 15,000 fish annually.

Bluegill (fingerling, catchable) and black crappie (fingerling, catchable) may be stocked as needed at any time during the year to augment or to recover the fishery following catastrophic events. Numbers of fingerling bluegill would be from 0 - 200,000 fish annually; numbers of catchable bluegill would be from 0 – 2,000 fish annually. Numbers of fingerling black crappie would be from 0 - 200,000 fish annually; numbers of catchable black crappie would be from 0 – 2,000 fish annually.

Water Distribution / Connectivity

Willow Creek courses 10.5 miles from the slopes of the Sierra Prieta until it hits Willow Creek Dam. It is an ephemeral waterway flowing only in response to spring runoff or large storm events. Willow Lake impounds approximately 13 miles of Willow Creek. Below Willow Lake Dam, Willow Creek and enters Granite Creek 1.3 miles downstream of the Willow Lake spillway. Water will flow over the spillway of Willow Dam, either from summer or winter precipitation. The City of Prescott does not keep formal records of Willow Lake spill events, and the spill frequency is not known; however Department personnel observations suggest that spills of the lake do occur (A. Clark pers. com.). The City of Prescott's Master Plan defines conservation pool (ideal) water elevations for both lakes. The conservation pools elevation is 5,136 feet above sea level. This results in about 4 feet between the spillway elevation and conservation pool. Water spilling over the spillway at Willow Lake falls 8 to 10 feet onto rocks before continuing down to Granite Creek. Once at Granite Creek flow must overcome the city diversion structures, sand and gravel pits and other modifications to the Granite Creek streambed to reach the upper Verde River. This has been known to occur in 1993 and 2005.

Records indicate Granite Creek has flooded to a sufficient magnitude to allow transport of fishes to the upper Verde River several times in the past 30 years (Clark 2003b). Water topped the Willow and Watson dams during the flood events of December 2004-January 2005 when Granite Creek flowed all the way to the Verde River.

Watson and Willow Lakes are directly in or adjacent to the stream course of Granite Creek which makes them more prone to contributing non-native fishes to the upper Verde. The City plans to continue to maintain water elevations of both reservoirs within several feet of their spillways making spilling and downstream flooding more common. The city stands to lose a great deal, however, if any water is allowed to flow very far down Granite Creek below Watson Lake. Prescott receives credit for ground water recharge in the vicinity of the Prescott Airport. This credit is extremely important to the area because it could help determine further "safe yield" determinations by the Arizona Department of Water Resources.

Some flexibility does exist in the management of these reservoirs. Changes in water release since the City acquired these lakes may make downstream movement of fishes even less likely than in years prior to 1998. Changes in water release since the City acquired these lakes may make downstream movement of fishes less likely than in years prior to 1998, when open canals carried water and fish from Watson Lake to the Chino Valley area into close proximity to the upper Verde. Recipients of Watson and Willow Lake releases were agricultural in nature and had less control over where water ended up in the Chino Valley/Paulden area. Now, the City measures and monitors release in order to maximize the water recharge credits (C. Dotseth personnel comm.). Various private farm ponds harbored non-native fishes from Watson and Willow Lakes in the past. Many of these ponds are not in use today because agricultural uses have been reduced and water that used to be available is now used by Prescott.

The Granite Creek and Willow Creek watersheds are similar but distinct. Willow Lake is much larger than Watson, yet its watershed is much smaller. In order to lower water levels in Watson and prevent spilling, diversion of water to Willow Lake can occur through an aqueduct between the two reservoirs. Fishes of various life stages can be transferred to Willow Lake from Watson Lake via this aqueduct. This is a one way transfer as the nature of the pipe and culvert does not allow transport of fishes back up to Watson from Willow. Water is transferred when City Officials deem it beneficial to capture water from Watson before it spills especially outside of the April to October release window (C. Dotseth personnel comm.).

An in-depth analysis of Granite Creek flow and connectivity downstream of Willow Lake to the upper Verde River is discussed in the Complex Analysis section.

Fish Movement

During runoff events sufficient enough to result in Willow Creek connecting to Willow Lake, fish in Willow Lake could move upstream into Willow Creek.

When Willow Lake spills, fish can escape and be transported downstream in Granite Creek. Watson and Willow Lakes are directly in or adjacent to the stream course of Granite Creek. This placement makes them more prone to contributing non-native fishes to the upper Verde. City water management strategies result in maintenance of water levels for both reservoirs within several feet of their spillways and may make flooding more common. The city stands to lose a great deal, however, if any water is allowed to flow very far down Granite Creek below Watson Lake. Some flexibility does exist in the management of these reservoirs. Changes in water release since the City acquired these lakes may make downstream movement of fishes even less likely than in years prior to 1998. Changes in water release since the City acquired these lakes may make downstream movement of fishes less likely than in years prior to 1998, when open canals carried water and fish from Watson Lake to the Chino Valley area into close proximity to

the upper Verde. Recipients of Watson and Willow Lake releases were agricultural in nature and had less control over where water ended up in the Chino Valley/Paulden area. Now, the City measures and monitors release in order to maximize the water recharge credits (C. Dotseth personnel comm.). Various private farm ponds harbored non-native fishes from Watson and Willow Lakes in the past. Many of these ponds are not in use today because agricultural uses have been reduced and water that used to be available is now used by Prescott.

Granite Creek has flooded to a sufficient magnitude to allow transport of fishes from Watson or Willow Lakes to the upper Verde River several times in the past 30 years (Clark 2003b). There are no known City records of spill events to indicate how often Watson Lake spills. Since the 23 miles of Granite Creek downstream of where Willow Creek flows into Granite Creek is wide sandy alluvium and contains two sand and gravel operations that impede flow, and the City of Prescott minimizes loss of water as much water as possible, escapement of fish out of Willow Lake, through Granite Creek to the upper Verde River is only likely to occur during large high flow events.

Refer to the Granite Creek Complex Analysis for a description and evaluation of fish movement from Willow Lake into downstream Granite Creek downstream.

Community Description
Of the 9 fish species captured in recent years, in Willow Lake, largemouth bass, bluegill sunfish, and green sunfish are the predominant species at Willow Lake (Table 19). Black crappie were historically numerous, but have not been collected during surveys in the last 10 years.

See the Granite Creek Complex analysis for a description of aquatic community assemblage in Granite Creek downstream from Willow Lake.

Willow Lake is within the bald eagle distinct population segment (DPS).

Table 19. Number, relative abundance, size range and catch per unit effort of sampling by electrofishing at Willow Lake 2000-2008.

May 2000						
N= 35	Total Weight= 5755			Total effort units = 77		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Length Range (mm)**	
Golden Shiner	1	1	3%	0.01	100	
Largemouth Bass	5	5	14%	0.06	165-490	

Redear Sunfish	3	3	9%	0.04	190-199	
Green Sunfish	26	26	74%	0.34	60-168	
June 2001						
N=5	Total Weight= 4315			Total effort units = 0		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Length Range (mm)**	
Largemouth Bass	5		100%	5	320-465	
June 2005						
N=187	Total Weight= 4857			Total effort units = 47		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Length Range (mm)**	
Mosquitofish	1	1	0.53%	0.02	55	
Green Sunfish	150	150	80.21%	3.19	58-127	
Largemouth Bass	34	34	18.18%	0.72	58-404	
Fathead Minnow	2	2	1.07%	0.04	46-54	
May 2006						
N=38	Total Weight= 3209			Total effort units =45		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Length Range (mm)**	
Golden Shiner	2	2	1%	0.04	130	
Largemouth Bass	15	15	42%	0.33	175-395	
Green Sunfish	21	21	57%	0.47	45-180	
April 2007						
N=33	Total Weight= 16213			Total effort units =45		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Length Range (mm)**	
Largemouth	21.00	21.00	64%	0.47	130-480	

Bass						
Green Sunfish	9.00	9.00	27%	0.20	55-180	
Golden Shiner	2.00	2.00	6%	0.04	115-130	
Black Bullhead	1.00	1.00	3%	0.02	280	
April 2008						
N=25	Total Weight= 2352			Total effort units =44		
Common Name	**Num. Sampled**	**Num. Measured**	**% of Total**	**CPUE**	**Length Range (mm)**	
Largemouth Bass	Largemouth Bass	14.00	14.00	56%	91-396	
Green Sunfish	Green Sunfish	4.00	4.00	16%	67-110	
Golden Shiner	Golden Shiner	6.00	6.00	24%	100-155	
Red Shiner	Red Shiner	1.00	1.00	4%	114	

Consultation Species or Critical Habitat
Potential impacts to bald eagle and Western yellow-billed cuckoo are discussed below. Consultation species and critical habitats potentially impacted downstream are located in the Upper Verde River and are addressed in the Upper Verde River analysis. Northern Mexican and narrow-headed garter snakes are analyzed within the Granite Creek Complex analysis and also addressed in the Upper Verde River analysis.

Bald Eagle
Lynx Breeding Area is located approximately 6.9 miles from Willow Creek Reservoir and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2001 and were last observed 21 May, 2009. Nest watchers were able to observe the prey types and in some cases species that were delivered to the nest by the eagles. Observed prey in 2006 included birds (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).

Sullivan Breeding Area is approximately 14.7 miles from Willow Creek Reservoir and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2007 and were last

observed at the breeding area in 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Sullivan Breeding Area productivity data shows that the nest failed in 2007, failed in 2008, and failed again in 2009 with one nestling gone 11 April, 2009-21 April, 2009 before they were 3 weeks old. The second nestling dies in the nest at 4-5 weeks old (Jacobson et al 2007; McCarty and Jacobson 2008, 2009). Willow Creek Reservoir does have monofilament bins present.

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.

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.

Western Yellow-Billed Cuckoo
A documented occurrence was recorded in Granite Creek over 7 miles south of Willow Lake in 1991. Documented occurrences have been recorded in the Upper Verde River.

Potential Impacts
There may be some limited amount of habitat degradation and some amount of disturbance to nesting cuckoos from anglers using or creating new trails to access the stocking site.

Potential impacts to migrant cuckoos can occur statewide and are most frequently found in the riparian zones along aquatic habitats (rivers, creeks, etc.), it is difficult to identify areas where they could not occur during migration. Additionally, the habitat requirements for migrant cuckoos are not as specific as nesting birds and specific stopover locations used are unpredictable in timing, duration, location, and abundance.

GRANITE CREEK COMPLEX ANALYSIS
Water Distribution / Connectivity
Granite Creek is an ephemeral stream that courses over 37 miles through Yavapai County to its mouth at the Verde River. A mostly dry streambed runs approximately 10 miles until Watson Dam, forming Watson Lake, interrupts it. In this first 10 miles it is characterized by high gradients and rapid runoff soils on the watershed (Wendt 1976). The watershed is shallow (Wirt 2000) and only a few tributaries add runoff to Granite Creek in this upper stretch. Granite Creek has 8 minor tributaries and all feed it in this upper 10 miles. The only major tributary, greater

than 10 miles in length, is Willow Creek. Willow Creek courses 10.5 miles from the slopes of the Sierra Prieta Mountains until it hits Willow Creek Dam, forming Willow Creek Lake, or Willow Lake.

Granite Creek downstream of Watson Lake is much different than upstream of the lake. The mouth of Willow Creek is 1.6 miles downstream of the Watson spillway. From this point, the next 14.5 miles of Granite Creek is ephemeral and is characterized by low grades of 1% and sandy alluvial soils that dissipate flow energy (Wendt 1976). In this stretch, several sand and gravel operations further inhibit water flow (Figure 39). Granite Creek drops 286 feet (20 feet per mile) from the mouth of Willow Creek to just downstream of the town of Chino Valley. In contrast, the remaining 8.8 miles of Granite Creek drops 486 feet to the Verde River, or 55 feet per mile. No other significant tributaries enter Granite Creek below Willow Creek. Therefore, a flood event would have to be sufficient enough to top either Watson or Willow lakes and retain enough flow to make it through 14.5 miles of wide, sandy alluvium while transporting fishes.

Water can go over the spillways of both Willow and Watson dams, either from summer or winter precipitation. Water topped both dams during the flood events of December 2004-January 2005, and Granite Creek flowed all the way to the Verde River. Some of the water does get captured at the large Hansen sand and gravel mining operation along Granite Creek near SR89A, before flowing northbound towards the Verde River (Figure 40). The City of Prescott's Master Plan defines conservation pool (ideal) water elevations for both lakes. This is important because it means the City intends to keep both lakes as full as possible or practicable in order to maximize its ability to recharge the Little Chino Aquifer and maintain a safe yield determination for the Prescott AMA. The Utilities Division releases water from both lakes and sends it through an aqueduct to the City's aquifer recharge facility near the Prescott Airport (E. Smith, pers. comm.; Figure 41).

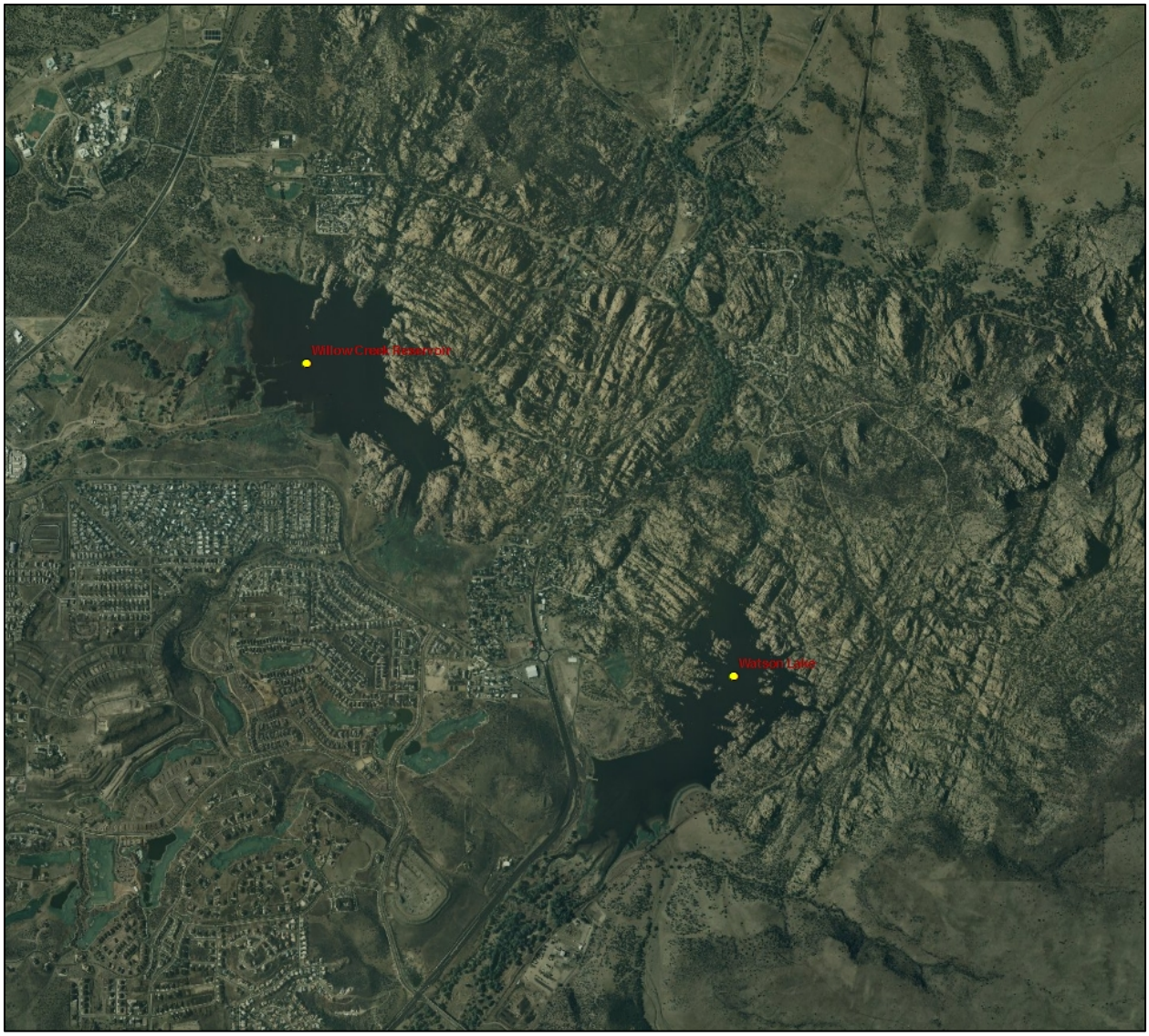

Figure 39. Satellite view of Willow Lake (left), Watson Lake (right) and Granite Creek (Copyright:© 2009 ESRI, i-cubed, GeoEye).

Highways are in red with Highway 89 up and down, and 89A running from left to right. Note water retention/recharge basin just upstream of Highway 89A crossing and Antelope Hills Golf Course.

Figure 40. Hansen Materials on Granite Creek downstream of Highway 89A crossing, adjacent to Antelope Hills Golf Course.

Figure 41. Granite Creek water recharge basin upstream of Highway 89A crossing. The Granite Dells near Watson Lake can be seen on the skyline right.

These releases are timed and monitored to ensure credit. All impoundments in the Prescott Valley spill infrequently and typically in response to extreme, geographically broad precipitation events. Factors effecting spills, and more importantly corresponding flows down Granite Creek, are complex. Some of the water from infrequent spills does get captured, at the large Hansen sand and gravel mining operation along Granite Creek near SR89A, before flowing northbound towards the Verde River. The Utilities Division releases water from both lakes through valves on the dams and sends through an aqueduct to City's aquifer recharge facility near the Prescott Airport (E. Smith, pers. comm.). These releases utilize the same series of canals and culverts as were used when CVID used them; however, fish must survive barriers at the recharge facility as well as the Hansen Materials site. Historical canals are used to deliver water from Watson and Willow Lakes to meet additional downstream water rights in Chino Valley. These canals are not in the flood plain of Granite Creek and terminate in Chino Valley (C. Dotseth, pers. comm.).

Examination of flow records from the USGS gauge on Granite Creek just upstream of Watson Lake indicates that floods greater than 400 cfs have occurred eight times, and floods greater than 600 cfs have occurred two times since October 1994 (Figure 42), but it is unknown how many of those resulted in water spilling out of Watson Lake. In addition, examination of the USGS gauge below Watson Lake reflects the 2005 flood event (Figure 43). This gauge has a short period of record beginning in 1999, the year the City acquired both Watson and Willow Lakes. Local residents of Chino Valley recall Granite Creek flowing "bank to bank" three times in the last 25 to 30 years (D. Rees, pers. comm.). Those events occurred in the early 1980s and the winter of 1993.

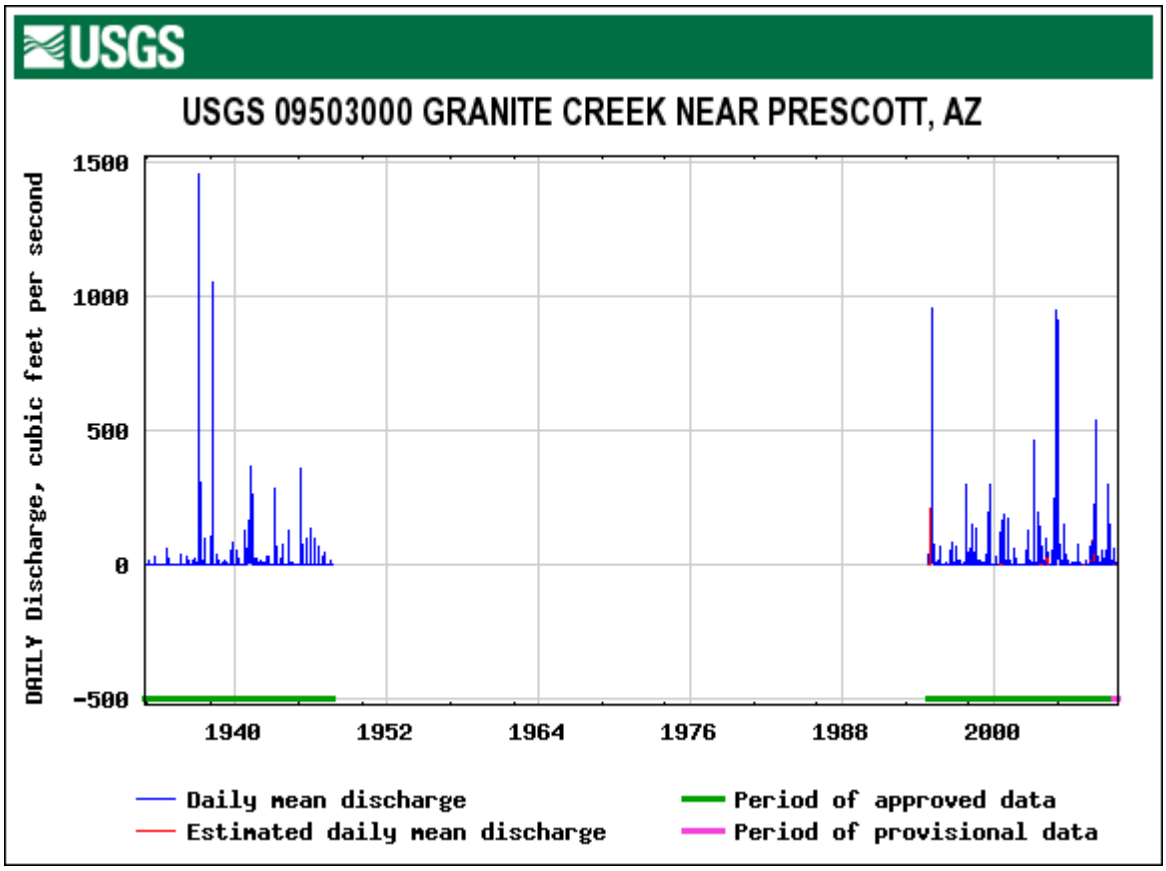

Figure 42. Discharge measured at USGS stream on Granite Creek just upstream of Watson Lake during 1932-1947 and 1994-2009.

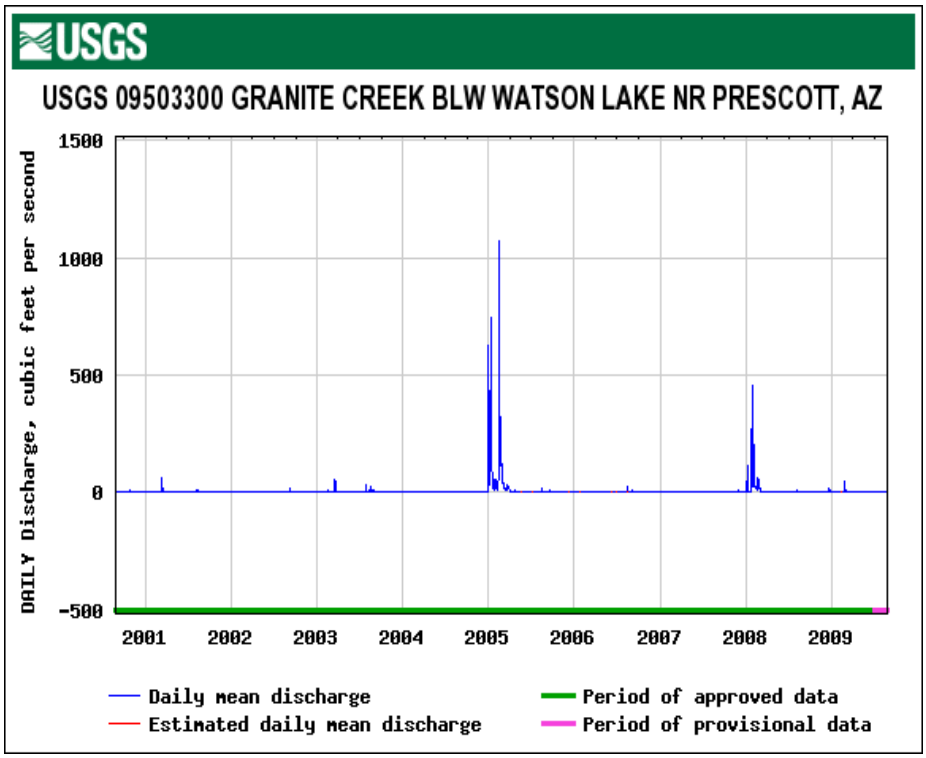

Figure 43. Discharge measured at USGS stream gage on Granite Creek approximately 1.5 miles downstream of Watson Reservoir during 2000-2009.

Fish Movement

While the minimum flow needed to transport fish cannot be determined, the data suggest these infrequent high flow events may move fish downstream. Lower Granite Creek 1 mile upstream of its confluence with the Verde contains green sunfish and shiners, with persistent water.

The high flow events of 1980, 1983, 1993, and 2005 also severely impact downstream habitat for fishes. Extreme flooding events entrain sediment, alter channel bed form and floodplain topography, and may remove vegetation, which in the short-term may reduce fish densities (Rinne 1996). Studies also indicate floods like these reduce all fish numbers temporarily (Rinne et al. 1998). The likelihood of stocked largemouth bass (which are only proposed for stocking in Goldwater Lake), bluegill sunfish or black crappie escapement and transport from upper Goldwater to lower Goldwater to Bannon and Granite Creeks (collective 8.5 miles) to Watson lake is unknown (see Goldwater Lake fish movement section).

Granite Creek has flooded to a sufficient magnitude to allow transport of fishes from Watson or Willow Lakes to the upper Verde River several times in the past 30 years (Clark 2003b). There are no known City records of spill events to indicate how often Watson Lake spills. Since the approximately 23 miles of Granite Creek downstream Watson and Willow lakes is wide sandy

alluvium and contains two sand and gravel operations that impede flow, and the City of Prescott minimizes loss of water as much water as possible, escapement of fish out of Watson and Willow Lakes via Granite Creek to the upper Verde River is only likely to occur large high flow events. The warm water species proposed for stocking in all three lakes prefer, if not require, slow-moving lentic habitats, including vegetated banks and pools in order to persist. During large flood events, these types of habitats are typically removed, which lessens the chance the fish would persist in the upper Granite Creek or Verde River.

Winter trout stockings in Watson and/or Willow Lakes would be focused on a high rate of return. Relatively small numbers of trout would be stocked at either lake relative to their size. Trout would not be expected to persist in either lake beyond summer months due to lethal temperatures and predation by largemouth bass and channel catfish. Trout that may escape from spills during winter flood events and make it to the upper Verde River may persist for some period until summer water temperatures and predation would all but eliminate them. Transport of trout through Granite Creek would not be expected due to high sediment loads and high physical abuse of surviving a flood event.

Community Description

Non-native species such as largemouth bass, black crappie, bluegill, rainbow trout, and golden shiner have been present in the Granite Creek watershed since the late 1930's. High numbers of trout and moderate numbers of largemouth bass have been stocked into all three proposed stocking locations over the past 20 years, and in some cases dating back more than 40 years. Since the City of Prescott acquired the Watson and Willow lakes, very few have been collected in downstream reaches of the Verde River (see Upper Verde River analysis; AGFD Nongame database records; A. Clark pers. comm.). Razorback suckers were stocked into the lower end of Granite Creek just above its confluence with the Verde River in 1988. Surveys of Granite Creek 1 mile upstream from the confluence with the Verde River in 1999 and 2003 did not detect any razorback suckers or any of the species proposed for stocking. The habitat in lower Granite Creek is not suitable for razorback sucker and stockings were of fingerling sized fishes in hopes they would distribute downstream into the mainstem Verde River.

Stocked rainbow trout, largemouth bass, bluegill sunfish and black crappie have not become established in Granite Creek downstream from Watson and Willow lakes and the upper Verde River (see Upper Verde River analysis for a detailed discussion). Largemouth bass, black crappie and bluegill sunfish are not adapted to lotic habitats and are not likely persist in stream habitats, especially those that are typically dry outside of run-off events unless there are perennial pools along the stream channel sufficient in size to support individuals. Studies suggest that high magnitude flood events reduce all fish numbers temporarily (Rinne et al. 1998). Any fish that would get transported in high flow events are not likely to persist due to lack of suitable habitat

in the Verde River, high water temperatures that limit trout persistence, elimination or severe reduction of lentic habitat when flooding events scour the channel, and lack of frequent water connectivity connection along the 16 miles between the reservoirs and the upper Verde River due to the City's management of the lake water levels and releases.

Largemouth bass are only proposed to be stocked in to Goldwater Lake; however there are other potential sources of largemouth bass and sunfish in the Granite Creek drainage. A pond used to be located at Del Rio Springs Ranch and supported populations of largemouth bass and sunfish; Department personnel recall catching fish at the pond in the late 1980's and early 1990's at the invitation of the land owner (R. Aikens, pers. comm.). The pond was still in existence through at least 2003, but according to more recent aerial photos of the area taken in 2009, the pond is no longer in existence (Figure 44). The linear distance from the pond at Del Rio to Stillman Lake in the upper Verde River is 3.8 miles. This pond could have been an additional potential source for largemouth bass collected over the years from the upper Verde River in Stillman Lake and is closer geographically than the lakes proposed for stocking in the headwaters area of Granite Creek. Del Rio Springs also has a USGS stream gauge on it. According to USGS data, the gauge measures run-off from a 40 square mile area (Figure 45). During salvage activities in Stillman Lake in summer of 2009, no largemouth bass were collected from the lake despite a moderately high flow event in Granite Creek in 2008 (Figure 43). Sensitive or imperiled aquatic species do not occur in habitats in the Granite Creek drainage, but are found further downstream in the upper Verde River.

The stocking history in the proposed lakes and knowledge of occurrence of largemouth bass and other species at un-stocked waters in the Granite Creek drainage (i.e. Del Rio Springs), and downstream sampling records from Granite Creek and the upper Verde River support the observation and assertion that the Granite Creek watershed may contribute species including red shiner, fathead minnow or green sunfish, but are not likely contributors of those species proposed to be stocked in Goldwater, Watson and Willow lakes.

Figure 44. Del Rio Springs Ranch Pond 2009 (Copyright:© 2009 ESRI, i-cubed, GeoEye).

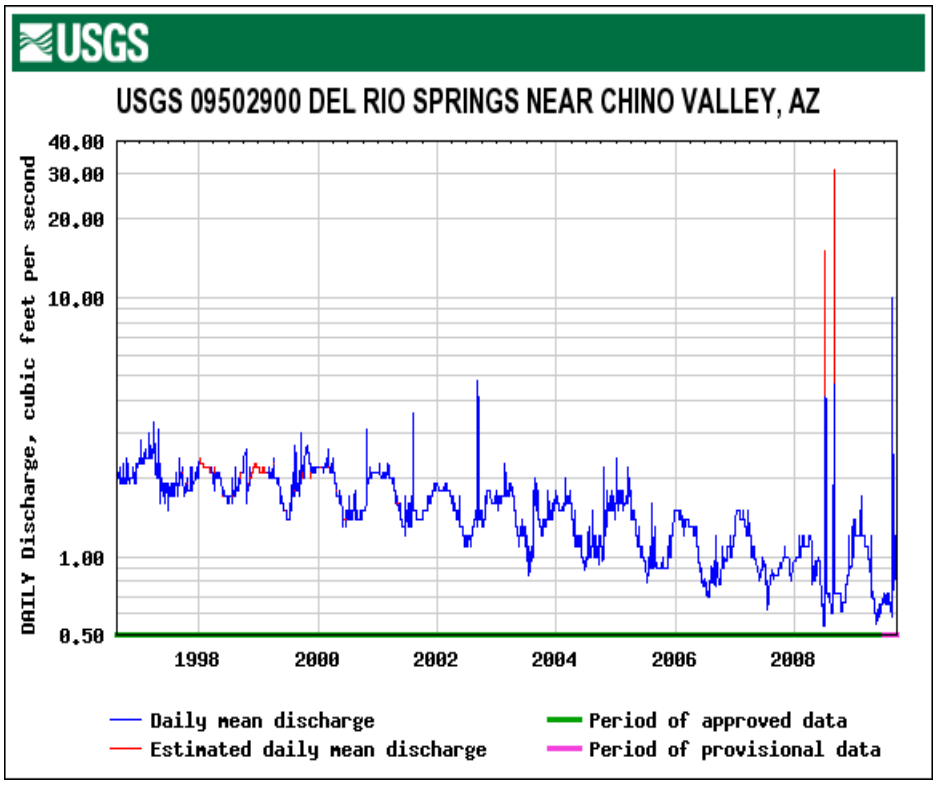

Figure 45. Discharge measured at USGS stream gage at Del Rio Spring during 1997-2009.

Table 20. Numbers of species and relative abundance sampled by backpack electrofishing from 1 mile of Granite Creek above confluence with the Verde River, April 1999 and May 2003.

Species	1999		2003	
	Num. Sampled	Rel. Abundance	Num. Sampled	Rel. Abundance
Common carp	1	7%	_	_
Desert Sucker	_	_	20	17.1%
Fathead minnow	13	22.2%	25	21.3%
Green sunfish	4	21.3%	8	7%
Longfin dace	1098	27.3%	26	22.2%
Mosquitofish	_	_	6	5.1%
Smallmouth bass	4	17.1%	_	_
Sonora Sucker	_	_	32	27.3%

Species	1999		2003	
	Num. Sampled	Rel. Abundance	Num. Sampled	Rel. Abundance
Sucker sp.(yoy)	_	_	2	_

Consultation Species or Critical Habitat
There are no endangered, threatened, candidate species or critical habitat in Granite Creek except for records of razorback suckers stocked into the lower end of the creek, just above its confluence with the Verde River in 1988 as discussed in the Upper Verde River Complex analysis. Potential impacts on consultation species downstream in the Verde River including: razorback sucker and critical habitat, Colorado pikeminnow, roundtail chub, spikedace and critical habitat are discussed in the Upper Verde River Complex analysis. Northern Mexican and narrow-headed gartersnakes are analyzed below along with discussion in the Upper Verde River Complex analysis.

Northern Mexican and narrow-headed 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.

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 Gartersnake
Stocking complex analysis: There is a single historical northern Mexican gartersnake record (ca. 1900) from Granite Creek (HDMS). There are no other records of the species from this part of the watershed, although no systemic surveys for gartersnakes have been conducted in this area, and it is unlikely that they occupy the Granite Creek Complex. The presence of non-native warm water fishes in Goldwater Lake, Watson Lake, and Willow Creek Reservoir makes this habitat less suitable for the species, as do the crayfish in Goldwater Lake. Therefore, it is

unlikely that northern Mexican gartersnakes would be exposed to fish stocked into the Granite Creek Complex.

Downstream analysis: Northern Mexican gartersnakes occupy the Middle Verde River, downstream of Pecks Lake. There are multiple records of the species from near Cottonwood on the Verde River, approx. 2.8 river mi downstream of Pecks Lake, including one from 2003 and one from 2004 (Holycross et al. 2006, HDMS). The presence of crayfish and non-native fish within the Verde River make the habitat less suitable for northern Mexican gartersnakes, but the species appears to persist (Holycross et al. 2006). If stocked sport fish escape from Watson Lake, Goldwater Lake and Willow Creek Reservoir and disperse into the Upper Verde River and then move downstream into the Middle Verde River, there is a likelihood of exposure to northern Mexican gartersnakes.

Narrow-headed gartersnake

Stocking complex analysis: Although the area has not been systematically surveyed for gartersnakes, narrow-headed gartersnakes are not expected to occupy the Granite Creek Complex because Goldwater, Watson and Willow Creek Reservoirs do not provide suitable habitat for the snakes. Therefore, it is unlikely that narrow-headed gartersnakes would be exposed to fish stocked into these sites. The presence of warm water spiny-rayed fishes in the three lakes also makes the habitat less suitable for the species.

Downstream analysis: Narrow-headed gartersnakes currently occupy the Upper Verde River. There are recent records from Bear Siding (1996, 2000) and Mormon Pocket (2001) and farther downstream within the vicinity of Clarkdale (1988). The presence of crayfish and non-native fish, including spiny-rayed fishes, within the Verde River reduce the suitability of the habitat for narrow-headed gartersnakes, but the species appears to persist (Holycross et al. 2006). Narrow-headed gartersnakes also occupy the Middle and Lower Verde River, though likely in low numbers. If stocked sport fish escape from Goldwater Lake, Watson Lake, and Willow Creek Reservoir and disperse into the Upper Verde River, there is a likelihood of exposure to narrow-headed gartersnakes.

SYCAMORE CREEK COMPLEX

Physical Geographic Description

Sycamore Creek has a drainage area of 477 square miles (approximately305,500 acres) and drains into the upper Verde River approximately 37 miles downstream from Sullivan Dam, the upstream end of the Upper Verde River reach (Figure 46). Of the three Upper Verde River drainages that are stocked, the Sycamore Creek drainage confluence is the furthest downstream. Sycamore Creek headwaters originate at Dow and L.O. Springs, which sit at an elevation of approximately 7,000 feet. From this point, the creek flows through a canyon that drops nearly

1,000 feet over 27 miles at an average gradient of 37 feet per mile. Perennial flow in Sycamore Creek begins at Parsons Spring about 4 miles upstream from the Verde River. Sycamore Creek above the lower perennial reach runs exclusively in response to snowmelt runoff or large runoff events and is typically wetted from March to June annually. During drought periods the creek may be dry to intermittent. There are no known discharge gauges in the Sycamore Creek drainage. The closest gauge is located just downstream of where Sycamore Creek enters the Upper Verde River (USGS gauge 09504000 Verde River near Clarkdale, AZ).

Drainage area and elevations

Sycamore Canyon receives runoff from four major tributaries, from upstream to downstream they are: Big Spring Canyon, Volunteer Canyon, Little L.O. Spring Canyon, and Tule Canyon (Figure 47). Of these tributaries, stocking sites are located on Big Spring Canyon, an unnamed tributary to Sycamore Creek, and Tule Tank Wash. Like Sycamore Creek these major tributaries only run in response to snowmelt runoff or large runoff events and are typically dry most of the year, especially in drought years. All of the sites in this drainage proposed for stocking freeze during winter, typically from December through February, although the freeze and thaw dates vary from year to year. In some years stocking sites have not thawed until late March (M. Rinker, pers. comm.).

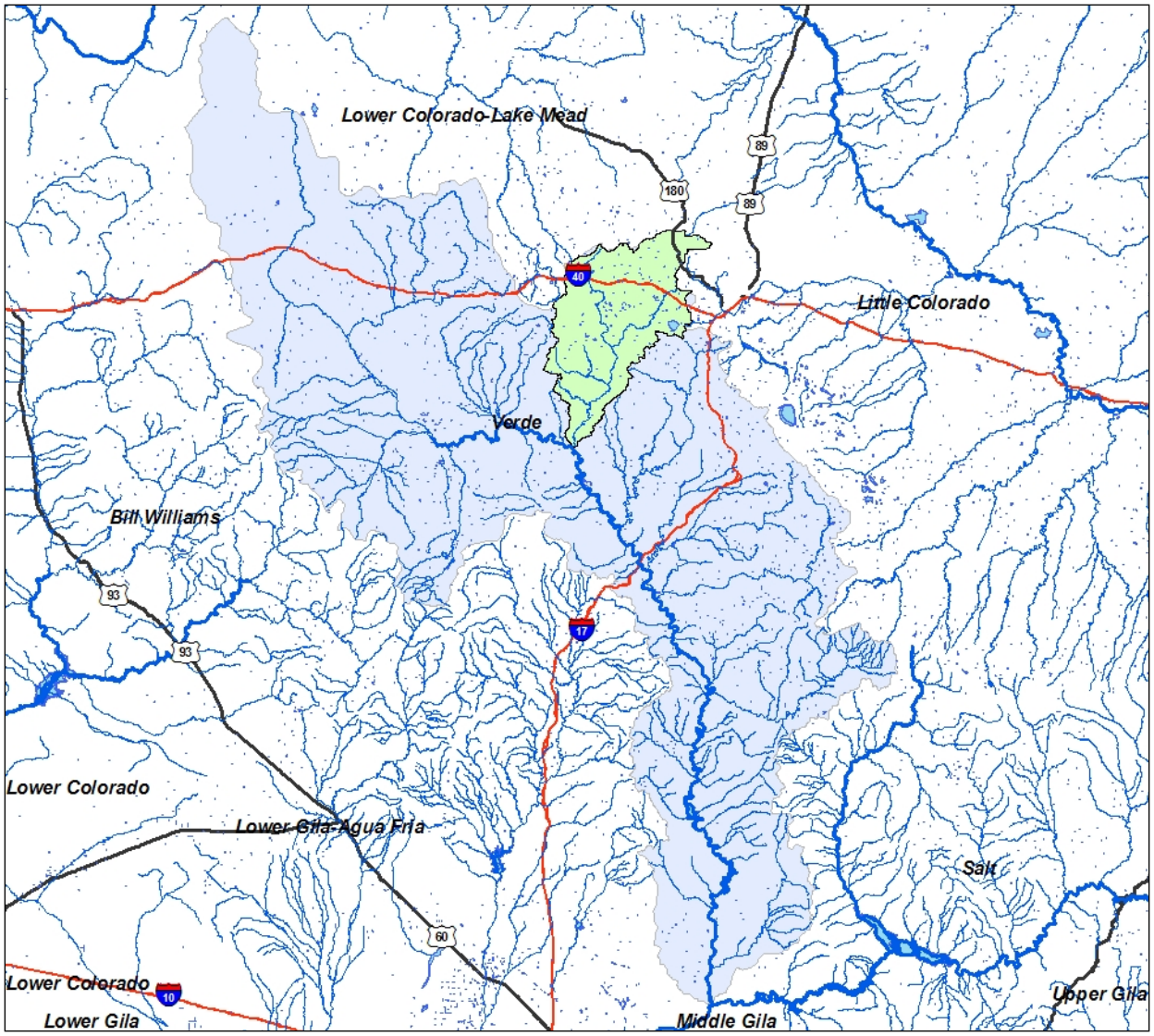

Figure 46. Overview of Verde River watershed highlighting the Sycamore Creek drainage.

The Sycamore Creek Complex contains 5 stocked sport fishing reservoirs that are managed by the AZ Game and Fish Department (Figure 48). Perkins Tank, White Horse Lake, Elk Tank, Middle Tank, and J.D. Dam Lake all lie in tributaries of Sycamore Creek on its west side. Perkins Tank lies in the headwaters of Big Springs Canyon, a major tributary to the headwaters of Sycamore Creek. White Horse Lake sits in an unnamed side canyon of Sycamore Creek just downstream from the confluence of Sycamore Canyon and Big Springs Canyon. Elk Tank, Middle Tank, and J.D. Dam Lake are impoundments of J.D. Wash which drains into Tule Canyon, a tributary of Sycamore Creek. Elk Tank is the upstream most of the three tanks, then

Middle Tank and J.D. Dam Lake at the downstream-most point. All 5 impoundments are on the Kaibab National Forest.

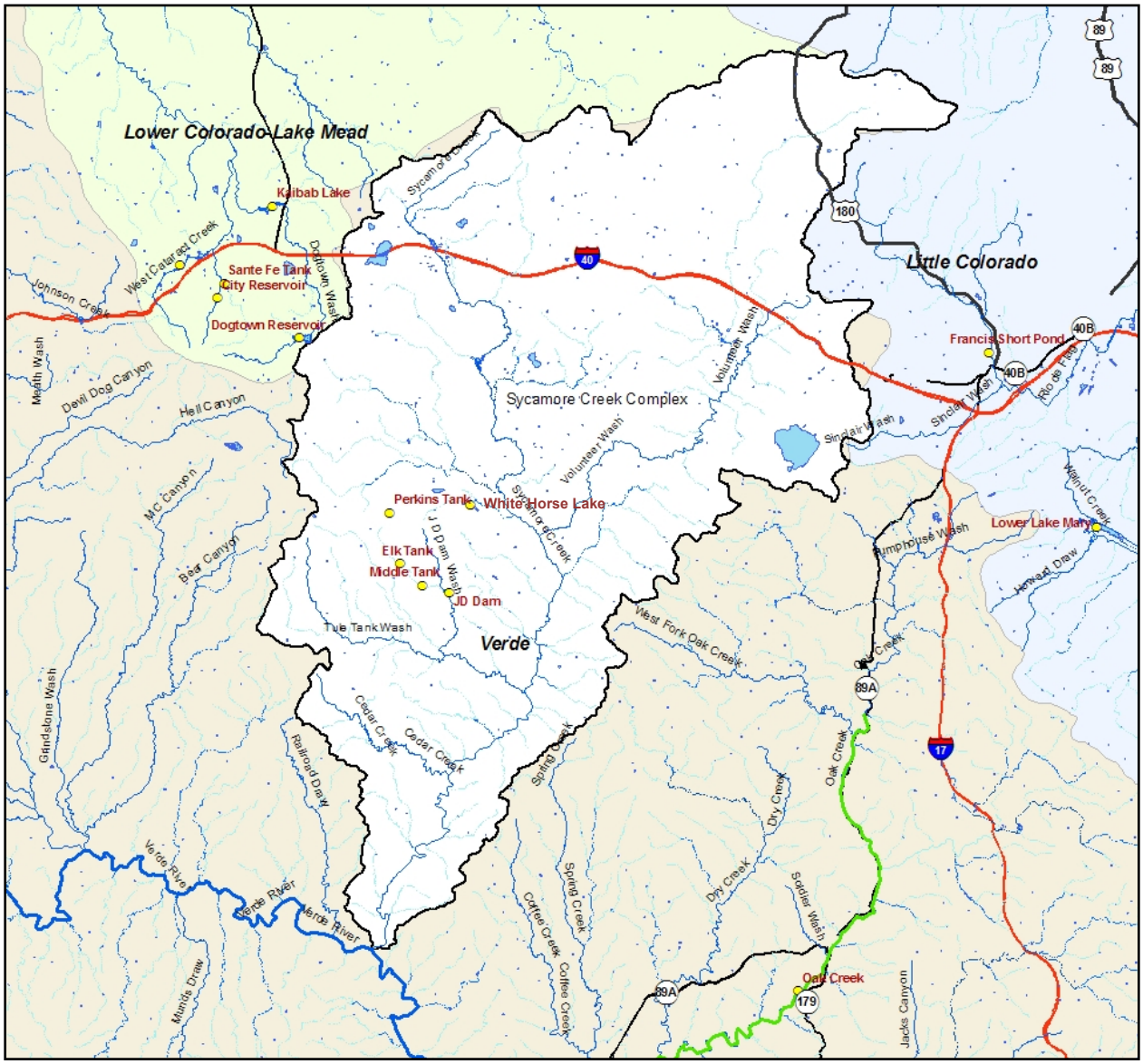

Figure 47. Sycamore Creek drainage.

Perkins Tank, Elk Tank, Middle Tank, and J.D. Dam Lake are managed as special regulation catch-and-release waters featuring an artificial fly and lure-only single barbless hook regulation. White Horse Lake is managed as a put-and-take rainbow trout fishery. Management of these impoundments is part of an ongoing effort from the Arizona Game and Fish Department (the

Department) and the Northern Arizona Flycasters (NAF) to provide trophy catch-and-release trout fisheries near Flagstaff and Williams. The members of the NAF have spent a significant amount of time, money, and effort to renovate and maintain these tanks as fisheries.

Over the years a desire to stock brown trout into the special regulation waters of Perkins Tank, White Horse Lake, Elk Tank, Middle Tank, and JD Dam Lake have been expressed by members of the NAF and the general public. Stocking brown trout into Elk tank, Middle Tank, and JD Dam Lake would satisfy the desire expressed by the public to "stock brown trout into JD Dam Lake, Perkins Tank, Elk Tank, Middle Tank, and Whitehorse Lake" in the Region II 2003 fisheries questionnaire, where 83.5% of the 678 total respondents supported the development of such fisheries.

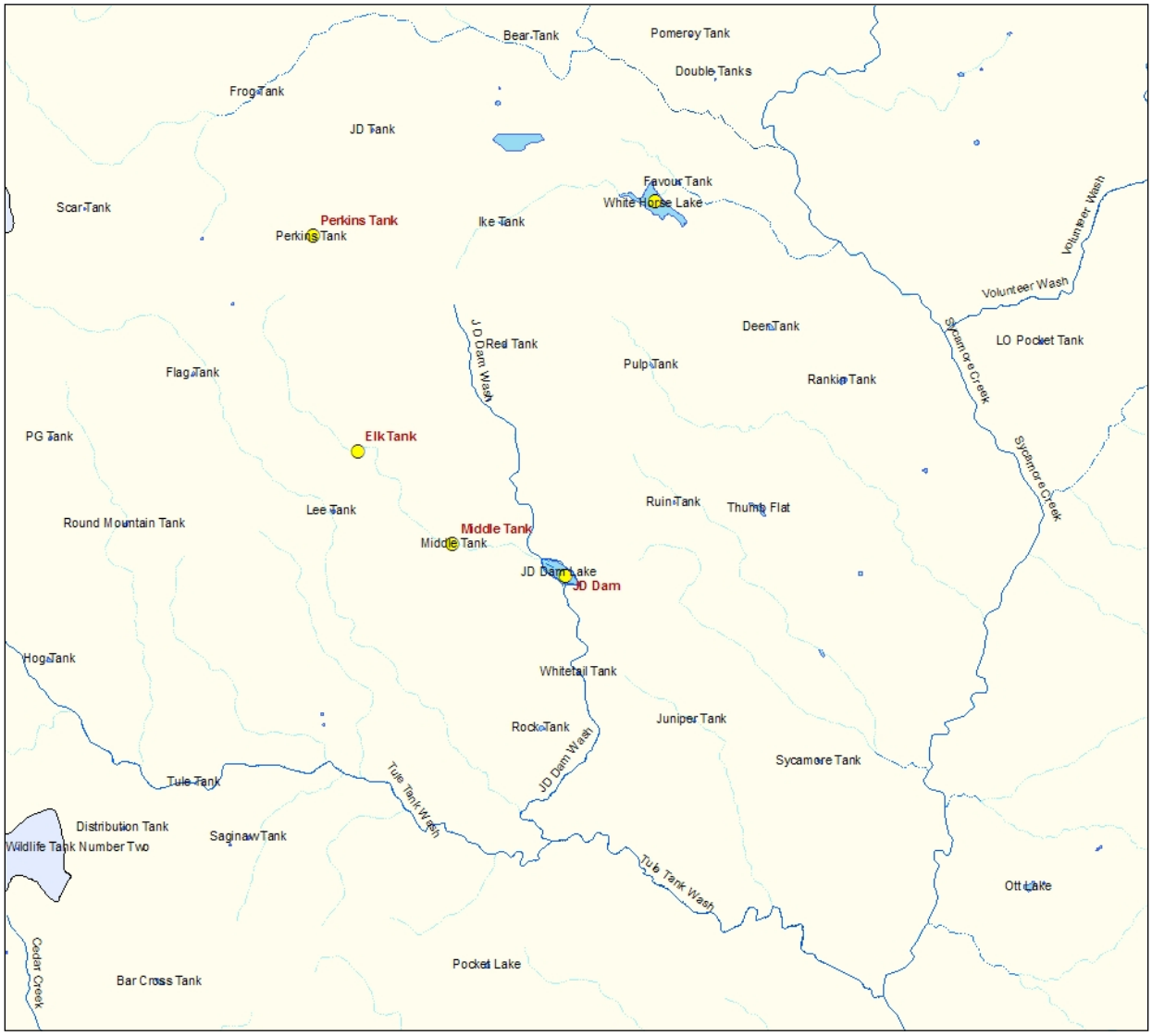

Figure 48. Sycamore Creek Complex.

Perkins Tank

Site Description

Perkins Tank is located approximately 15 miles southeast of the City of Williams off Forest Service Road 110 on the Kaibab National Forest; it is a popular catch-and-release trout fishery for the local flyfishing anglers of Williams, Flagstaff, and the surrounding area. Perkins Tank, with a lake elevation of 6,800 feet, on average is about 10 feet deep with a maximum depth of 16 feet, and is approximately 3.5 surface acres when fully watered.

Management of Waterbody

Perkins Tank is primarily managed as a special regulation cold water catch-and-release fishery. Recent management has emphasized the stocking of catchable and sub–catchable rainbow trout as well as sub-catchable and fingerling brook trout and arctic grayling. There are no creel surveys for Perkins Tank; however, the 2001 statewide angler use survey based on angler license sales estimated that Perkins Tank supported 2,402 angler use days (Pringle 2004). Perkins Tank is currently approved to stock rainbow, brown trout, brook trout, and arctic grayling. Brown trout have not been stocked into Perkins Tank since 1995 (Table 21).

Perkins Tank was pumped dry in 2001 in an effort to eliminate illegally introduced green sunfish. In July of 2007 there was a fish kill at Perkins Tank due to low dissolved oxygen levels resulting from an algal bloom and subsequent monsoon storms (Rinker 2007b). A spot check for water quality indicated very low dissolved oxygen condition, and 128 dead trout were removed. It is not known if the kill was complete; however, crayfish were observed dying, and the survey crew expects the kill was significant (M. Rinker, pers. comm.).

Table 21. Perkins Tank stocking history from 1968 to 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Brown trout	1978	1995	8	5,994
Arctic Grayling	2008	2008	1	350
Rainbow trout	1968	2009	43	31,056
Brook trout	1978	2008	9	7,852
Total			61	45,252

Proposed Action

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

Sub-catchable and catchable rainbow trout would be stocked multiple times per season, from March to November annually; numbers of rainbow trout stocked may be from 0 – 3,000 fish annually.

Sub-catchable and catchable brown trout would be stocked from September to November annually; numbers of brown trout stocked may be from 0 – 750 annually.

Sub-catchable and fingerling brook trout would be stocked opportunistically when available from March to June annually; numbers of brook trout stocked may be 0 – 1,000 annually.

Sub-catchable and fingerling Arctic grayling would be stocked opportunistically from March to June annually; numbers of arctic grayling stocked may be 0 – 1,000 annually.

Water Distribution / Connectivity

Perkins Tank is located on a small unnamed ephemeral drainage, that when spilling, flows through JD Tank onto Sunflower Flat. Sunflower Flat drains into Big Spring Canyon, a tributary of Sycamore Creek (Figure 49). When it overflows, the water goes through a broad shallow valley and eventually into a 6-mile long ephemeral drainage that drops nearly 800 feet over the last two miles into Sycamore Canyon. From this point, it is 24 miles of intermittent flow followed by 4 miles of perennial flow to the confluence with the Verde River.

Holloway Tank is a small earthen tank approximately 1 mile upstream of Perkins Tank. During storm events, or spring run-off events, Holloway Tank can fill and spill, and flow downstream into Perkins Tank. Perkins Tank spills approximately one out of every six years into the unnamed ephemeral drainage.

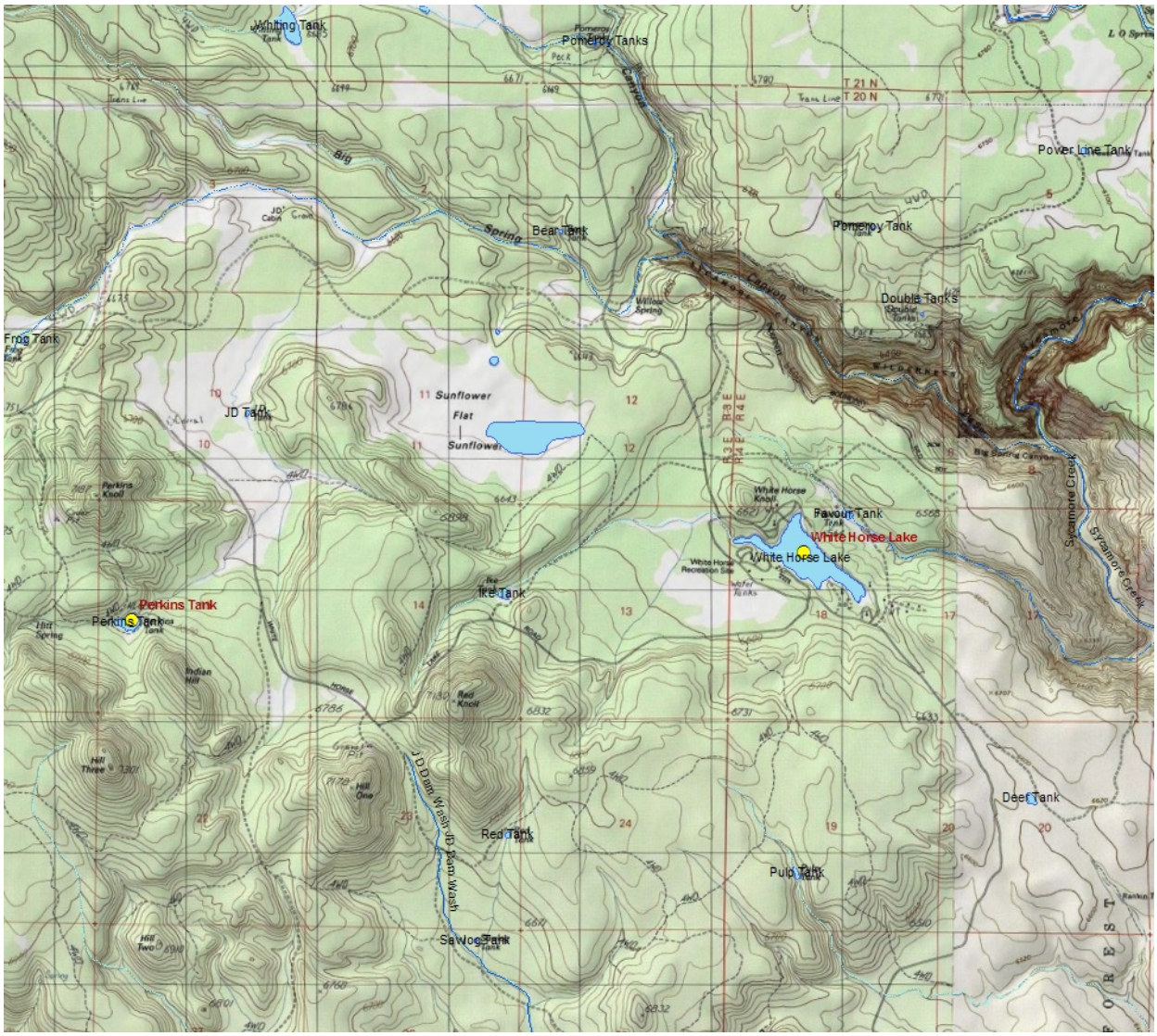

Figure 49. Topographic map depicting Perkins Tank, which if it spills, would flow into Sunflower Flat and in turn Big Spring Canyon, and finally Sycamore Creek.

From Perkins Tank it is 1.09 miles to another unnamed ephemeral drainage that continues 0.39 miles to JD Tank. From JD Tank the drainage continues 0.71 miles to Sunflower Flat. In order for the flow to continue down the drainage, Sunflower Flat, which is 280 surface acres, has to fill and spill. Sunflower Flat has not filled since 1993 and is typically reduced to a small tank on the north side of the flat (Figure 50). Only during multiple extreme precipitation events will Sunflower Flat receive enough water to spill downstream. Sunflower Flat then drains 0.63 miles down an unnamed ephemeral drainage to Willow Spring. From Willow Spring it is 0.42 miles before descending over a 70 foot drop (Figure 51 and Figure 52) followed by a 125–150 foot

drop into Big Spring Canyon (Figure 53 and Figure 54). Big Spring Canyon travels 2.84 miles to its confluence with Sycamore Canyon. From this point, it is 24 miles of intermittent flow followed by 4 miles of perennial flow to the confluence with the Verde River.

Figure 50. Sunflower Flat.

Figure 51. Initial drop into Big Spring Canyon (approximately 70 foot Vertical Drop).

Figure 52. Initial drop into Big Spring Canyon (approximately70 Foot Vertical Drop).

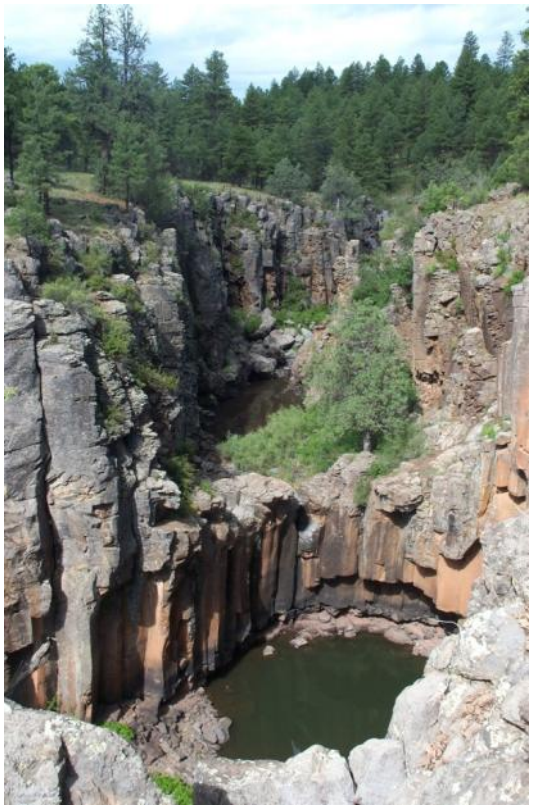

Figure 53. Photo depicting approximately125-150 foot vertical drop within Big Spring Canyon.

Figure 54. Plunge pool below the Big Spring Canyon drop (approximately 125-150 foot vertical drop).

Fish Movement

Stocked fish could move upstream to Holloway Tank during storm events. Existence of a fish community in this tank is unknown, but unlikely given its small size and likelihood for drying on a frequent basis, as do other tanks in the area. During precipitation events large enough to cause Perkins Tank to fill and spill, fish could potentially escape downstream into JD Tank and then into Sunflower Flat. Flood events sufficient to fill Sunflower Flat and spill towards Willow Spring are rare. Sunflower Flat has not filled since 1993 and is typically reduced to a small tank on the north side of the flat (Figure 55). Only during multiple extreme precipitation events will Sunflower flat receive enough water to spill downstream. Any trout escaping from Sunflower Flat would be subjected to a 70 foot drop followed by a 125–150 foot drop into Big Spring Canyon just to reach Sycamore Canyon. Trout are not expected to survive these drops. If any

did, they would then have to survive the harsh environmental conditions of the 32 miles of ephemeral/intermittent flow to reach the Verde River. For these reasons Perkins Tank is considered a closed system.

Figure 55. Aerial photo of Sunflower Flat (taken from World Imagery coverage layer).

Community Description

Perkins Tank was pumped dry in 2001 to remove illegally introduced green sunfish, and consequently all fish species present in the tank were removed. Fish surveys have not been conducted at Perkins Tank since 2001; however, based on stocking records, rainbow trout, brook trout, and arctic grayling are assumed to currently exist within the tank. In addition, crayfish and bullfrogs currently inhabit the tank. Northern leopard frogs were observed at Perkins Tank in 1972 (J.E & A.L. Platz-ASU from AGFD Ranid frog database).

Consultation Species & Critical Habitat

Perkins Tank, including Sunflower Flat, is a closed system. There are no endangered, threatened or candidate fish species present within this system. Potential impacts to northern leopard frogs, Mexican spotted owl and its critical habitat are discussed below.

Northern Leopard Frog

Local Analysis: Although Perkins Tank and the Sycamore Creek buffered stocking complex are within the historical range of the northern leopard frog, the likelihood that northern leopard frogs could be exposed to fish stocked in Perkins Tank is moderate. There is a 1972 northern leopard frog record from Perkins Tank, but leopard frogs were not observed during a 1992 survey (HDMS, AGFD Riparian Herpetofauna Database) or while pumping the tank dry in 2001. In addition, crayfish and bullfrogs have been documented at the tank, making it less suitable leopard frog habitat. There have been 57 surveys at 30 sites within the buffered stocking complex between 1967 and 2000 (Figure 56, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Northern leopard frogs from Deadman Pocket Tank were released by the Department at Unnamed Tank (=16 Tank) in 1996 (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). This Unnamed Tank was surveyed 4 times post-release: 1997 (n=1) and 1998 (n=3) and northern leopard frogs were not observed during these surveys. However, given that this site and immediate area have not been adequately surveyed, northern leopard frogs may occupy the area (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing stocked fish due to an extreme storm event or a breached berm is low, because the drainages into which the fish would disperse are below the minimum elevational range for the northern leopard frog in the Verde River Watershed (approximately5300 feet) (Sredl 1997) and there are no historical records for frogs in these downstream drainages (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

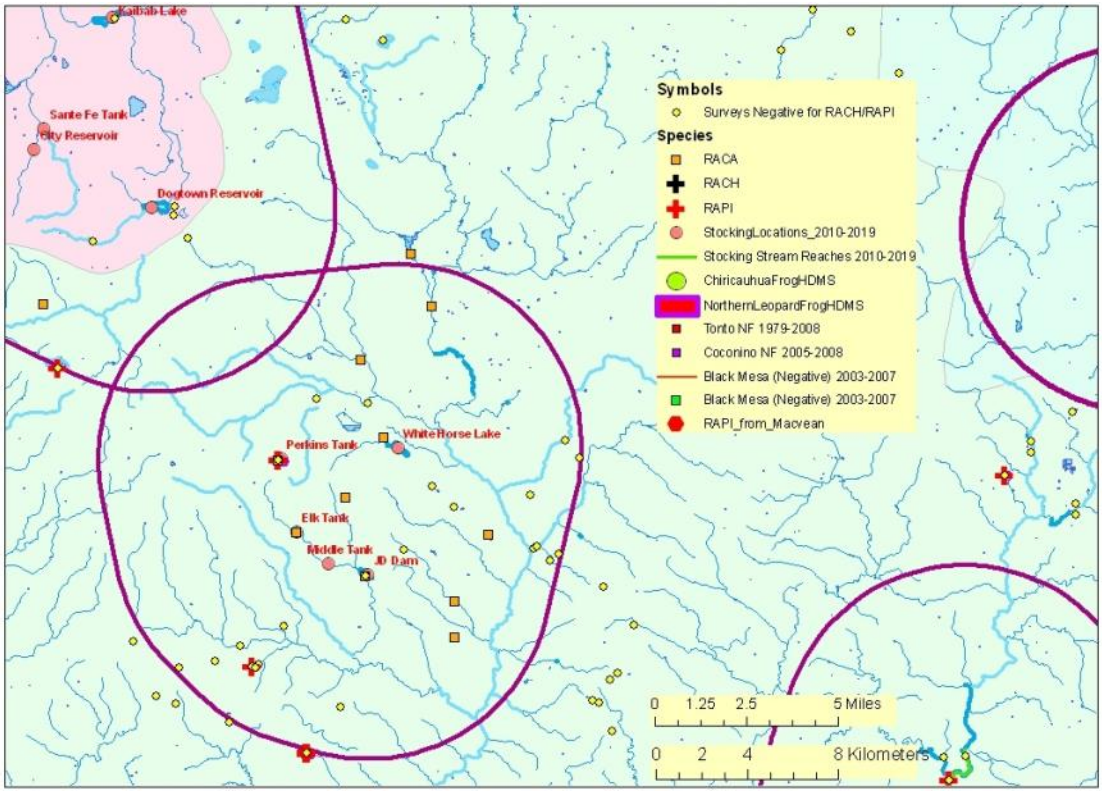

Figure 56. Map of Sycamore Creek buffered stocking complex.

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).

Mexican Spotted Owl

This stocking location is within 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.

White Horse Lake

Site Description

White Horse Lake is located on the Kaibab National Forest approximately 10 miles south of Interstate 40 on Forest Service road 109. White Horse Lake is located 15 miles from Williams and 55 miles from Flagstaff (Figure 48). White Horse Lake on average covers 30 surface acres, with a 46 surface acre maximum capacity and an elevation of 6,551 feet (Figure 57). The lake is 12 to 15 feet deep on average and has maximum depths of up to 20 feet. White Horse Lake is a popular summertime camping and fishing location. The dam at White Horse was renovated in 1961, 1963, and 1978.

A large Forest Service campground is located on the lake and the area is managed by the Kaibab National Forest. Boats are restricted to a single electric motor only. Access is via an improved gravel road. There are no concessions available at the lake.

Figure 57. Aerial photo of White Horse Lake (World Imagery).

Management of Water Body

White Horse Lake is managed primarily as a high intensity cold water put-and-take rainbow trout fishery. Recent management has focused on catchable rainbow trout stocked in the spring, summer, and fall. Brook trout and brown trout have been stocked historically, but have not been stocked since 1986 and 1995 respectively (Table 22). The Department would like to have the opportunity to stock brown trout once again in White Horse Lake, in response to angler requests, and also to provide angling opportunity when water quality prohibits survival of rainbow trout.

Since high water temperature in summer can preclude stocking rainbow trout, stocking brown trout is an alternative because brown trout has higher temperature tolerance than rainbow trout. Warm water species including channel catfish, largemouth bass, redear sunfish, and bluegill have been stocked in the past, but not since 1990. Creel has not been conducted at White Horse Lake; however the 2001 statewide angler use survey based on angler license sales estimated that the lake supported 11,255 angler use days (Pringle 2004). 2001 was a drought year in northern Arizona and the forest was closed much of the summer. White Horse Lake is currently approved for stocking rainbow trout.

Table 22. White Horse Lake stocking history from 1936 to 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Brook Trout	1965	1986	11	56,083
Rainbow Trout	1954	2009	543	1,255,106
Brown Trout	1971	1995	29	168,523
Channel Catfish	1957	1990	14	31,844
Largemouth Bass	1936	1990	11	76,274
Bluegill	1936	1944	4	15,480
Redear Sunfish	1989	1989	1	6,510
Total			613	1,609,820

White Horse Lake is characterized by a shallow shoreline around most of its perimeter; problems with warmer water temperatures during summer months are typical. In recent years rainbow trout have been stocked from April to June and then again from late August to October when water quality permits. Late season fish are typically stocked in response to monsoonal patterns.

Proposed Action

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

Sub-catchable and catchable rainbow trout would be stocked multiple times during spring summer and fall annually; numbers of rainbow trout stocked may be from 0 – 53,000 annually.

Sub-catchable and catchable brown trout would be stocked multiple times during the fall annually; numbers of brown trout stocked may be from 0 – 20,000 annually.

Water Distribution / Connectivity

White Horse Lake is located on an unnamed tributary 2 miles upstream from its confluence with Sycamore Creek. Ike Tank is a small tank upstream from White Horse Lake. During storm events, or spring run-off events, Ike Tank can fill and spill, and flow downstream into White

Horse Lake. In the event of flooding, outflow from the White Horse Lake Lake would travel across the concrete spillway located on the north side of the lake, travel 0.24 miles to Favour Tank in an unnamed ephemeral drainage. From Favour Tank the drainage continues 0.50 miles to a 30 foot drop into a tributary of Sycamore Canyon (

Figure 58). The ephemeral tributary continues 1.97 miles over a series of falls, the largest 30 feet tall, and down a high gradient slope of about a 900 foot drop in 1.2 miles (Figure 59 and Figure 60) characterized by large boulders to Sycamore Canyon. Once at Sycamore Canyon it is 24 miles of ephemeral / intermittent channel followed by 4 miles of perennial flow to the confluence of Sycamore Creek and the upper Verde River.

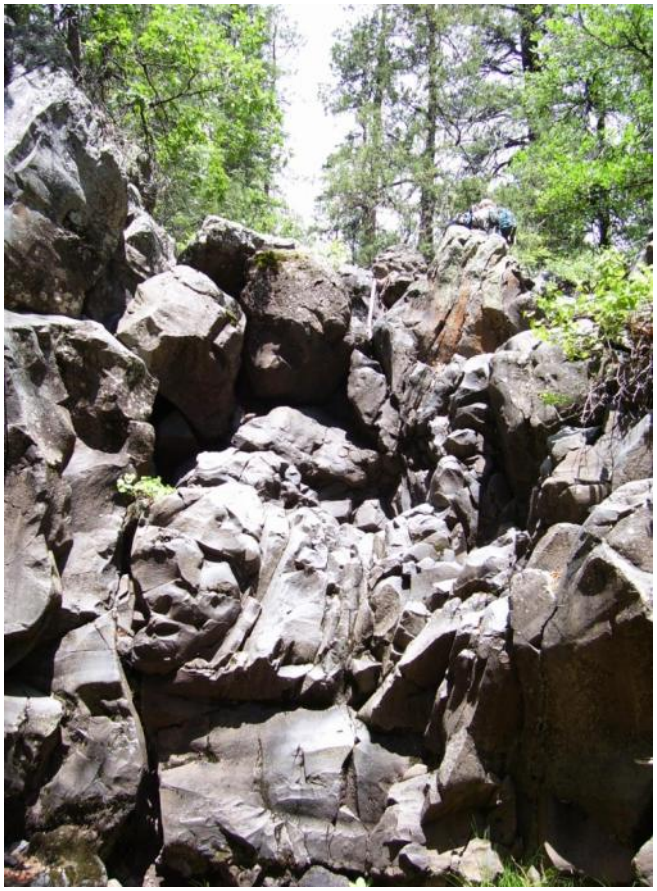

Figure 58. Photo depicting the canyon drop (approximately30 foot) approximately 0.5 miles below Favour tank over which water flows before reaching Sycamore Canyon.

Figure 59. High gradient slope of unnamed tributary flowing into Sycamore canyon (approximately900 ft. drop in 1.2 miles).

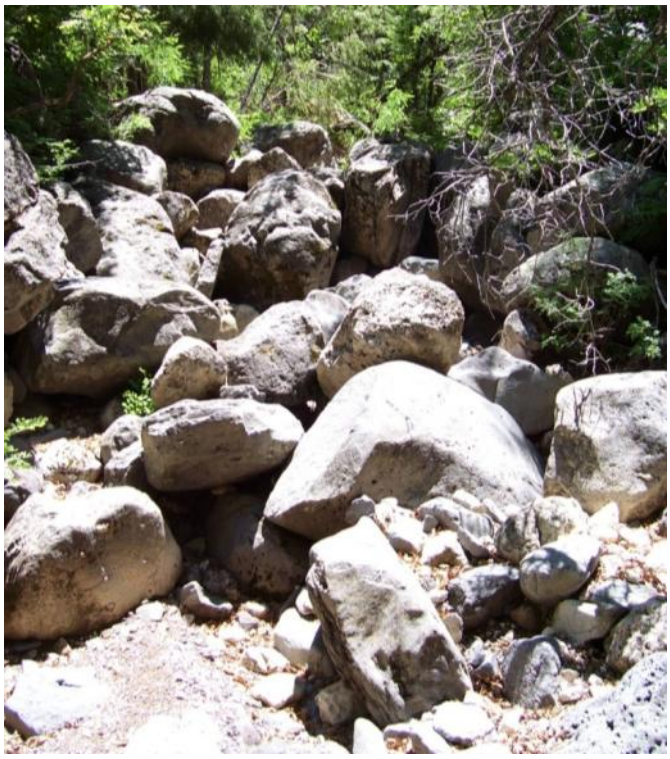

Figure 60. Steep canyon slope of tributary to Sycamore Canyon.

Fish Movement
Stocked fish could move upstream to Ike Tank in extreme storm events. Existence of a fish community in this tank is unknown, but unlikely because of its small size and because it dries frequently, as do other tanks in the area. White Horse Lake spills exclusively in response to snowmelt runoff or high runoff events, and typically has low water levels in most years. In the event of precipitation events significant enough to cause White Horse Lake to fill and spill, fish could escape downstream into Favour Tank, and continue down the unnamed ephemeral channel over a series of falls, the largest 30 feet tall, and down a high gradient slope of about a 900 foot drop in 1.2 miles, characterized by large boulders to Sycamore Canyon.

The lake's substrate is composed primarily of small cinders and the sediment associated with runoff events collected from its drainage upstream. During spring runoff events significant enough to cause White Horse Lake to spill, the outflow is extremely sediment-laden, causing low visibility and low oxygen levels. A high level of stream sediment, severe vertical drops and large boulders on a steep decline creates an environment difficult for fish to survive during flood events.

For this reason, White Horse Lake downstream to the confluence if the unnamed tributary and Sycamore Creek is considered a closed system.

Community Description
Recent fish surveys have not been conducted at White Horse Lake; however, based on stocking records and angler reports, rainbow trout, black crappie, non-native crayfish, and non-native bullfrogs are present in the lake. Black crappie was not stocked by the Department. The species was detected in White Horse Lake in approximately 1999. In January 2003 an unsuccessful attempt was made to pump the lake dry to remove black crappie. When the lake refilled in 2004, black crappie was still present in the reservoir. The crayfish population of White Horse Lake is abundant. A Department crayfish trapping clinic in 2006 captured 5 gallons of crayfish over the course of a 6 hour period, using 4 baited crayfish traps and 10 baited minnow traps.

Consultation Species or Critical Habitat
White Horse Lake downstream to the confluence with Sycamore Creek is a closed system. There are no endangered, threatened, or candidate fish species or critical habitat present within this system. Potential impacts to northern leopard frogs are discussed below.

Northern Leopard Frog
Local Analysis: Although White Horse Lake and the Sycamore Creek buffered stocking complex are within the historical range of the northern leopard frog, the likelihood that northern leopard frogs could be exposed to fish stocked in White Horse Lake is low. There are no records for northern leopard frogs from White Horse Lake. There have been 57 surveys at 30 sites within

the buffered stocking complex between 1967 and 2000 (Figure 56, AGFD Riparian Herpetofauna Database). Northern leopard frogs were observed at 2 of these sites, Perkins Tank in 1972 and Unnamed Tank (=16 Tank) in 1996 (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Northern leopard frogs from Deadman Pocket Tank were released by the Department at Unnamed Tank (=16 Tank) in 1996 (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Perkins Tank was surveyed in 1992 and Unnamed Tank was surveyed 4 times post-release: 1997 (n=1) and 1998 (n=3). Northern leopard frogs were not observed during these surveys and likely do not occupy the area, because crayfish and bullfrogs have been documented at the area, making it less suitable leopard frog habitat. (AGFD Riparian Herpetofauna Database, Sredl, pers. comm.).

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing stocked fish due to an extreme storm event or a breached dam at White Horse Lake is low, because the drainages into which the fish would disperse are below the minimum elevational range for the northern leopard frog in the Verde River Watershed (approximately5300 feet) (Sredl 1997) and there are no historical records for frogs in these drainages (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Elk Tank

Site Description

Elk Tank is the upstream-most impoundment on JD Wash (Figure 48) and is located 18 miles southeast of the City of Williams and 4 miles southwest of White Horse Lake on the Kaibab National Forest. The tank is 0.89 surface acres when full (Figure 61) and has a depth of 30 feet.

Elk Tank is a popular catch-and-release fishery for the local fly fishing anglers of Williams, Flagstaff, and surrounding areas.

Elk Tank is a walk-in only fishery with a small parking pullout and kiosk located off of Forest Road 11.

Management of Water Body

Elk Tank is managed primarily as a special regulation cold water catch-and-release trout fishery featuring artificial flies and lures only, with a single barbless hook regulation (Table 23).

Figure 61. Photograph of Elk Tank.

Table 23. Elk Tank stocking history from 1989 to 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Rainbow trout	1989	2009	22	9,302
Total			22	9,302

In May of 2006, AGFD pumped Elk Tank dry to allow the Kaibab National Forest to repair erosion damage to the dam caused by extreme runoff events of spring 2005 (Figure 62). During the pumping efforts 100 rainbow trout were collected, and in addition, large populations of bullfrogs were removed from the tank. Rainbow trout were restocked in 2008 after repairs were made and the tank refilled. It took the tank almost two years to refill after repairs were made to the dam (Figure 63). Despite the small surface acreage, the tank is incredibly deep at approximately 30 feet. Creel surveys have not been conducted at Elk Tank; however, the 2001 statewide angler use survey based on angler license sales estimated that Elk Tank supported 714 angler use days (Pringle 2004). Elk Tank is currently approved for stocking of rainbow trout and brown trout.

Figure 62. Elk Tank following being pumped in 2006.

Figure 63. Elk Tank water level in august 2007.

Proposed Action

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

Catchable and sub-catchable rainbow trout would be stocked multiple times per season annually from March to November; numbers of rainbow trout stocked may be from 0 – 3,000 annually.

Catchable and sub-catchable brown trout would be stocked from September to November annually; numbers of brown trout stocked may be from 0 - 750 annually.

Water Distribution / Connectivity

Elk Tank and Middle Tank are impoundments on an unnamed tributary that flows into JD Wash, with Elk Tank being the upstream-most tank. JD Dam Lake is located at the confluence of this unnamed tributary and JD Wash. The outflows from these three water bodies occur almost exclusively from snowmelt runoff or other high runoff events. The tanks are subject to

fluctuations in water level from year to year depending on precipitation cycles. It is 1.48 miles from Elk Tank to Middle Tank, and 0.93 miles from Middle Tank to JD Dam Lake. Elk Tank was pumped dry in 2006 and took almost two years to refill to a level acceptable for stocking. From JD Dam Lake, ephemeral JD Dam Wash continues 1.01 miles to Whitetail Tank. Outflow from Whitetail Tank continues 0.07 miles before it descends down a more than 100 foot drop (Figure 64). There is a boulder field at the bottom of the falls. This fall and 18 miles of ephemeral channel separate the trout stocking locations and the upper Verde River. Whitetail Tank spills approximately one out of every six years. From the 100 foot drop, the ephemeral JD Dam Wash channel continues 1.79 miles into Tule Canyon, which is an ephemeral drainage of Sycamore Creek. Tule and Sycamore Creek have ephemeral/intermittent flow for 14.5 miles followed by 4 miles of perennial flow before reaching the upper Verde River.

Figure 64. 100 foot drop located 0.07 miles downstream from Whitetail tank on JD Dam Wash. Note the person in the upper center of the picture for size reference.

Fish Movement
Only wet climactic cycles large enough to cause JD Wash and the series of tanks on it to fill and spill would allow fish to move freely between these tanks. However the nature of the runoff from these tanks is often heavy, with sediment from the earthen tanks and the drainage itself creating a harsh environment for fish movement. Fish from Elk Tank could potentially move downstream into Middle Tank, then to JD Dam Lake, then to Whitetail Tank, as well as upstream JD Dam Wash above JD Dam Lake. Whitetail Tank spills one out of every six years on average. Fish from Whitetail Tank could continue down JD Wash to a 100 foot drop into Tule Canyon.

The JD Dam Wash drainage above the 100 foot fall is considered a closed system because of the nature of the waterfall over which all escaped trout would have to pass. Passage over the 100 foot fall would result in mortality to rainbow or brown trout stocked in the Elk Tank.

Community Description
Recent fish surveys have not been conducted at Elk Tank; however, based on stocking records and angler reports, rainbow trout and non-native bullfrogs are present in the tank.

Consultation Species or Critical Habitat
JD Dam Wash downstream to the 100 foot waterfall is considered a closed system, and there are no endangered, threatened or candidate fish species or critical habitat present within this system. Potential impacts to northern leopard frogs and Mexican spotted owl and its critical habitat are discussed below.

Northern Leopard Frog
Local Analysis: Although Elk Tank and the Sycamore Creek buffered stocking complex are within the historical range of the northern leopard frog, the likelihood that northern leopard frogs could be exposed to fish stocked in Elk Tank is low. There are no records of northern leopard frogs in Elk Tank. There have been 57 surveys at 30 sites within the buffered stocking complex between 1967 and 2000 (Figure 56, AGFD Riparian Herpetofauna Database). Northern leopard frogs were observed at 2 of these sites, Perkins Tank in 1972 and Unnamed Tank (=16 Tank) in 1996 (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Perkins Tank was surveyed in 1992 and Unnamed Tank (=16 Tank) was surveyed during 4 visits after the 1996 release of frogs from Deadman Pocket Tank; northern leopard frogs were not observed at either site during these surveys (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.) and likely do not occupy the area because bullfrogs have been documented at the tank, making it less suitable leopard frog habitat.

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing stocked fish due to an extreme storm event or a breached berm at Elk Tank is low, because the drainages into which the fish would disperse are below the minimum elevational range for the northern leopard frog in the Verde River Watershed (approximately 5300 feet) (Sredl 1997) and there are no historical records for frogs in these drainages (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Mexican Spotted Owl
This stocking location is within 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.

<u>Middle Tank</u>
Site Description
Middle Tank is located 18 miles southeast of the City of Williams and approximately 4 miles southwest of White Horse Lake on the Kaibab National Forest. It is 2.19 surface acres when full (Figure 65). Middle Tank is the second and smallest of three impoundments on an unnamed tributary that flows into JD Dam Wash, and is located 1.48 miles downstream from Elk Tank.

Middle Tank is a walk-in only fishery with a small parking pullout and kiosk located off of Forest Road 11. It is located on and managed by the Kaibab National Forest.

Figure 65. Photo of Middle Tank.

Management of Water Body

Middle Tank is primarily managed as a special regulation cold water catch-and-release trout fishery featuring an artificial fly and lure only, single barbless hook regulation (Table 24). Recent management has emphasized the stocking of catchable and sub–catchable rainbow trout as well as sub-catchable and fingerling brown trout. Creel surveys have not been conducted at Middle Tank, and the 2001 statewide angler use survey based on angler license sales does not report angler use days for this tank (Pringle 2004). Middle Tank is currently approved to stock rainbow and brown trout. Middle Tank is a popular catch-and-release rainbow trout fishery for the local fly fishing anglers of Williams, Flagstaff, and surrounding areas.

Middle Tank was drained in 2004 to deepen the tank and repair the spillway; in addition, efforts were made to improve bank stabilization due to heavy cattle and wildlife use. Middle Tank is characterized by large amounts of aquatic vegetation in the summer and is consequently often subject to poor water quality and occasional fish kills.

Table 24. Middle Tank stocking history from 1984 to 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked

Brown trout	1989	2006	4	1,208
Channel catfish	1984	1984	2	650
Rainbow trout	1990	2008	14	4,711
Total			20	6,569

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

Catchable and sub-catchable rainbow trout would be stocked multiple times per season from March to November annually; numbers of rainbow trout stocked may be from 0 – 3,000 annually.

Catchable and sub-catchable brown trout would be stocked from September to November annually; numbers of brown trout may be from 0 – 750 annually.

Water Distribution / Connectivity
Elk Tank and Middle Tank are impoundments on an unnamed tributary that flows into JD Wash; Elk Tank is the upstream-most tank. JD Dam Lake is located at the confluence of this unnamed tributary and JD Dam Wash. The outflows from these three water bodies occur almost exclusively from snowmelt runoff or other high runoff events. The tanks are subject to fluctuations in water level from year to year depending on precipitation cycles. Elk Tank is located 1.48 miles upstream of Middle Tank, and 0.93 miles from Middle Tank to JD Dam Lake. From JD Dam Lake, ephemeral JD Dam Wash continues 1.01 miles to Whitetail Tank. Outflow from Whitetail Tank continues 0.07 miles before it descends down a more than 100 foot drop (Figure 64). There is a boulder field at the bottom of the falls. These falls and 18 miles of ephemeral channel separate the trout stocking locations and the upper Verde River. Whitetail Tank spills approximately one out of every six years. From the 100 foot drop, the ephemeral JD Dam Wash channel continues 1.79 miles into Tule Canyon, which is an ephemeral drainage of Sycamore Creek. Tule and Sycamore Creek have ephemeral/intermittent flow for 14.5 miles followed by 4 miles of perennial flow before reaching the upper Verde River.

Fish Movement
Only wet climactic cycles large enough to cause JD Wash and the series of tanks on it to fill and spill would allow fish to move freely between these tanks. However, the nature of the runoff from these tanks is often heavy with sediment from the earthen tanks and the drainage itself, creating a harsh environment for fish movement. Fish from Middle Tank could potentially move upstream to Elk Tank or downstream into Middle Tank, then to JD Dam Lake, then to Whitetail

Tank. Whitetail tank spills one out of every six years on average. Fish from Whitetail tank could continue down JD wash to a 100 foot drop into Tule Canyon.

The JD Dam Wash drainage above the 100 foot fall is considered a closed system because of the nature of the waterfall over which all escaped trout would have to pass. Passage over the 100 foot fall would result in mortality to rainbow or brown trout stocked in Middle Tank.

Community Description
Recent fish surveys have not been conducted at Middle Tank; however, based on stocking records and angler reports, rainbow trout and a large, non-native bullfrog population are currently present in the tank.

Consultation Species or Critical Habitat
JD Dam Wash downstream to the 100 foot waterfall is considered a closed system, and there are no endangered, threatened, or candidate fish species or critical habitat present within this system. Potential impacts to northern leopard frogs, Mexican spotted owl and its critical habitat are discussed below.

Northern Leopard Frog
Local Analysis: Although Middle Tank and the Sycamore Creek buffered stocking complex are within the historical range of the northern leopard frog, the likelihood that northern leopard frogs could be exposed to fish stocked in Middle Tank is low. There are no records of northern leopard frogs in Middle Tank. There have been 57 surveys at 30 sites within the buffered stocking complex between 1967 and 2000 (Figure 56, AGFD Riparian Herpetofauna Database). Northern leopard frogs were observed at 2 of these sites, Perkins Tank in 1972 and Unnamed Tank (=16 Tank) in 1996 (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Perkins Tank was surveyed in 1992 and Unnamed Tank (=16 Tank) was surveyed during 4 visits after the 1996 release of frogs from Deadman Pocket Tank; northern leopard frogs were not observed at either site during these surveys (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.) and likely do not occupy the area because bullfrogs have been documented at the tank, making it less suitable leopard frog habitat.

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing stocked fish due to an extreme storm event or a breached berm at Middle Tank is low, because the drainages into which the fish would disperse are below the minimum elevational range for the northern leopard frog in the Verde River Watershed (approximately5300 feet) (Sredl 1997) and there are no historical records for frogs in these drainages (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Mexican Spotted Owl

This stocking location is within 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.

JD Dam Lake

Site Description

JD Dam Lake is located approximately 18 miles southeast of the City of Williams and approximately 4 miles southwest of White Horse Lake on the Kaibab National Forest; it is about 8 surface acres when full (Figure 66). JD Dam Lake is the downstream most of the three managed waters on the JD Dam Wash drainage. JD Dam Lake is vehicle accessible and includes a parking lot, boat launch, information kiosk, and outhouses, located off of Forest road 105. Boats are restricted to a single electric motor only. JD Dam Lake is the most popular of the three fisheries on the JD Wash drainage, since it is accessible by vehicle and the largest of the three.

Figure 66. Photo of JD Dam Lake.

Management of Water Body

JD Dam Lake is primarily managed as a special regulation cold water catch-and-release trout fishery featuring artificial flies and lures only, single barbless hook regulation (Table 5). In 1998 NAF, the Kaibab National Forest, the City of Williams, and the Department undertook a project to improve the fishery. The project involved pumping the lake dry, removing silt, re-contouring the lake, building islands and peninsulas, reseeding the area including the islands and peninsulas, and rebuilding fences to control cattle.

Recent management has emphasized the stocking of catchable and sub–catchable rainbow trout as well as sub-catchable and fingerling brown trout. Creel surveys have not been conducted at JD Dam Lake; however, the 2001 statewide angler use survey based on angler license sales estimated that the lake supported 2,140 angler use days (Pringle 2004). JD Dam Tank is currently cleared to stock rainbow and brown trout, which are the only species stocked since 1995 (Table 25).

Elk Tank, Middle Tank, and JD Dam Lake are popular catch-and-release fisheries for the local fly-fishing anglers of Williams, Flagstaff, and surrounding areas. All three tanks have catch-and-

release, artificial fly and lure single barbless hook regulations. Table 25. JD Dam Lake stocking history from 1936 to 2009.

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Brook Trout	1965	1986	6	4,620
Bluegill	1936	1936	1	8,500
Brown Trout	1964	1995	23	31,943
Channel Catfish	1957	1960	2	563
Largemouth Bass	1946	1957	4	8,395
Rainbow Trout	1954	2008	75	94,978
Redear Sunfish	1949	1949	1	1,950
Total			112	150,949

Proposed Action

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

Catchable and sub-catchable rainbow trout would be stocked multiple times per season from March to November annually; numbers of rainbow trout stocked may be from 0 – 14,000 annually.

Catchable and sub-catchable brown trout would be stocked multiple times per season from September to November annually; numbers of brown trout stocked may be from 0-1,500 annually.

Water Distribution / Connectivity

JD Dam Lake is located at the confluence of this unnamed tributary and JD Dam Wash. JD Dam Lake receives runoff from the unnamed tributary that holds Elk and Middle Tanks, after Elk and Middle Tank upstream have filled and spilled, as well as from JD Dam Wash upstream of JD Dam. The outflow from these tanks occurs almost exclusively from snowmelt runoff or other high runoff events. The tanks are subject to fluctuations in water level from year to year depending on precipitation cycles. Elk Tank is located 1.48 miles upstream of Middle Tank, and 0.93 miles from Middle Tank to JD Dam Lake. From JD Dam Lake, ephemeral JD Dam Wash continues 1.01 miles to Whitetail Tank. Out flow from Whitetail Tank continues 0.07 miles before it descends down a more than 100 foot drop. There is a boulder field at the bottom of the falls. These falls and 18 miles of ephemeral channel separate the trout stocking locations and the upper Verde River. Whitetail Tank spills approximately one out of every six years. From the 100 foot drop, the ephemeral JD Dam Wash channel continues 1.79 miles into Tule Canyon an

ephemeral drainage of Sycamore Creek. Tule and Sycamore Creek have ephemeral/intermittent flow for 14.5 miles followed by 4 miles of perennial flow before reaching the upper Verde River.

Fish Movement

Only wet climactic cycles significant enough to cause JD Wash and the series of tanks on it to fill and spill would allow fish to move freely between these tanks. However the nature of the runoff from these tanks is often heavy with sediment from the earthen tanks and the drainage itself, creating a harsh environment for fish movement. Fish from JD Dam Wash could potentially move upstream to Middle and Elk tanks or downstream into to JD Dam Lake, then to Whitetail Tank. Whitetail Tank spills one out of every six years on average. Fish from Whitetail Tank could continue down JD wash to a 100 foot drop into Tule Canyon.

The JD Dam Wash drainage above the 100 foot fall is considered a closed system because of the nature of the waterfall over which all escaped trout would have to pass. Passage over the 100 foot fall would result in mortality to rainbow or brown trout stocked in the JD Dam Lake.

Community Description

In September 2007, a trammel netting and angling survey was conducted in response to angler reports of a possible illegal stocking of northern pike into the tank. Two 15 foot and one 150 trammel nets were set in random locations across the tank for approximately 6 hours. Two anglers also actively fished for pike during a 3-hour period using artificial lures and flies with single, barbless hooks. Results of that survey indicated a fish community of catchable sized rainbow and brown trout (Table 26). The survey also indicated that adult bullfrogs were observed in extremely large numbers (in the hundreds) at the tank.

Table 26. 2007 JD Dam Lake trammel net and angling survey.

Species	**# Collected**	**Length Range (mm)**	**# caught Angling**	**# caught Trammel**
Rainbow Trout	17	216-302	7	10
Brown Trout	2	206-211	2	0

Elk Tank, Middle Tank, and JD Dam Lake all suffered from low water levels due to drought conditions in 2008. In April of 2008, a gill netting survey was conducted to determine if the trout population in JD Dam Tank survived the winter of 2007-2008 (Table 27). One 150 foot 6 panel experimental trammel net was set across the tank for 17.25 hours. The results of the survey indicated that rainbow trout were still present in the tank.

Table 27. 2008 JD Dam Lake gill netting survey.

Species	Num. Collected	Average Length (mm)	Min-Max Length (mm)
Rainbow trout	12	334.8	320-350
Brown trout	0	-	-
Northern pike	0	-	-
Totals	12	-	-

Consultation Species or Critical Habitat
JD Dam Wash downstream to the 100 foot waterfall is considered closed system, and there are no endangered, threatened, or candidate fish species or critical habitat present within this system. Potential impacts to northern leopard frogs, Mexican spotted owl and its critical habitat are discussed below.

Northern Leopard Frog
Local Analysis: Although JD Dam Lake and the Sycamore Creek buffered stocking complex are within the historical range of the northern leopard frog, the likelihood that northern leopard frogs could be exposed to fish stocked in JD Dam Lake is low. There are no records of northern leopard frogs in JD Dam Lake (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). There have been 57 surveys at 30 sites within the buffered stocking complex between 1967 and 2000 (Figure 56, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Northern leopard frogs were observed at 2 of these sites, Perkins Tank in 1972 and Unnamed Tank = (16 Tank) in 1996 (AGFD Riparian Herpetofauna Database). Perkins Tank was surveyed in 1992 and Unnamed Tank (=16 Tank) was surveyed during 4 visits after the 1996 observation; northern leopard frogs were not observed at either site during these surveys (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.) and likely do not occupy the area because bullfrogs have been documented at the tank, making it less suitable leopard frog habitat.

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing stocked fish due to an extreme storm event or a breached berm at JD Dam is low, because the drainages into which the fish would disperse are below the minimum elevational range for the northern leopard frog in the Verde River Watershed (approximately 5300 feet) (Sredl 1997) and there are no historical records for frogs in these drainages (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Mexican Spotted Owl
This stocking location is within 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.

Sycamore Creek Complex Analysis

All of the proposed stocking sites located within the Sycamore Creek drainage are upstream of significant barriers over which stocked fish are not expected to survive. No stocked fish in this drainage are expected to survive escapement and move downstream into the lower reaches of Sycamore Creek or the Upper Verde River.

Upper Verde River Impacts Analysis

Site Description

The upper Verde River for the purposes of this analysis is 48.5 miles long and begins at the base of Sullivan Dam at river-mile (RM) 0 near Paulden, and terminates and the Pecks Lake or TAPCO Diversion at river-mile 48.5 near Clarkdale. The upper Verde River is fed by the Big Chino, Granite Creek, and Sycamore Creek Complexes, which were previously described (Figure 67). Land ownership for the first 6-miles is a mixture of Private, Arizona Game and Fish Commission, and State Trust Land. At river-mile 6, the Prescott National Forest is the dominate landowner with various private in holdings.

Management of Water Body

The upper Verde is currently managed as a recreational fishery with an emphasis on native fish species. Access is poor and most fishing occurs at or near the upper Verde River Wildlife Area (UVRWA). In addition to the UVRWA, only 2 additional road access sites exist on the upper Verde River; 1 at Bear Siding, and 1 at Perkinsville. In early 2002, a mail out angler survey was developed by the Arizona Game and Fish Department (Department) and Arizona State University (ASU) to collect data on statewide fishing efforts. The survey sample was developed using fishing license sales from 2001. To increase precision by county, all available fishing

licenses from Department offices and Internet sales, and those entered manually from the license dealers across the State were used. This produced a sample of 46,149 anglers of which 37,729 were office sales and 8,420 from license dealers; from this survey it was estimated a total of 191 angler use days were expended on the upper Verde River to fish for non-trout species (Pringle 2004).

The UVRWA (Figure 68) was purchased in 1996 using Heritage Fund monies. The land and resource values associated with this acquisition provide outstanding opportunities to meet objectives of Arizona's Heritage Fund Program for Threatened, Endangered and Sensitive (TES) species and habitats, as well as provide benefits for other wildlife species and the public. Located approximately 8 miles north of Chino Valley in Yavapai County, it was incised from the Cooper-Morgan Ranch that originally consisted of 7,700 acres of deeded land and grazing allotments on 23,397 acres of Forest Service and 21,799 acres of State Trust lands. The primary historical land use in this area was livestock production. Due to recent acquisitions, the UVRWA now roughly extends from river-mile 1.6 to the Prescott National Forest Boundary at river-mile 6.

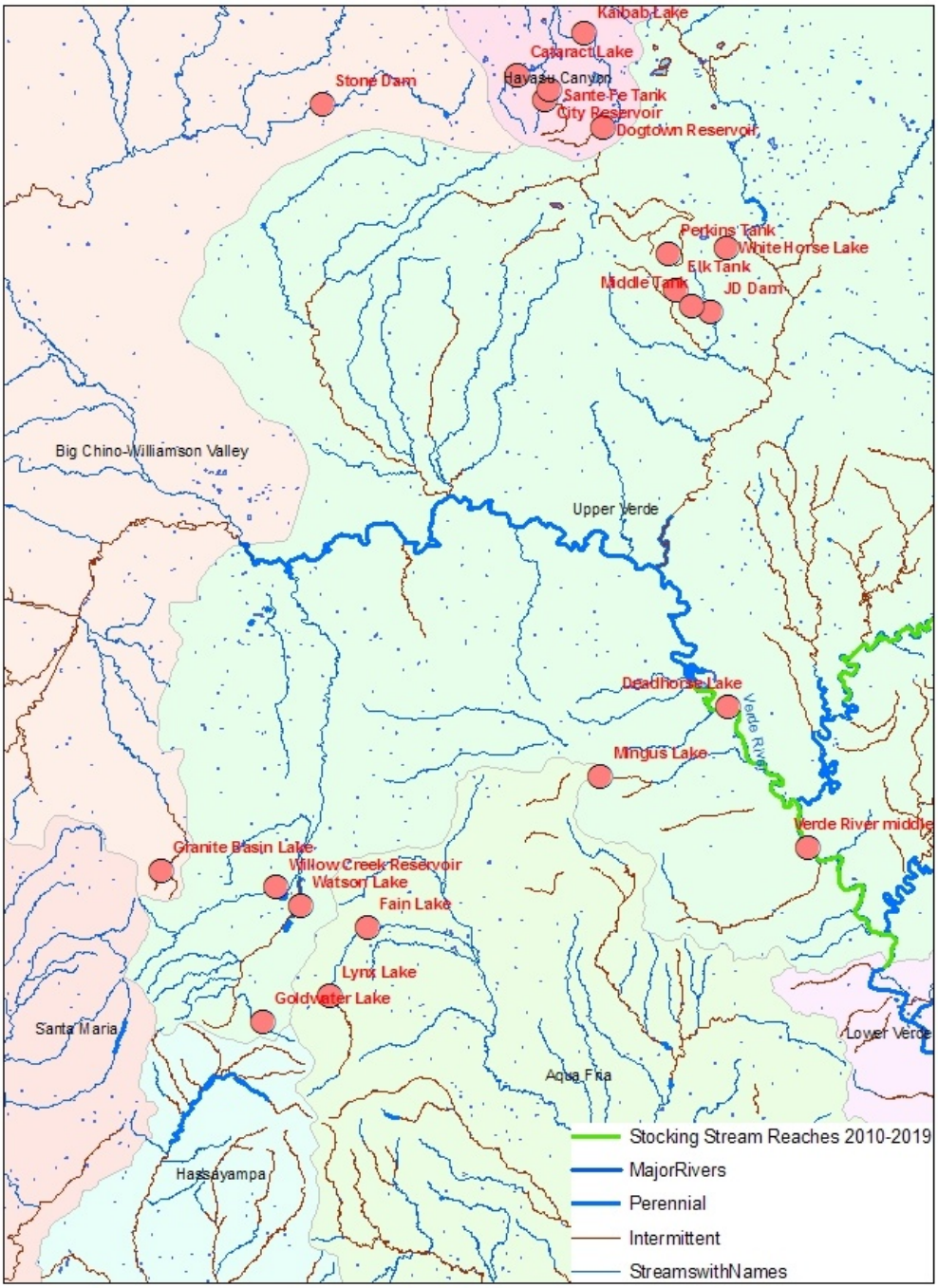

Figure 67. Upper Verde Sub-Watershed and surrounding Sub-Watersheds

The Game and Fish Commission approved measures to benefit native fish species at their October 1997 meeting by establishing unlimited harvest of warm-water species and restrictions on baitfish transport and use. The Verde River was included in a list of several Arizona Rivers to

fall under the new regulations. These two changes to Commission Order 40 were designed to encourage angling and harvest as well as limit the spread of baitfish into sensitive areas.

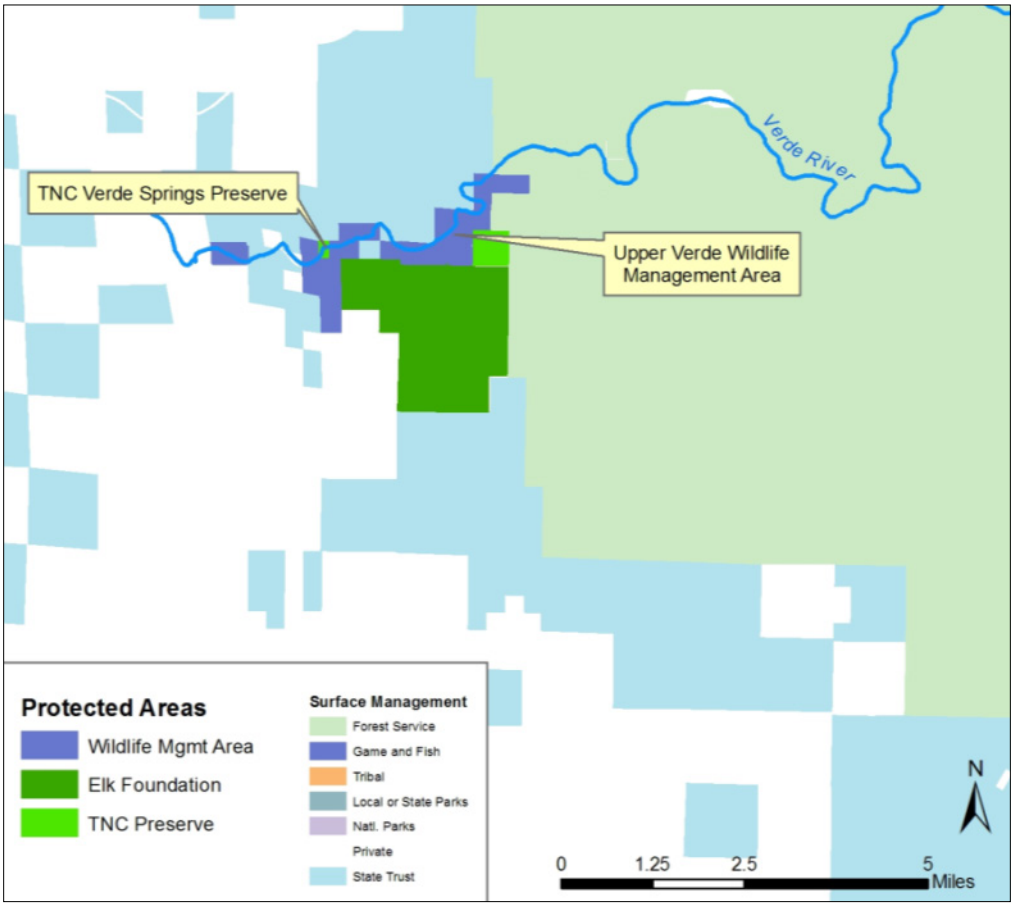

Figure 68. Upper Verde River Wildlife Area.

The Department's historic fish stocking activities on the Verde River immediately upstream of Sycamore Creek are listed in Table 28 and Table 29. The area from Sullivan Lake to Perkinsville is identified as the upper reach; the area between Perkinsville and Sycamore Creek is identified as the middle reach, for a total of 38.5 miles. Stockings of 4 non-native species occurred up to 1991. Only the stockings of smallmouth bass appear to have been successful in the establishment of a reproducing population. Stockings subsequent to 1991 have been exclusively reintroduction efforts for native species.

Table 28. Historical Stocking Report Verde River – Sullivan Lake to Perkinsville.

Common Name	First Year	Last Year	Num. of Stockings	Num. Stocked
Bluegill	1943	1944	2	13,213

Colorado squawfish	1988	1992	4	34,114
Rainbow trout	1951	1991	5	5,689
Razorback sucker	1986	1993	11	122,448
Smallmouth bass	1942	1944	3	36,000
		Total	**25**	**211,464**

Table 29. Historical Stocking Report Verde River – Perkinsville to Sycamore Creek.

Common Name	First Year	Last Year	Num. of Stockings	Num. Stocked
Colorado squawfish	1988	1992	3	60,005
Northern pike	1968	1968	1	44
Razorback sucker	1987	1994	6	70,107
Total			**10**	**130,156**

The Strategic Direction for the Department's Sport Fish and Nongame and Endangered Wildlife Programs envisions a balanced approach to maintaining and enhancing sport fishing opportunities, while simultaneously contributing to the conservation and restoration of Arizona's native aquatic wildlife resources (AGFD 2007c). The Sport Fish Program's goals include the charge to "Maintain, manage, and enhance the quality, abundance, availability, and diversity of sport fishing opportunities while contributing to the recovery of Arizona's native fishes." Recognizing this charge, the objectives of both programs have envisioned the completion of Watershed-Based Fisheries Management Approaches that identify reaches or zones for the management of sport fishes and separates reaches or zones for the management of native fishes. This has proven to be necessary where nonnative fishes, combined with habitat parameters, have created conditions that threaten the persistence or continued existence of native aquatic populations. Efforts to create a Watershed-Based Fisheries Management Plan for the Verde River Watershed is planned to begin in 2010 (AGFD 2009c).

The Game and Fish Commission has long recognized the value of the Verde River to conservation of Arizona's biodiversity, and to the conservation of native aquatic fauna. Existing and long-standing Commission Policy Direction (DOM A2.13 and A2.17) set the foundation for the Commission's guidance for conservation of the Verde River's unique biological and habitat values to the State. Further, Commission action taken in 1997 consciously removed bag limits for warm-water fishes and banned the transport of bait fishes to the Verde River Watershed above Horseshoe Dam, which clarified the Commission's objectives for management of the

Verde River above Horseshoe Dam, to be first and foremost for native aquatic communities. While this was not without some amount of controversy, this latter decision recognized that:

- conservation of Arizona's imperiled aquatic resources was essential to the Commission's mission;
- geographically concurrent objectives for managing to benefit nonnative fishes and to conserve native aquatic animals could often be in direct conflict; and
- to best protect and conserve sport fishing opportunity and native fish resources, the watershed would have to be partitioned into segments for native fish conservation and often separate segments for sport fish conservation.

Conservation and enhancement of the upper Verde River's native aquatic community is critically important to the future persistence and existence of those resources, and to the future of sport fishing in Arizona. The upper Verde River has constituted a diverse and important habitat for native fish communities in Arizona, but those communities are in decline in part due to interactions with resident nonnative fishes. Continued decline of that community and further imperilment of native aquatic resources can only lead to greater limitations on providing sport fish management services and sport fishing in the future. In concert with the direction the Commission has already set by Commission Policy, by Commission Order, and through its strategic plan, we propose that the upper 48.5 miles of the Verde River (upper Verde River) mainstem be considered a prime zone for the assertive management of native aquatic wildlife. The ramifications of such a decision may include experimental or operational suppression or removal of nonnative warm-water fishes, and if feasible, a potential barrier construction to maintain and protect core native fish reaches. We would anticipate in making the decision to identify the upper Verde River mainstem as an area for active or passive management for native aquatic wildlife, the Department and its partners would fully recognize the significant benefits and opportunities for sport fish management in other zones or areas of the Verde River Watershed.

Proposed Action

No stocking enhancements are proposed at this time for the upper Verde River. However, based on the potential for hydraulic connectivity between the Big Chino Complex, Granite Creek Complex, and Sycamore Creek Complex, an analysis of potential movement of fish and impacts to the fauna of the upper Verde River is provided. This analysis relies, in part, on the information previously provided in the three complexes just mentioned.

Water Distribution / Connectivity

The upper Verde River drains an area of 2,507 square miles, and begins at the bottom of the Big Chino Wash Complex and the Granite Creek Complex (Figure 1). The upper portion of the Verde River is primarily spring fed but is subject to high spring runoff events that result during years with above normal snowfall in the watersheds upstream from the upper Verde River . Summer thunderstorm activity can increase flows locally, but rarely are these effects seen on a large scale, nor do they contribute to significant run-off events downstream. The uppermost USGS stream gauge on the Verde near Paulden has a contributing drainage area of about 2,000 square miles, which is about 40% of the total basin area. Despite its large size, this portion of the basin appears to contribute little runoff to the peak discharge of the large floods historically recorded at the gauges downstream of the Paulden gauge, such as at the Clarkdale, Childs, or Tangle Creek. Peak flows recorded at the Paulden gauge almost always lag behind those at the Clarkdale gauge downstream by several hours (Haney et al. 2008). Base flow in the upper stretches of the Verde vary between 20-25 cubic feet per second and vary little from summer to winter (Haney et al. 2008). Base flow increases slightly with additional spring influence in various localities downstream to Sycamore Creek (Figure 69 [taken from Wirt et al. 2005]). Springs and small tributaries may contribute sub-surface flow in some locations. Sycamore Creek enters the Verde at river-mile 37.5 and is the first major tributary to contribute perennial surface flow (Haney et al. 2008). There are no known barriers to fish movement within the upper Verde River except upstream movement, which is blocked by Sullivan Dam. Partial barriers exist during times of normal to below normal flow at Stillman Lake, at a Salt River Project low flow gauge on the UVRWA, at Tunnel Falls (RM 30.2), and at various beaver dams, when they exist throughout the system. However, these barriers do not restrict fish movement during higher than base flow events. Haney et al. (2008) gives an excellent description of the fluvial geomorphology and flow regime for the upper Verde River.

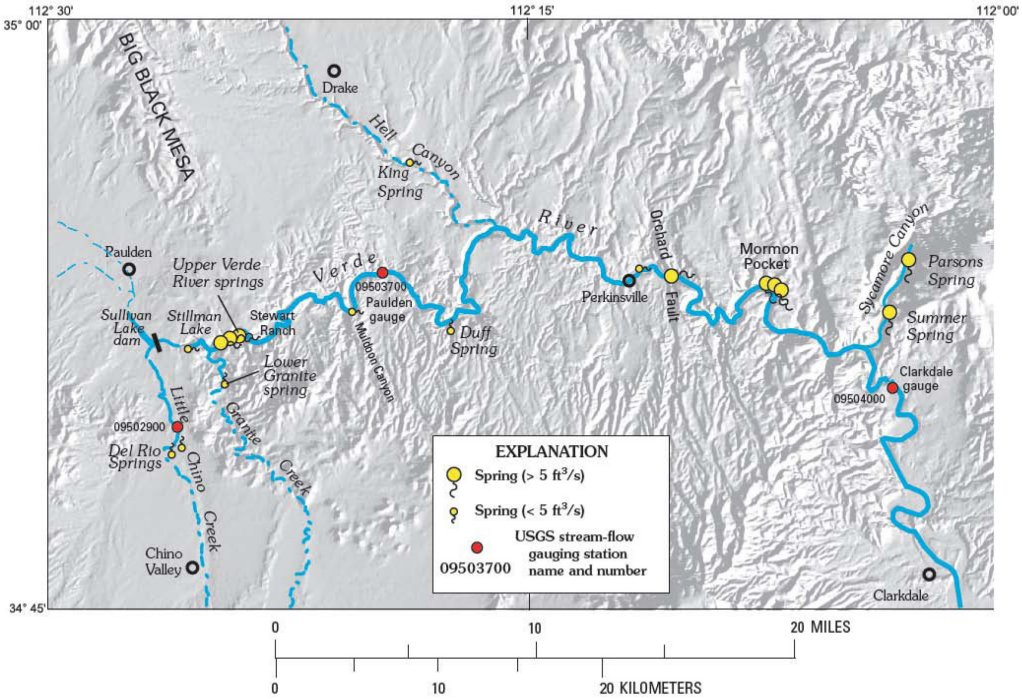

Figure 69. Locations of known springs and gauges along the upper Verde River from Sullivan Lake to Sycamore Creek (Wirt et al. 2005).

The gauge records for Granite Creek below Watson Lake do not begin until September 1999 (Table 30, Table 31 and Table 32) and indicate that the channel is dry or nearly dry for many days of the year. The gauge is located 150 feet north of the Highway 89A bridge on Granite Creek, upstream of the confluence with Willow Creek. Over the period of record, significant flows in Granite Creek occurred in 2003, 2005, and 2008 (Table 32). Interestingly, hurricane Javier which came over Arizona from the Gulf of California in September 2004 did not result in a spike flow down Granite Creek, although the rest of the Big Chino and upper Verde River watershed did flood (Table 33). Similarly, the December 2008 high flow event from Williamson Valley Wash was not reflected in increased flows in Granite Creek. Reservoir storage of high flows makes it difficult to assess when an inflow will spill; however, the City of Prescott's intention to keep both Watson Lake and Willow Creek Reservoir as full as possible increases the potential for incoming flows to exceed the spillway capacities of either lake.

Table 30. USGS gauge data for Granite Creek showing mean daily flows for selected months.

Day of Month	January	February	March	December
1	6.9	8.0	8.9	1.6
2	3.9	6.5	7.6	0.25

3	6.6	7.4	6.0	0.13
4	48	25	5.4	0.12
5	20	11	5.5	0.13
6	12	6.5	5.4	0.16
7	19	5.9	5.8	0.81
8	21	5.5	4.2	0.67
9	21	4.7	3.4	0.37
10	26	4.6	9.4	0.36
11	84	13	8.6	0.31
12	55	122	5.7	0.22
13	19	44	4.4	0.24
14	12	23	3.5	0.22
15	8.0	16	2,9	0.23
16	6.1	15	2.9	0.21
17	5.3	11	3.3	0.21
18	4.4	19	7.9	0.21
19	3.6	37	7.5	0.21
20	2.8	27	6.9	0.20
21	2.4	20	5.7	0.20
22	3.1	23	4.3	0.21
23	1.7	26	5.5	0.23
24	1.6	23	3.9	0.23
25	1.4	17	3.2	0.21
26	1.4	15	2.9	0.22
27	17	14	2.5	0.21
28	56	11	2.5	0.24
29	26	7.1	2.1	70
30	14		2.1	42
31	8.7		1.7	13

Table 31. USGS gauge data for Granite Creek showing mean monthly flows over 5 cfs.

January		**February**		**March**		**April**		**December**	
2005	111.6	2005	138.2	2001	7.15	2005	5.99	2004	36.5
2008	36.6	2008	38.2	2003	6.97				
				2005	25.0				

Table 32. USGS gauge peak flow data for Granite Creek.

Water Year	Date	Flow (cfs)
2000	August 24, 2000	119
2001	August 3, 2001	184
2002	September 7, 2002	120
2003	July 27, 2003	1,100
2004	July 27, 2004	78
2005	January 11, 2005	2,180
2006	August 13, 2006	250
2007	July 25, 2007	119
2008	January 28, 2008	808

Table 33. Comparison of mean daily flows (cfs) at Williamson Valley Wash, Granite Creek, and Verde River at Paulden USGS gauges.

Date	Williamson Valley	Granite Creek	Verde R. at Paulden	Dominant Watershed?
February 1978				Williamson Valley
2/27/78	2.6		22	
2/28/78	1,540		227	
3/1/78	4,180 (max 7,490)		4,000 (max 8,080)	
3/2/78	1,850		6,210	
3/3/78	1,740		3,400	
3/4/78	318		1,130	
3/5/78	1,160		1,030	
3/6/78	648		1,610	
3/7/78	242		722	
February 1980				Mixed
2/13/80	1.5		34	
2/14/80	2,390		558	
2/15/80	3,700		7,450	
2/16/80	712		3,420	
2/17/80	763		1,970	
2/18/80	696		1,500	

Date	Williamson Valley	Granite Creek	Verde R. at Paulden	Dominant Watershed?
2/19/80	1,360		1,850	
2/20/80	2,800 (max 10,100)		7,400 (max 15,700)	
2/21/80	964		4,430	
2/22/80	575		4,260	
2/23/80	196		1,890	
2/24/80	115		881	
September 1983				Williamson Valley
9/22/83	0.50		25	
9/23/83	4,200 (max 14,800)		2,720	
9/24/83	1,800		6,550 (max 15,600)	
9/25/83	235		1,510	
9/26/83	131		387	
July 2003				No effect
7/25/03	0.0	5.4	20	
7/26/03	0.0	0.0	20	
7/27/03	0.0	35 (max 1,100)	20	
7/28/03	0.0	5.2	20	
September 2004				Big Chino
9/18/04	0.0	0.0	21	
9/19/04	401 (est) (max 2,180)	0.0	1,501 (max 11,390)	
9/20/04	67 (est)	0.0	6,280 (max 12,350)	
9/21/04	5.9 (est)	0.0	714 (max 1,270)	
9/22/04	1.3 (est)	0.0	198 (max 430	
January 2005				Big Chino
1/3/05	82	57	88	
1/4/05	969	430	801 (max 1,450)	
1/5/05	315	180	1,080 (max 1,360)	
1/6/05	120	101	561 (max 735)	

Date	Williamson Valley	Granite Creek	Verde R. at Paulden	Dominant Watershed?
1/7/05	68	72	316 (max 393)	
1/8/05	58	68	179 (max 220)	
1/9/05	746	147	308 (max 720)	
1/10/05	1,210	218	1,950 (max 4,250)	
1/11/05	2,780	743 (max 2,180)	5,740 (max 9,400)	
1/12/05	1,330	489	7,440 (max 12,300)	
1/13/05	326	164	2,450 (max 4,560)	
1/14/05	134	101	840 (max 1,270)	
1/15/05	66	70	398 (max 542)	
1/16/05	43	52	244 (max 301)	
1/17/05	42	44	167 (max 201)	
1/18/05	39	36	67	
February 2005				Williamson Valley
2/10/05	37	11	32	
2/11/05	879	89	35	
2/12/05	5,300 (max 8,340)	1,070	4,960 (max 8,210)	
2/13/05	976	351	5,440 (max 6,440)	
2/14/05	417	170	1,750 (max 3,300)	
2/15/05	185	116	643 (max 953)	
2/16/05	176	112	377 (max 454)	
2/17/05	134	80	264 (max 264)	
2/18/05	727	147	294 (max 522)	
2/19/05	1,450	322	1,690 (max 2,800)	
2/20/05	739	231	2,830 (max 3,440)	
2/21/05	321	155	1,620 (max 2,700)	
2/22/05	948	176	816 (max 1,030)	
2/23/05	1,070	171	1,290 (max 1,540)	
2/24/05	891	144	1,170 (max 1,510)	
2/25/05	469	102	561 (max 765)	
January 2008				Williamson Valley

Date	Williamson Valley	Granite Creek	Verde R. at Paulden	Dominant Watershed?
1/26/08	2.3	0.22	24	
1/27/08	826 (max 3,320)	95	27	
1/28/08	878	452 (max 808)	784 (max 1,880)	
1/29/08	244	180	301 (max 487)	
1/30/08	44	71	114 (max 174)	
December 2008				
12/25/08	2.4	2.3	25	Williamson Valley
12/26/08	1,140	7.9	415 (max 1,610)	
12/27/08	66	1.3	263 (max 720)	
12/28/08	15	0.62	71 (max 109)	

It is unknown how high a flow must be in Granite Creek to reach the confluence with the upper Verde River. The 23.3 mile distance is in part along a low-grade, sandy alluvial course (14.5 miles) with 1 sand and gravel operation in the wash near Chino Valley that could trap or impede flows (Clark 2003b). The lower 8.8 miles are in a canyon-like reach much steeper and narrower, before reaching the permanent water in Granite Creek at the confluence with the upper Verde River. Because the gauge is located upstream of Willow Creek, there may be some flows from Willow Creek Reservoir that are not counted in the gauge data. To attempt to address the potential connectivity, the Department will only look at flows over 800 cfs, in the assumption that a flow of that magnitude, combined with flows out of Willow Creek, could reach the confluence with the upper Verde River. The Department understands this may overestimate the potential number of events, since the July 2003 high flow on Granite Creek (1,100 cfs) is not represented in any flow increases at the Paulden gauge (Table 33).

Table 32 only shows the highest flow per water year in Granite Creek from October through September of the following year; there may have been other flows in a year that were high but not as high as the peak. This is apparent in Table 33, where the peak flow was in January 2005, even though there was another high flow in February that same year. The record contains three events that then qualify for connectivity: January 2005, February 2005, and January 2008.

In addition to these years, Clark (2003b) also looked at gauge data from the Paulden and Williamson Valley Wash gauges in a similar way to Table 33. These data are reported in Table

34. Table 35 provides yearly peak flow at the Williamson Valley gauge, and Table 36 provides yearly peak flow at the Paulden gauge. Table 37 shows mean monthly flows at the Paulden gauge over 100 cfs. Table 33 focused on the contributions of Big Chino Wash (ungauged) and Williamson Valley Wash to the flows at Paulden, and where a peak for Granite Creek occurred at those same points, included the daily flow data. Table 31 overlaps slightly; however, it looks at a number of other dates not included in Table 30. Importantly, we modified the table to look at the flow "remainders" in terms of both Big Chino Wash and Granite Creek as potential contributions. Six additional years, December 1965, October 1972, December 1978, February 1980, September 1983, and September 1984 show a possible Big Chino Wash/Granite Creek contribution.

Table 34. Comparison of Paulden and Williamson Valley Wash gauge data to estimate potential contributions from Big Chino Wash and Granite Creek. Modified from Clark 2003a.

Date	**Williamson Valley Wash**	**Verde River @ Paulden**	**Big Chino Wash and/or Granite Creek (estimated)**
12/30/65	3,630	6,130	2,500
10/20/72	1,940	3,040	1,100
2/9/76	3,910	4,430	430
3/1/78	7,490	8,080	590
12/19/78	4,890	5,700	810
2/20/80	10,100	15,700	5,600
9/24/83	14,800	15,600	800
9/1/84	3.1	3,650	3,650

Table 35. USGS gauge yearly peak flow data for Williamson Valley Wash.

Water Year	**Date**	**Flow (cfs)**
1965	April 10, 1965	820
1966	December 30, 1965	3,630
1967	December 7, 1966	1,710
1968	January 28, 1968	2,120
1969	February 26, 1969	400
1970	August 19, 1970	445
1971	August 23, 1971	465
1972	August 12, 1972	254
1973	October 19, 1972	1,940
1974	September 27, 1974	570

Water Year	Date	Flow (cfs)
1975	November 2, 1974	112
1976	February 9, 1976	3,910
1977	September 12, 1977	1,300
1978	March 1, 1978	7,490
1979	December 18, 1978	4,890
1980	February 20, 1980	10,100
1981	August 8, 1981	137
1982	February 11, 1982	572
1983	September 23, 1983	14,800
1984	October 5, 1983	1,280
1985	December 24, 1984	2,780
2001	August 9, 2001	1,010
2002	September 6, 2002	1,710
2003	August 29, 2003	1,650
2004	September 19, 2004	2,180
2005	February 12, 2005	8,340
2006	July 24, 2006	754
2007	August 2, 2007	212
2008	January 27, 2008	3,320

Table 36. USGS gauge yearly peak flow data for Verde River near Paulden.

Water Year	Date	Flow (cfs)
1963	August 25, 1963	710
1964	August 5, 1964	1,270
1965	April 10, 1965	685
1966	December 30, 1965	6,130
1967	December 7, 1966	1,250
1968	January 28, 1968	1,800
1969	July 26, 1969	465
1970	August 19, 1970	705
1971	August 13, 1971	2,270
1972	August 08, 1972	1,620
1973	October 20, 1972	3,040
1974	September 5, 1974	270
1975	July 9, 1975	73

Water Year	Date	Flow (cfs)
1976	February 9, 1976	4,340
1977	September 12, 1977	1,290
1978	March 1, 1978	8,080
1979	December 19, 1978	5,700
1980	February 20, 1980	15,700
1981	August 9, 1981	195
1982	March 16, 1982	541
1983	September 24, 1983	15,600
1984	September 0, 1984	3,650
1985	December 28, 1984	2,390
1986	November 30, 1985	1,460
1987	August 12, 1987	217
1988	April 26, 1988	342
1989	July 08, 1989	263
1990	July 15, 1990	123
1991	March 2, 1991	6,320
1992	February 14, 1992	1,590
1993	February 20, 1993	23,200
1994	September 2, 1994	192
1995	February 15, 1995	3,960
1996	July 15, 1996	1,030
1997	August 30, 1997	208
1998	August 31, 1998	592
1999	September 24, 1999	1,070
2000	August 25, 2000	83
2001	October 28, 2000	633
2002	September 10, 2002	1,610
2003	August 15, 2003	909
2004	September 20, 2004	12,350
2005	January 12, 2005	12,300
2006	July 31, 2006	124
2007	August 14, 2007	770
2008	January 28, 2008	1,880

Table 37. USGS gauge data for Verde River near Paulden showing mean monthly flows over 100 cfs (years shown are actual calendar years, not water years).

January		February		March		September		October		December	
1979	112.9	1973	122.8	1973	304.5	1983	440.3	1972	200.1	1965	295.4
1980	231.8	1976	155.7	1978	668.5	2004	314.8	2004	168.2	1978	214.7
1993	860.9	1980	1,311	1979	224.2					1984	105.4
2005	770.3	1993	1,443	1983	208.0					2004	142.0
		1995	192.9	1991	152.4						
		2005	906.5	1993	123.2						
				1995	188.3						

Clark (2003b) notes that Granite Creek has flooded to a "sufficient magnitude" to allow transport of fishes several times over the last 30 years. He also reports that local residents of Chino Valley, which is more than half-way down to the upper Verde River confluence, recall the creek flowing "bank to bank" in 1980, 1983, and 1993. The February 1980 and September 1983 comparisons in Table 37 likely reflect these events. The Williamson Valley gauge was not in service during the February 1993 flood that produced 23,300 cfs at the Paulden gauge, and was likely the 1993 event at Granite Creek. Fish can be transported downstream during floods. There are factors that influence how successfully this can occur, since water velocities and sediment loads can be quite high which can injure or kill fish caught in the flows. Fine clay sediments transported with runoff often prohibit fish survival in pools following runoff events. High sediment loads can also result in fish mortality as a result of decreased dissolved oxygen concentrations concurrent with increased suspended sediments (Bozek and Young 1994; Robinson et al. 2004a; Rinne and Carter 2008). During the process of the flood, there may be safer eddies or shallow waters where fish can ride out the worst; however, depending on the duration of the high flows, these areas may become isolated and not allow further downstream movement.

Based on available flow information, it appears that all three of the contributing watersheds to the upper Verde River have the potential to hydraulically connect. Lack of flow data on the Big Chino watershed prevents assessing the contribution of its sub-watersheds to the overall flow coming into the upper Verde River. Some run-off may be coming from Partridge Creek where proposed stocking sites are located, while some contributing flows may come from other sub-watersheds, such as Walnut Creek, Little Chino Wash, or upper Big Chino Wash, where no stocking sites are located.

Fish Movement

While fish movement likely does occur from the Big Chino Complex and the Granite Creek Complex into the upper Verde River, it is unclear how often and what species of stocked sport fish are the most prone to movement. Data from the Regional Department surveys, and the long-term data set compiled by John Rinne and partners for the upper Verde, suggest species like

largemouth bass, longfin dace, and speckled dace may move into the upper Verde from either upstream or downstream sources during large scale flooding events. However, those same data sources suggest that these species do not persist over time (Table 38 through Table 43). Other species such as channel catfish, green sunfish, yellow bullhead, red shiner, and mosquitofish appear to maintain populations in the upper Verde. However, the origin of those fish collected in the upper Verde cannot be distinguished from populations found elsewhere lower in the Verde River or some of its contributing watersheds, such as Granite Creek, Big Chino Wash, Williamson Valley Wash, Little Chino Wash, Hell Canyon or Sycamore Creek. Impediments to movement downstream are few in the upper Verde. If significant numbers of stocked fish, especially largemouth bass, were moving into the upper Verde from tributaries, it would be reasonable to assume surveys would reflect reproduction or migration of this species downstream of confluences with Big Chino Wash and Granite Creek; however, data do not suggest significant reproduction or migration because although individual largemouth bass have been collected from Stillman Lake following large floods (but maybe not as a result of them); they have not been collected from downstream habitats in the last 15 years, except for 1 individual found near Sycamore Creek, 37 miles downstream.

The Pecks Lake diversion is a complete barrier to upstream fish movement during all but the largest flood events. Flooding in 2004 showed water going around the structure and significant damage was sustained by the diversion during that event (Figure 70). It is possible, although unlikely, that during large 100 year flooding events species such as largemouth bass are able to move up and around the Pecks diversion. It is more feasible that small numbers of largemouth bass were coming downstream from tributaries and finding suitable habitat around the Sycamore Creek area due to more pool habitat being available. Largemouth bass have not been sampled above the Pecks Lake diversion in the last 9 years (Table 39 through Table 43) suggesting this species is not maintaining populations in the upper Verde River. A robust population of largemouth bass exists from the Pecks Diversion downstream; refer to the Middle Verde River analysis at the end of the document.

Community Description

As described above, the upper Verde fishery has been extensively studied and surveyed in recent history. Because of efforts by the Department, Rocky Mountain Research Station, Prescott National Forest, The Nature Conservancy, Salt River Project, Fish and Wildlife Service, Bureau of Reclamation-Central Arizona Project, and many private landowners along the river, more is known about the upper Verde River riparian and aquatic ecosystems than most river systems in Arizona.

Figure 70. Pecks Diversion September 20, 2004.

The Region III Fisheries Program shares the responsibility with Region II and Region VI for 106 miles of the Verde River, from Sullivan dam to the Childs Power plant. The upper Verde and the middle Verde reaches had not been surveyed following a standard protocol until beginning in 2000. Survey efforts had been effective in local areas or at access points, but lacked the continuity to be able to make Region-wide assessments about the fish community throughout the river. Specifically, problems with sample bias had plagued previous surveys. Prior to 2000, samples had been collected using a backpack type electrofishing unit. While effective in shallow, gravel dominated areas, these units lose effectiveness in sampling larger, deeper (> 4-feet) pools. Backpack units also lack the power and flexibility to sample in high discharge water situations often found during summer-month surveys.

Beginning in 2000, summer sampling of the variety of habitats found in the upper Verde has been conducted using an electrofishing canoe and block seine. Between July 2000 and August 2008, over 2,061 minutes of electrofishing time was expended by Department Regional survey crews to sample 37,839 individuals of 14 species of fish (Table 39). The efforts were in 16 reaches or areas of the upper Verde River. Regional survey crews select sample sites using a combination of random and fixed 200-meter long areas; fixed sites are selected using historic

data and access points. By selecting both random and fixed sites, sample bias is further minimized. The methods used in these canoe efforts have minimized sample bias to an acceptable level by giving survey crews flexibility to sample all types of habitats with the same assumption of success on all sizes of fishes. Further, the Smith-Root electrofishing units used allow great flexibility in power and wavelength selection. This allows crews to select settings for electrofishing that are the most appropriate for river conditions.

In 1993, Forest Service Research Fisheries Biologist John Rinne and a team of biologists established 7 permanent monitoring sites from Sullivan Dam down to Sycamore Creek (Table 40 and Table 41). These sites were to be sampled using backpack electrofishing units and seine nets in the spring and fall annually, and were selected based on road access points. While useful for long-term trend data, these sites contain fairly high sample bias and may not accurately reflect changes in habitat and species composition across the entire upper Verde River.

In the winter of 1992-93, flooding occurred in the Verde drainage. At the Paulden USGS gauging station some 10 miles downstream of Sullivan Dam, flows were recorded in excess of 23,000 cfs. The series of flood events that winter caused significant change to occur in the Verde River system; 80-90% of streamside vegetation was altered or removed. Millions of tons of sand and gravel substrates were moved and deposited in different areas downstream, and beaver dams previously present were removed. Data collected suggested that native species responded positively post-flooding, and non-native fish species responded poorly after such floods (Table 40 and Table 41). Small bodied natives such as spikedace, longfin dace, and speckled dace were all found in large numbers for 1-2 years following the 1993 flood event. However, within that same timeframe, non-native species like the red shiner began rebounding, quickly re-colonizing in many areas. By 1997, the presence of spikedace and the other small-bodied natives were significantly reduced from the upper Verde River across Rinne's 7 sampling sites. During that same period, surveys conducted by Department biologists confirmed non-native species presence in large numbers but also showed large bodied, relatively long-lived natives, including: roundtail chub, desert sucker and Sonora sucker persisting more abundantly than smaller bodied species.

Sampling data as previously referenced, suggests that fish assemblages transition to an increasing dominance of non-native species in an upstream to downstream direction, which may be related to increasing levels of hydrologic alteration (Rinne et al. 1998). This is most relevant below Sycamore Creek. The upper Verde River is home to robust populations of green sunfish, yellow bullhead and smallmouth bass (Table 39). Red shiner and mosquitofish are also very abundant (Table 39). Common carp, fathead minnow, flathead catfish and channel catfish can be found locally in higher numbers, although channel catfish have been markedly less common since the late 1990's (Table 39 and Table 43).

Hell Canyon is a tributary to the upper Verde and also harbors populations of black crappie and green sunfish as described in a spot check of Meath Wash from Barrata seep to Meath Springs (Cummins 2007 (6)) and Hell Canyon west of Highway 89 spot check (Cummins 2006). The privately owned dam at Meath Tank failed during the high water events in February 2005 and was not able to hold water in later years. Local Wildlife Manager Bill Ough claimed black crappie were present in this tank historically and may have been the origin of the crappie sampled in 2007, after the compromising of Saw Dam at Meath Tank (A. Clark pers. comm.). The confluence of Hell Canyon and the upper Verde is at river mile 18.6. Stillman Lake remains one place channel catfish have been found since 2001 consistently, but in low numbers (Table 38). During renovation efforts at Stillman Lake in November 2009, crews recorded dozens of channel catfish in the 6-8 inch size class (A. Clark pers. comm.). It is unclear what the origins of these catfish are; however, Stillman Lake is prime habitat for channel catfish because it is the largest pool habitat on the upper Verde. It also contains boulder, woody, and cavity type habitats which catfish prefer for spawning and recruitment (Minckley 1973). While individual channel catfish may have washed in from tributaries such as Big Chino and Granite Creek, or have come from other undetermined vectors, it is most likely that the origins of these fish is from downstream, and is supported by the fact that other species such as common carp have been observed swimming back and forth from Stillman Lake to areas below the pool during the high water events in 2008; refer to the Granite Creek Complex analysis (A. Clark pers. comm.). Regardless, it appears some component of the Stillman Lake microcosm is not allowing for the channel catfish to recruit to higher numbers as there seems to be some level of reproduction and habitat for them, but a limited response due to some ongoing factor.

It is suggested that existing flathead catfish and bullhead catfish populations are limiting the recruitment of channel catfish in Stillman Lake and in the rest of the upper Verde River, but these fish are not totally eliminating channel catfish. This scenario is more likely than if the presence of catfish in the Upper Verde River were the result of channel catfish coming in from somewhere else. Typically, catfish anglers are harvest-oriented and harvest most of what they catch (Michaletz et al. 2008). It is possible this harvest, in addition to competition and predation by the other catfishes, is limiting recruitment of channel catfish.

Regardless of whether channel catfish are reproducing or not in the upper Verde River, outside of Stillman Lake, they are rare in the upper Verde. Spikedace have not been sampled since 1999, when 1 individual was sampled in the vicinity of Forest Road 638. This species is still considered present in the upper Verde. The same concept regarding presence of a reproducing population of fish at levels at or below detection ability can be said for channel catfish in the upper Verde River. Juvenile channel catfish (individuals less than 200 mm) have been collected from the upper Verde River during surveys in 1988, 1989, 1990, 1992, 1993, 1994 and 1995 (Table 43).

Table 38. Species and number of individuals sampled in Stillman Lake, using a canoe based electrofishing unit, 150' experimental gillnets and 3' diameter hoopnets, 2000 through 2008.

Common Name	2001	2004	2005	2006	2007	2008	Totals
Longfin Dace							
Yellow Bullhead		11	21	23	82	126	240
Sonora Sucker			28	2	6	274	308
Carp	#	152	111	65	50	100	413
Red Shiner	#		135	8	77	164	376
Mosquitofish				5		23	23
Roundtail Chub						82	82
Channel Catfish	3	3	2			2	7
Green Sunfish	#	12	559	80	329	305	1205
Smallmouth Bass		1	1			386	388
Largemouth Bass		1	2				3
Desert Sucker						28	28
Fathead Minnow			10	4	3	66	79
Flathead Catfish	6	22	8	4	5	3	38
Totals	**9**	**202**	**877**	**191**	**552**	**1559**	**3190**

=present in samples but not counted

Table 39. Species and number of individuals sampled in the upper Verde River using a canoe based electrofishing unit, 2000 through 2009 (additional breakdown of sampling data by site, year and species for years 2000-2006 is provided in Table 51).

Common Name	2000	2001	2003	2004	2005	2006	2007	2008	Totals
Longfin Dace					58			901	959
Yellow Bullhead	72	26	3	161	114	29	159	1	565
Sonora Sucker	244	111	11	556	7020	709	1241	57	9949
Sucker (young-of-the-year)					3200				3200
Carp	30	13	4	133	417	27	293		917
Red Shiner	475	2486	159	3645	1606	134	1262	1789	11556
Mosquitofish	68		1	141				3	213
Roundtail Chub	136	11	4	34	432	51	79		747
Green Sunfish	23	21	13	176	83	6	137	36	495
Smallmouth Bass	372	95	99	1766	1039	242	398	1	4012
Desert Sucker	266	62	58	510	2937	446	646	57	4982

Common Name	2000	2001	2003	2004	2005	2006	2007	2008	Totals
Fathead Minnow				1	55			137	193
Flathead Catfish	14	1		14	3	1	5		38
Speckled Dace					13				13
Totals	**1700**	**2826**	**352**	**7137**	**16977**	**1645**	**4220**	**2982**	**37839**

Table 40. Native Fish community summary of 7 sites sampled from 1994 to 2008 on the upper Verde River, Prescott National Forest (Rinne unpublished data); additional data breakouts by year, site and species are provided in Table 44 through Table 50.

Year	Longfin Dace	Speckled Dace	Spikedace	Desert Sucker	Sonora Sucker	Roundtail Chub
1994	1319	171	428	2644	1810	776
1995	12	25	72	328	322	341
1996	282	68	140	471	654	259
1997	21	1	0	231	240	50
1998	13	12	0	126	125	64
1999	2	2	0	167	118	25
2000	1	7	0	137	197	20
2001	2	0	0	376	163	43
2002	1	0	0	148	90	20
2003	1	0	0	128	75	4
2004	0	0	0	94	67	6
2005	1	0	0	44	24	0
2006	0	0	0	1119	742	259
2007	0	0	0	380	294	14
2008	1	3	0	221	366	24

Table 41. Nonnative Fish community summary of 7 sites sampled from 1994 to 2008 on the upper Verde River, Prescott National Forest (Rinne unpublished data) - additional data breakouts by year, site and species are provided in Table 44 through Table 50.

Year	Fathead Minnow	Mosquitofish	Red Shiner	Green Sunfish	Smallmouth Bass	Largemouth Bass	Channel Catfish	Flathead Catfish	Yellow Bullhead	Common Carp

Year	Fathead Minnow	Mosquitofish	Red Shiner	Green Sunfish	Smallmouth Bass	Largemouth Bass	Channel Catfish	Flathead Catfish	Yellow Bullhead	Common Carp
1994	7	0	1473	4	14	0	5	0	31	23
1995	0	0	97	29	10	0	2	1	29	6
1996	0	0	275	6	32	0	0	1	9	13
1997	0	3	2238	8	35	0	1	1	40	19
1998	0	6	1047	21	66	0	0	1	33	9
1999	0	59	545	49	104	0	0	0	15	4
2000	0	227	1594	95	48	1[1]	0	0	22	15
2001	0	131	1608	192	163	0	0	5	36	15
2002	0	97	276	53	211	0	0	0	19	4
2003	0	32	632	139	193	0	1	1	29	4
2004	0	76	928	31	57	0	1	1	16	4
2005	0	0	326	29	15	0	1	1	6	10
2006	0	0	701	14	143	0	1	1	57	0
2007	0	0	469	45	58	0	1	1	38	15
2008	0	0	264	73	115	0	0	1	20	0

1. This single largemouth bass was collected at the furthest downstream site near Sycamore Creek confluence.

Table 42. All largemouth bass records for upper Verde River.

Date	Location	Num.	Source
1966	T18NR1E (near Bear Canyon)	1	SONFISH
12/11/1989	T17NR2W sec 12 (confluence Granite Creek	1	SONFISH, likely record from Hendrickson 1993 survey data
7/18/1990	T17NR2W sec 12 and 14 (below Granite Creek	5	SONFISH, likely record from Hendrickson 1993 survey data
2/5-6/1991	T17NR2W section 15 (at/below Sullivan Lake?)	2 (also 3 channel catfish)	SONFISH, likely record from Creef et al 1992
9/25-10/29/1992	Morgan Ranch to Perkinsville	6 (also 4 channel catfish)	Creef and Clarkson 1993

2000	Near Sycamore Creek	1	Rinne compiled data
2004	Stillman Lake	1	Cited USFWS 2009a
2005	Stillman Lake	2	Cited USFWS 2009a

Table 43. Summary of fishes collected from the upper Verde River, above TAPCO Diversion, from the AGFD Native Fish database (data points depicted in Figure 71). Grayed rows are species proposed for stocking in the upstream watershed.

Common Name	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Longfin Dace		126	244	182	600	222	3	28	2021	53	681					4160
Black Bullhead			20		1	22										43
Yellow Bullhead	14		50	45	69	164	46		42	90	324		5	17		866
Sonora Sucker	42	29	500	236	2329	1452	998	1014	2144	906	1426	23	66	137		11302
Unidentified Suckers			1		1765											1766
Carp		5	50	28	364	201	118	121	30	53	37	22	26	3		1058
Red Shiner		37	579	3942	6614	3377	435	941	197	667	369		10	7		17175
Mosquitofish		7	267	1239	7654	5485	1445	433								16530
Roundtail Chub	94	7	210	223	529	288	117	172	163	199	528	4	13	29		2576
Brown Bullhead								2								2
Channel Catfish				10	50	103	9	20	3	2	7		1	2		207
Green Sunfish	3		191	90	307	90	8		14	102	88	1	21	62		977
Bluegill								3								3
Spikedace		637	1	146	199	60		5	148	13	111				1	1321
Smallmouth Bass			137	98	330	153	57	82	11	34	335	8	40	68		1353

Common Name	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Spotted Bass								6								6
Largemouth Bass					6	9	2				2					19
Rainbow Trout							1									1
Desert Sucker	4	1	281	238	885	519	243	201	1755	1060	1310	16	15	24		6552
Fathead Minnow				11	22	4	1		20	7	3					68
Colorado Squawfish	7		11	834				3			2					857
Flathead Catfish					12	29	4	8								53
Speckled Dace			18	7	10	17	1	135	524	77	695					1484
Razorback Sucker		363	7	64	51	41	3	2	44	104						679
Totals	164	1212	2586	7393	21797	12236	3491	3176	7116	3367	5918	74	197	349	1	69077

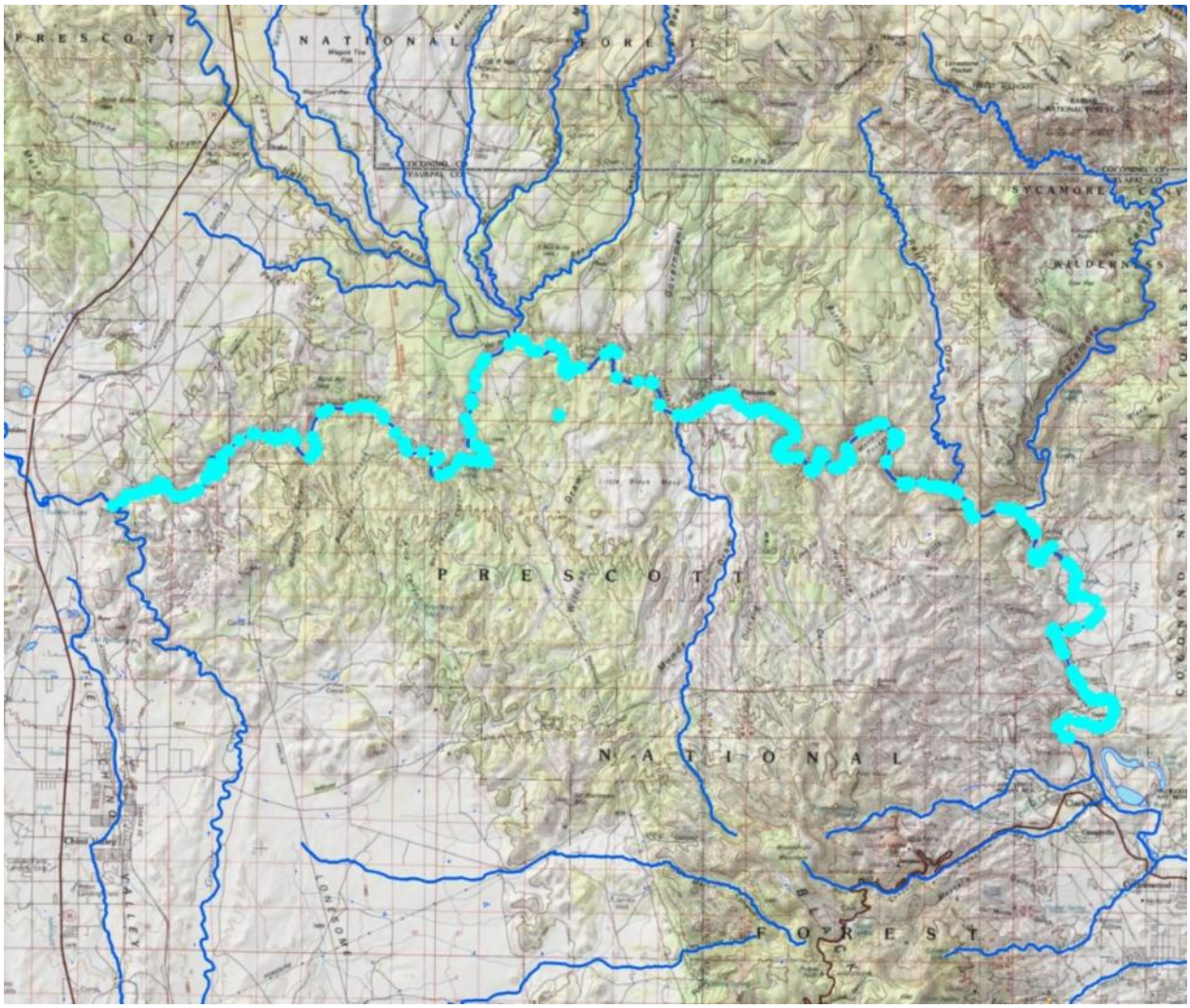

Figure 71. Location of Native Fish Database sample sites as summarized in Table 43.

Consultation Species or Critical Habitat

No stocking enhancements are proposed at this time for the upper Verde River. However, based on the potential for hydraulic connectivity between the Big Chino Complex, Granite Creek Complex, and Sycamore Creek Complex, an analysis of potential movement of fish and impacts to the fauna of the upper Verde River is provided. This analysis relies, in part, on the information previously provided in the three complexes just mentioned. Impacts on razorback sucker and critical habitat, Colorado pikeminnow, roundtail chub, spikedace and critical habitat, northern Mexican and narrow-headed gartersnakes (discussed also in the previous complexes) are discussed below.

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 and narrow-headed 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.

Razorback Sucker and Critical Habitat

The razorback sucker is not found in the Big Chino Complex, Granite Creek Complex, or the upper Verde River. Historically, razorback suckers were found in the Verde River (Minckley 1973) and were stocked into the upper Verde River 33 times between 1985 and 1993 (Hendrickson 1993; Creef and Clarkson 1993; Hyatt 2004) (Table 28 and Table 29). Recaptures of stocked razorback suckers in the upper Verde were typically soon after stocking, although some fish recaptured in lower Granite Creek and Stillman Lake in 1990 may have been at large 1 to 4 years after they were stocked (Hendrickson 1993). As part of the Stillman Lake native fish restoration effort, razorback suckers will be reintroduced into the lake once non-native fish have been removed (USFWS 2009a). It is expected that razorback suckers will move out of the lake during high flows and establish in the upper Verde River.

Critical habitat for the razorback sucker on the Verde River was designated in 1995 and extends from the western boundary of the Prescott National Forest west of Perkinsville to Horseshoe Dam. The Verde River critical habitat unit was described in the biological support document for the designation as contributing to delisting of the species, therefore important for recovery (Maddux et al. 1993). The upper Verde reach was described as being altered by livestock grazing, mining, and recreational use, with a diverse native fish community present. At the time of the designation, the upper Verde River maintained populations of six native species, and non-natives were not dominant in the system.

At the time of designation, the upper Verde River supported several constituent elements of critical habitat as described below:

Water: the upper Verde River base flow is supported by springs near the confluence with Granite Creek. Higher flows are created through runoff from the Big Chino sub-watershed, Granite Creek, and Sycamore Creek. The Little Chino sub-basin may have been a more significant contributor to flows in the past (Wirt and Hjalmarson 2000); although that contribution may have been more effecting in contributing to base flows via the spring system. At the time of designation, the upper Verde River had sufficient flows and hydrological regimes to support native fish populations.

Physical habitat: the upper Verde River contained a wide variety of habitats suitable for razorback sucker. While backwaters were generally lacking, the clean substrates and pools provided opportunities for spawning and nursery habitats, although conditions downstream in the middle and lower reaches may have been more favorable for nursery habitats in backwaters and sloughs.

Biological environment: at the time of designation, non-native fish species were present in the upper Verde River, but they did not dominate the aquatic fauna, and native fish species were maintaining populations. In the 13 years since, the spikedace has all but disappeared, and populations of the other native species appear to have declined (Rinne 2001; Rinne and Carter 2005; Rinne et al. 1998) as numbers of non-natives, particularly smallmouth bass and flathead catfish, have increased. Smallmouth bass have been in the system since at least 1984, and flathead catfish since 1989.

Additional selection criteria besides the primary constituent elements were developed to assist in selecting critical habitat areas for the razorback sucker:

Presence of spawning population: there was no spawning population in the Verde River at the time of designation. The Verde River may have supported a spawning population of razorback suckers later than did the Gila or Salt Rivers, as the last razorback sucker from the Verde River was documented in 1954, several years after the species was gone from the other central Arizona rivers.

Nursery habitat: nursery habitat is available in all reaches of the Verde River.

Historic or present distribution: the reintroduction of razorback sucker into the Verde River began in the 1980s, and the river was considered occupied at the time of designation of critical habitat.

Maintenance of range-wide distribution: as the last of the central Arizona rivers to support razorback suckers, the Verde River shares some physical characteristics with the Gila River in terms of elevational changes and the mixture of canyon and open alluvial floodplain areas. The Gila River is also free-flowing in that critical habitat reach. The

significant difference is that the Gila River supported a large and dominant non-native fish community at the time of designation, unlike the upper Verde River.

Special management: the potential for groundwater development in the upper Verde River watershed was identified as an issue of concern, for maintaining suitable flows in the river to support the water and physical habitat primary constituent elements. Maintenance of a natural flow regime that would encourage native fish and discourage non-native fish was also identified as an important management need.

Potential Impacts

Potential impacts to razorback suckers in the upper Verde River would result from transportation of the non-native fish or their progeny stocked or propagated in the upper watersheds into downstream occupied habitat. Historically, Sullivan Lake and the upper Verde River were stocked with non-native fish (Table 28 and Table 29), although the only species to have established appears to be smallmouth bass. The response from razorback suckers to potential interactions with stocked sport fish species, if they were to find their way into the upper Verde River or into critical and occupied habitat further downstream, would be predation by the stocked fish or their progeny; specifically on larval or juvenile razorbacks if they are able to successfully spawn, or potential competition for food or space where habitats overlap. Largemouth bass and channel catfish were documented eating desert and Sonora suckers (Bonar et al. 2004) in the Verde River. Marsh and Brooks (1989) documented extensive predation on newly stocked, small razorback suckers by channel catfish in the Gila River. There is a considerable overlap in preferred habitats between these three species, with pools being preferred over runs and riffles (Bonar et al. 2004). Stillman Lake is the first likely location where non-native stocked fish or their progeny could interact with razorback suckers. As demonstrated by surveys of the fish community in the lake (Table 38 and Table 42), Stillman Lake habitat is suitable for largemouth bass, sunfish, and channel catfish as well as razorback suckers.

At the present time, razorback suckers are either not present in the upper Verde River or are at such low numbers that the surveys conducted to date have not detected them. There has been no stocking of razorback suckers into the upper Verde River since 1993, and no recaptures since 1994 (AGFD unpublished database). However, razorback suckers will be reintroduced into Stillman Lake as part of the native fish recovery portion of the project. The Stillman Lake/Granite Creek area successfully supported razorback suckers between 1986 and 1990 (Hendrickson 1993; USFWS 2009), and the type of deep pool/backwater-like habitat at Stillman Lake would be expected to provide suitable habitat for adults and juveniles, once non-native fish are removed. It is unclear if there is suitable substrate (clean gravel) for razorback suckers to spawn in Stillman Lake; however, there may be such areas downstream or in lower Granite

Creek that can be used once fish disperse out of the lake. Largemouth bass and channel catfish pose a threat of predation on larval and juvenile razorback suckers. The number of potential predation attempts by these non-native species is limited due to the low numbers of largemouth bass and channel catfish expected to enter the upper Verde over the next 10 years. The impact of any particular predation action is the loss of individual razorback suckers. Efforts will be made to monitor and evaluate the numbers and interactions between native and non-native fish in Stillman Lake under the management plan for the native fish introductions (USFWS 2009).

The connectivity of the Big Chino Wash Complex and the Granite Creek Complex to the upper Verde River has been documented using USGS gauge data. It is believed that the Williamson Valley Wash drainage may contribute more frequent surface runoff events that allow for connection of that system than the Big Chino Wash itself or Granite Creek. Within the Big Chino Wash, other tributaries, such as Walnut Creek where no stocking is proposed, are likely a more significant supply of seasonal runoff than is Partridge Creek, where some stocking sites are located. However, that does not rule out the potential for transport of non-native sport fish or their progeny from any site to the upper Verde River during very high flow events. The presence of channel catfish in Stillman Lake and downstream does appear to be the result of a self-sustaining population of this species in the upper Verde River because sizes collected indicate reproduction (A. Clark pers. comm.), although likely at a very low level. Channel catfish do maintain self-sustaining populations in the Middle and Lower Verde River, and some may move upriver if they can get past the TAPCO Diversion Dam. Channel catfish have only been sporadically found in regular surveys between 1994 and 2008 (Table 38 through Table 43) between Stillman Lake and Sycamore Creek. Channel catfish have been found in Stillman Lake itself in several surveys between 2001 and 2009, and were detected in renovation efforts in November 2009. Largemouth bass have been recorded in Stillman Lake; 2 were reported in 1991 from between Sullivan Lake and Perkinsville (Creef et al. 1992); 4 from the same area in 1992 (Creef and Clarkson 1993); 1 in 2004; 2 in 2005, and 1 near Sycamore Canyon in 2000. No largemouth bass were recorded in renovation efforts during November 2009. No bluegills have been reported, although they have been stocked into the river itself (Table 28) as well as 4 Big Chino Watershed stocking sites, and are already present in the fifth stocking site (Stone Dam). Black crappie have not been stocked into the Big Chino stocking sites but are present in Stone Dam and are proposed for Garrett, Shucking, and Presley Tanks, but not for Stone Dam or Granite Basin Lake.

The origin of the channel catfish and largemouth bass in the upper Verde River is unknown. These individuals may have been brought into the system from stocking sites in the Big Chino Wash sub-watershed or Granite Creek. There are also other waters located on private lands not stocked by the Department that may maintain sport fish populations established historically or illegally. Persons could also have deliberately transported these species to the river in an attempt

to establish a fishery for them. The origin point of such transported fish is unknown but could be from any nearby population, including the proposed stocking sites in the upper watersheds or other ponds.

The 2 largemouth bass recorded in May 2005 in Stillman Lake were found after the major flood events of September 2004 and January 2005. The 1 largemouth from July 2004 was recorded prior to these high flow events. The 2 found in 1991 were from surveys in February, before or just at the start of a high flow (maximum 6,320 cfs March 2 1991 at the Paulden Gauge). The 4 in September 1992 may have come in with the 1991 flows or the runoff events in March of 1992. Any of these largemouth bass may also have been illegally moved into the reach. Access to the upper Verde River is not easy at Stillman Lake, but is available via horseback or by foot. Road access is readily available at the fish survey site at Burnt Corral, at Forest Road 638, and at Perkinsville. The only other record of largemouth bass, from near Sycamore Creek in September, 2000, could have moved up from the populations below TAPCO Diversion either on its own or been illegally moved by someone. The confluence of Sycamore Creek with the Verde River was formerly private land known as the Packard Ranch, which is targeted for conservation acquisition or transfer to Forest Service ownership.

The channel catfish records are more numerous and are spread across the upper Verde in both time and location. There is no distinct pattern of records relative to high flows; however, that does not mean these individuals were not transported by those flows and were not found immediately after. The longest data set, from 1994 to 2008 (Table 41) for the upper Verde is based on 1 survey in the fall of each year at the same 7 sites. Surveyors found 12 channel catfish, all but 1 of them at or above Perkinsville. If these fish were moving up from below the TAPCO Diversion, one would expect most of them to be found below Perkinsville. Looking specifically at Perkinsville, 5 were taken there, 4 in 1994 and 1 in 2002. In 1989, 9 were taken in surveys from Perkinsville to TAPCO, most of which were from the lower end of the reach near Sycamore Creek (Hendrickson 1993). Other records for channel catfish in the upper Verde are from Bonar et al. (2004), for probably less than 10 individuals; 10 in 1991 (Creef et al. 1992), and 20 in 1992 (Creef and Clarkson 1993). Of those 30 fish, 7 were in the uppermost reach above Perkinsville and 23 were from below Perkinsville. Channel catfish appear to reproduce in the upper Verde River as reflected in sizes collected since 1985 (AGFD Native Fish Database; AGFD Region III fisheries data).

Potential impacts to designated critical habitat must be considered based on the result of those impacts to the ability of the critical habitat unit to contribute to the recovery of the species. The upper Verde River contains only a portion of the entire designated reach, approximately 22 of the total 123 miles, but is the section that showed the most promise relative to the dominance of native fish species over non-native fish species at the time of designation. As shown from survey

data (Table 39 through Table 43), this is no longer the case. The change is not consistent across the entire upper Verde or between species. The larger-bodied desert and Sonora suckers still fare better than any other native species, but their numbers are significantly reduced throughout. Small-bodied longfin and speckled dace are largely gone from the system, and spikedace have not been found since 1999.

The portion of the razorback sucker critical habitat in the upper Verde River has experienced the most significant alteration in the native fish community since designation, as documented over time. The rise to dominance of non-native fish species in this area cannot be attributed to stocked largemouth bass, since despite sporadic captures, they have not established a presence in the reach. While individuals are present, they do incrementally contribute to the non-native fish populations in the critical habitat. Channel catfish in the Perkinsville to TAPCO Reach are a minority of the catch of nonnative fish as apparent in the previous data summary tables, which is dominated by potential predators such as green sunfish, smallmouth bass, and yellow bullhead (no channel catfish have been documented from 2000-2008 Table 39). The catfish found above Perkinsville can certainly move downriver during even moderate flow events to contribute to the numbers in the critical habitat reach. The overall number of channel catfish detected in the critical habitat reach has not increased since the time of designation, thus the changes to the native fish community in this reach cannot be ascribed to channel catfish. The effects of the other non-natives present, particularly smallmouth bass and yellow bullheads, are greater than the incremental effect of the presence of channel catfish, largemouth bass or any other sport fish proposed for stocking in the watershed.

Colorado Pikeminnow

Colorado pikeminnow were stocked into the upper Verde River 22 times between 1985 and 1992 (Hendrickson 1993; Hyatt 2004) and only 1 individual has been recaptured in the reach (Hyatt 2004). The species was extirpated from this area prior to the stocking efforts, and survival of the stocked fish has been low or non-existent. The Colorado pikeminnow is not believed to be present in the upper Verde River.

Potential Impacts

No impacts to the Colorado pikeminnow are expected to result from the proposed action because they are no longer present in the upper Verde.

Roundtail Chub

Roundtail chub are known from the upper Verde River beginning below Sullivan Dam and extending down the Verde River past Granite Creek and throughout its entirety to the confluence with the Salt River. The specific abundance or density of roundtail chub has not been documented with certainty, but they are known to occur throughout the entire reach of river.

Potential Impacts
See discussion for Razorback Sucker; potential impacts to roundtail chub could result from the escapement of stocked fish species downstream to occupied habitat. If these events should occur, and the stocked species were able to access the occupied habitat even for only brief periods of time before dying of natural causes or moving (i.e. being transported) further downstream, there would be the potential for predation on roundtail chub, competition for food, or competition for space in the aquatic habitats. Adult roundtail chub appear to handle non native fish better than most native fish species (Minckley 1973). However, 26 years later, the 12-month finding for roundtail chub (USFWS 2009c) found that nonnative species that compete or prey on roundtail chub are a serious and persistent threat to the continued existence of the roundtail chub.

With periodic flooding, roundtail chub appear to maintain viable population numbers in the presence of non native predators. The most important possible impact of stocked species that may be in areas of the upper Verde is on young of year during dry or low water periods. Low water limits riffle habitats and as such removes preferred habitat of young chub. The result is increased predation by non native predators. The stocked species have not been found to persist in the upper Verde River; channel catfish excepted, because they currently appear to maintain a reproducing population. Additionally, the upper Verde River is occupied by several other competing and predatory non-native species that occur independent of stocking actions, such as smallmouth bass, flathead catfish, green sunfish, red shiner, yellow bullhead, crayfish etc.

Spikedace and Critical Habitat
See discussion for Razorback Sucker; spikedace are historically known from the Verde River from below Sullivan Dam downstream to the lower reaches of West Clear Creek. Critical habitat is also present in the upper Verde River from Sullivan Dam downstream to near Pecks Lake. There is no suitable habitat for spikedace in or near Garret Tank. The intervening ephemeral and intermittent channels between Garret Tank and the upper Verde River are also not suitable habitat for this species. Spikedace were last documented from the upper Verde River with 1 individual sampled in 1999, despite large efforts in multiple surveys resulting in nearly 38,000 individual fish being surveyed (AGFD data). Targeted surveys have also not found spikedace in the upper Verde River (Richardson 2006).

Potential Impacts
Potential impacts to spikedace and its critical habitat would result from transportation of the stocked fish downstream to occupied or critical habitat. The response would be potential predation by the stocked fish or their progeny on the spikedace, or potential competition for food or space. The proposed stocking activity would not be anticipated to have negative impacts to spikedace or its critical habitat due to the low likelihood of movement of stocked fish to their habitat. The significance of transport of the stocked species from the stocked location to the

occupied habitat is further diminished by the fact that the stocked species have not been found to persist in the upper Verde River, except for channel catfish, which are already present and reproducing in numbers sufficient to maintain a small population. In addition, the fact that the upper Verde River is occupied by large numbers of several other competing and predatory non-native species that occur independent of stocking actions, such smallmouth bass, flathead catfish, green sunfish, red shiner, crayfish, and others further diminishes the impact stocked species will have.

Northern Mexican Gartersnake

Watershed analysis: There are no recent records of northern Mexican gartersnakes from the Upper Verde River or its tributaries, and the species is likely extirpated from the Upper Verde River north of Clarkdale (USFWS 2008a). The most recent record is from 1987 above TAPCO on the Upper Verde (HDMS). Holycross et al. (2006) did not find any northern Mexican gartersnakes during surveys in a stretch of the Upper Verde River east of Hells Canyon, and they reported that crayfish and non-native fish were abundant. There are 2 historical records from Sycamore Creek from 1954 (0.6 river mi and 1.5 river mi upstream of the confluence of the Verde River (HDMS, Rosen and Schwalbe 1988). During surveys in this stretch in 2004, Holycross et al. (2006) found no gartersnakes and they suggested that northern Mexican gartersnakes were probably extirpated from this locality. There are no other records of the species from the Upper Verde. Additionally, the abundance of bullfrogs, crayfish, and non-native sport fish, including spiny-rayed fishes such as catfish and green sunfish, makes the habitat in the Upper Verde less suitable for northern Mexican gartersnakes. Given the unsuitable habitat and that only one northern Mexican gartersnake has been recently observed on the Upper Verde River, it is unlikely that northern Mexican gartersnakes would be exposed if stocked sport fish from Big Chino, Granite Creek, or Sycamore Creek complexes disperse into the Upper Verde.

Downstream analysis: The Middle Verde, downstream of Pecks Lake, is occupied by northern Mexican gartersnakes. There are multiple records of the species from near Cottonwood on the Verde River, approx. 2.8 river mi downstream of Pecks Lake, including one from 2003 and one from 2004 (Holycross et al. 2006, HDMS). There appears to be a low density population in this vicinity (Holycross et al. 2006). There is also a population (likely low density) of northern Mexican gartersnakes from near Camp Verde, approx. 25 river mi downstream of Pecks Lake, with an observation as recent as 2003 (HDMS). Additionally, there are 3 historical (1954-1986) records of northern Mexican gartersnakes on the Verde River between West Clear Creek and the East Verde River (HDMS, Rosen and Schwalbe 1988). If stocked sport fish from Big Chino, Granite Creek, or Sycamore Creek complexes disperse into the Middle Verde River, there is a likelihood of exposure to northern Mexican gartersnakes.

Narrow-Headed Gartersnake

Watershed analysis: Narrow-headed gartersnakes currently occupy the Upper Verde River. Two records exist from Bear Siding, 18.6 and 19.3 river mi downstream of Sullivan Dam (from 1996 and 2000, respectively; HDMS). There is a photo voucher of an individual from Mormon Pocket in 2001, approx. 29 river mi downstream of Sullivan Dam. There also are two observations of narrow-headed gartersnakes farther downstream: one from approx. 0.6 river mi downstream of Sycamore Creek (HDMS), and one from the vicinity of Clarkdale in 1988 (photo voucher, T. Jones pers. comm.). The presence of crayfish and non-native fish, including spiny-rayed fishes, within the Verde River make the habitat less suitable for narrow-headed gartersnakes, but the species appears to persist in the Upper Verde, at least in low numbers (Holycross et al. 2006). If stocked sportfish disperse into the Upper Verde from Big Chino, Granite Creek, or Sycamore Creek complexes, there is likelihood of exposure to narrow-headed gartersnakes.

Downstream analysis: Narrow-headed gartersnakes occupy the Middle and Lower Verde River, though likely in low numbers. A narrow-headed gartersnake was observed on the Verde River at The Falls in 1987, approx. 64 river km downstream of Pecks Lake (HDMS). Another was observed at Ikes Backbone, just south of Fossil Creek, in 2005 (Holycross et al. 2006, HDMS). Because the Upper Verde is occupied by narrow-headed gartersnakes, it is possible for these snakes to disperse into the Middle and Lower Verde Rivers. Oak Creek, a tributary of the Verde River, supports a large population of the species. The population begins approx. 40 river mi upstream of the confluence of Oak Creek and the Verde River. There is potential for fish from the Verde River to move into Oak Creek since no fish barriers exist on Oak Creek south of Sedona. Narrow-headed gartersnakes also are able to disperse into the Verde from Oak Creek. If stocked sportfish disperse from Big Chino, Granite Creek, or Sycamore Creek complexes into the Middle Verde River, there is likelihood of exposure to narrow-headed gartersnakes.

Table 44. Survey history for Burnt Ranch Site (Campbell Place).

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
1994	1072	0	257	339	278	15	0	0	39	0	2	0	0	0	2	1
1995	0	0	33	15	60	3	0	0	7	0	3	0	0	0	2	0
1996	91	0	33	79	92	23	0	0	88	1	5	0	0	0	1	1
1997	0	0	0	66	68	24	0	3	1	4	8	0	0	0	13	3
1998	0	0	0	21	43	12	0	5	27	9	11	0	0	0	0	1
1999	0	0	0	13	19	3	0	58	1	39	6	0	0	0	1	0
2000	0	0	0	23	124	6	0	226	89	31	18	0	0	0	4	3
2001	0	0	0	50	51	19	0	127	2	131	37	0	0	0	5	7
2002	0	0	0	43	30	11	0	96	0	17	32	0	0	0	7	0
2003	0	0	0	23	6	0	0	30	31	30	24	0	0	0	4	0
2004	0	0	0	2	3	0	0	54	64	25	22	0	0	0	4	0
2005	1	0	0	1	2	0	1	0	158	14	9	0	0	0	0	0
2006	0	0	0	242	165	44	0	0	66	2	33	0	0	0	27	0
2007	0	0	0	197	82	0	0	0	71	13	17	0	1	0	13	0
2008	0	0	0	17	96	0	0	0	6	6	38	0	0	0	0	0

Table 45. Survey information for FR 638 site.

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
1984	30	0	131	16	7[1]	4	0	0	3	12	3	0	0	0	1	0
1986-1987	187	0	314	103	110	5	0	2	30	12	6	0	1	0	14	7
1986[2]	130		62	501	84			19								
1994	227	0	2	230	154	18	0	0	61	0	0	0	0	0	3	0
1995	11	0	2	48	57	4	0	0	8	8	1	0	0	0	3	1
1996	179	1	53	127	307	81	0	0	112	1	0	0	0	0	0	5
1997	19	0	0	76	57	8	0	0	82	0	1	0	0	0	10	1
1998	12	0	0	28	27	19	0	1	101	1	5	0	0	0	0	1
1999	0	0	0	20	4	3	0	1	33	0	5	0	0	0	3	2
2000	0	0	0	74	27	0	0	1	437	3	10	0	0	0	7	0
2001	0	0	0	219	74	11	0	4	144	0	36	0	0	0	8	0
2002	1	0	0	57	10	0	0	1	30	0	15	0	0	0	0	0
2003	0	0	0	68	15	0	0	0	80	0	16	0	0	0	0	2
2004	0	0	0	29	23	2	0	11	132	1	12	0	0	0	1	3
2005	0	0	0	25	11	0	0	0	15	6	1	0	0	0	0	10
2006	0	0	0	205	171	2	0	0	49	0	10	0	0	0	4	0
2007	0	0	0	62	84	0	0	0	92	0	8	0	0	0	6	0

2008	0	0	0	50	124	23	0	0	50	4	25	0	0	0	6	0

1 Plus an additional 61 suckers not identified to species
2 Surveys for larval fish only in April 1986

Table 46. Survey information for Duff Spring Site.

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
1994	0	0	1	192	329	28	0	0	32	0	4	0	0	0	1	3
1995	0	0	0	65	73	50	0	0	55	5	6	0	2	1	17	1
1996	6	0	0	32	51	17	0	0	1	0	12	0	0	0	1	5
1997	2	0	0	0	11	5	0	0	830	0	6	0	1	0	0	12
1998	0	0	0	10	17	23	0	0	79	2	19	0	0	1	9	2
1999	0	0	0	15	17	5	0	0	23	0	18	0	0	0	4	0
2000	0	0	0	2	3	7	0	0	100	8	9	0	0	0	3	1
2001	0	0	0	16	12	0	0	0	133	2	59	0	0	0	4	0
2002	0	0	0	5	7	0	0	0	9	3	54	0	0	0	3	0
2003	0	0	0	2	2	0	0	2	94	1	26	0	0	0	8	0
2004	0	0	0	2	7	0	0	9	143	2	3	0	0	0	7	0
2005	0	0	0	3	3	0	0	0	59	0	1	0	0	0	0	0
2006	0	0	0	96	88	1	0	0	202	0	1	0	0	0	12	0
2007	0	0	0	24	76	1	0	0	16	0	16	0	0	0	3	0
2008	0	0	0	6	49	0	0	0	32	1	11	0	0	0	0	0

Table 47. Survey information for Bear Siding (= U.S. Mine) site.

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
1986-1987	11	2	4	42	68	57	0	0	124	3	0	0	4	0	8	0
1986[1]	60		5	385	223	3			71							
1994	0	3	1	382	357	249	0	0	227	0	3	0	1	0	1	4
1995	0	0	0	45	47	22	0	0	10	10	0	0	0	0	5	0
1996	0	1	0	50	25	6	0	0	27	2	10	0	0	0	3	1
1997	0	0	0	18	4	0	0	0	9	3	11	0	0	1	0	0
1998	0	0	0	15	9	1	0	0	6	6	4	0	0	0	4	4
1999	0	0	0	5	2	0	0	0	203	7	15	0	0	0	0	0
2000	0	0	0	1	3	3	0	0	238	52	2	0	0	0	1	1
2001	0	0	0	8	12	7	0	0	283	56	17	0	0	2	8	6
2002	0	0	0	5	3	0	0	0	87	27	54	0	0	1	4	3
2003	0	0	0	1	2	0	0	0	118	72	67	0	1	0	2	2
2004[2]	Ns	ns	ns	ns	ns	ns	n	ns	ns	ns	ns	ns	ns	Ns	ns	ns
2005	0	0	0	3	1	0	0	0	70	7	1	0	0	1	0	0
2006	0	0	0	49	21	7	0	0	63	0	6	0	0	0	2	0
2007	0	0	0	30	7	0	0	0	217	17	6	0	0	1	9	0

2008	0	0	0	8	6	0	0	0	118	30	4	0	0	0	3	0

1 Survey for larval fish April 1986
2 Not sampled due to turbidity

Table 48. Survey information for Perkinsville Site.

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
1984	3	22	62	51	18[1]	63	0	0	0	0	0	0	0	0	1	0
1986-1987	28	246	50	503	199	181	0	0	224	2	3	0	0	0	45	29
1986[2]	12	1	2	453	276				20							
1989[3]	0	0	0	217	516	67		0	0	1	15	0	9	3	2	42
1993	0	51	18	51	16	3	0	0	7	0	0	0	0	0	1	0
1994	19	61	37	885	442	244	7	0	1109	4	2	0	4	0	12	11
1995	1	23	1	90	10	115	0	0	4	3	0	0	0	0	1	1
1996	5	63	0	112	76	57	0	0	36	0	1	0	0	1	4	0
1997	0	1	0	15	28	0	0	0	1222	1	1	0	0	0	1	0
1998	0	12	0	35	10	5	0	0	701	1	4	0	0	0	5	0
1999	2	2	0	69	37	0	0	0	261	1	11	0	0	0	5	1
2000	1	7	0	30	11	0	0	0	421	1	2	0	0	0	1	0

2001	2	0	0	61	12	0	0	0	948	2	2	0	0	3	3	2
2002	0	0	0	22	7	0	0	0	74	2	23	0	1	0	2	0
2003	0	0	0	13	0	0	0	0	116	30	15	0	0	0	7	0
2004	0	0	0	45	2	0	0	1	425	2	6	0	0	0	3	0
2005	0	0	0	6	2	0	0	0	18	0	0	0	0	0	0	0
2006	0	26	0	296	114	85	0	0	113	1	7	0	0	0	4	0
2007	0	0	0	46	1	0	0	0	2	0	0	0	0	0	3	0
2008	1	3	0	89	6	0	0	0	8	17	14	0	0	1	2	0

1 Plus 628 suckers not identified to species
2 Survey for larval fish only April 1986
3 Perkinsville to TAPCO: all flathead catfish were below Sycamore Creek. First record in upper Verde

Table 49. Survey information for Black Bridge Site.

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
1994	0	88	38	237	27	57	0	0	2	0	0	0	0	0	2	0
1995	0	2	19	36	38	43	0	0	8	1	0	0	0	0	0	1

1996	0	3	3	33	62	50	0	0	2	2	4	0	0	0	0	0
1997	0	0	0	44	34	13	0	0	77	0	2	0	0	0	0	0
1998	0	0	0	13	11	4	0	0	132	2	18	0	0	0	8	0
1999	0	0	0	34	38	13	0	0	7	2	13	0	0	0	1	1
2000	0	0	0	1	4	4	0	0	260	0	3	0	0	0	1	0
2001	0	0	0	13	1	1	0	0	99	0	2	0	0	0	6	0
2002	0	0	0	3	21	9	0	0	71	3	10	0	0	0	2	1
2003	1	0	0	17	37	4	0	0	104	5	21	0	0	0	5	0
2004	0	0	0	16	32	4	0	1	150	1	12	0	0	0	1	0
2005	0	0	0	6	4	0	0	0	4	1	0	0	1	0	2	0
2006	0	0	0	201	152	119	0	0	52	7	43	0	0	0	4	0
2007	0	0	0	18	22	12	0	0	0	0	1	0	0	0	1	0
2008	0	0	0	14	4	1	0	0	1	12	16	0	0	0	2	0

Table 50. Survey information for Sycamore Site.

Year	**Longfin dace**	**Speckled dace**	**Spikedace**	**Desert sucker**	**Sonora sucker**	**Roundtail chub**	**Fathead minnow**	**Mosquito fish**	**Red shiner**	**Green sunfish**	**Smallmouth bass**	**Largemouth bass**	**Channel catfish**	**Flathead catfish**	**Yellow bullhead**	**Common carp**
1984	76	4	25	1	32[1]	2	0	0	4	2	6	0	0	0	0	1
1986-1987	1	0	52	27	34	4	0	0	6	5	13	0	0	0	27	7

1986[2]			30	113	23											
1994	1	19	92	379	223	165	0	0	3	0	3	0	0	0	10	4
1995	0	0	17	29	37	104	0	0	5	2	0	0	0	0	1	2
1996	1	0	51	38	41	25	0	0	9	0	0	0	0	0	0	1
1997	0	0	0	12	38	0	0	0	17	0	6	0	0	0	16	3
1998	1	0	0	4	8	0	0	0	1	0	5	0	0	0	7	1
1999	0	0	0	11	1	1	0	0	17	0	36	0	0	0	1	0
2000	0	0	0	6	25	0	0	0	49	0	4	1	0	0	5	10
2001	0	0	0	9	1	5	0	0	0	1	10	0	0	0	2	0
2002	0	0	0	13	12	0	0	0	5	1	23	0	0	0	1	0
2003	0	0	0	4	13	0	0	0	89	1	24	0	0	0	3	0
2004	0	0	0	0	0	0	0	0	14	0	2	0	0	0	0	1
2005	0	0	0	0	1	0	0	0	2	1	3	0	0	0	4	0
2006	0	0	0	30	31	1	0	0	156	4	43	0	0	0	4	0
2007	0	0	0	3	22	1	0	0	71	15	10	0	0	0	3	15
2008	0	0	0	37	81	0	0	0	49	3	7	0	0	0	7	0

1 Plus 990 suckers not identified to species

2 Survey for larval fish only in April 1986

Table 51. AGFD Surveys in the upper Verde River 2000-2006[1].

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
Granite Creek to Verde Ranch																
2002	9	0	0	683	270	119	0	80	338	47	350	0	0	0	32	44
2004	0	0	0	192	248	24	0	72	1887	61	1066	0	0	2	37	106
2005	49	0	0	713	4000	56	57	0	942	56	239	0	0	0	9	54
2006	0	0	0	443	752	51	0	0	118	7	392	0	0	1	31	27
Burnt Ranch/Campbell Place																
2003	0	0	0	72	17	4	0	1	159	16	237	0	0	0	3	4
2004	0	0	0	90	74	1	1	56	151	27	429	0	0	0	16	1
2004[2]	0	0	0	80	49	0	0	0	61	67	294	0	0	0	13	2
Verde Ranch to Bear Siding																

Year	Longfin dace	Speckled dace	Spikedace	Desert sucker	Sonora sucker	Roundtail chub	Fathead minnow	Mosquito fish	Red shiner	Green sunfish	Smallmouth bass	Largemouth bass	Channel catfish	Flathead catfish	Yellow bullhead	Common carp
2004	0	0	0	84	128	0	0	13	2020	61	313	0	3	16	130	45
2004	0	0	0	92	142	21	0	0	321	9	385	0	2	14	87	18
Verde Ranch to Perkinsville																
2005	8	0	0	1191	1610	54	0	0	616	24	192	0	0	0	76	89
Perkinsville to Sycamore Creek																
2001	0	0	0	475	113	114	0	0	2496	86	560	0	0	1	113	33
2004	0	0	0	145	180	44	0	2	773	54[3]	626	0	1	10	75	13
2005	1	13	0	1058	1637	323	0	0	59	4	471	0	0	3	22	291
Granite Creek to Verde Ranch																
2003	26	0	0	20	32	0	25	6	0	8	0	0	0	0	0	0

1 Data from Morgan 2000a, 2000b; Fong 2004 (3), 2004 (4), 2004 (6); Chmiel 2005a, 2005b; Clark 2003e, 2004b, 2004c, 2005, 2006c; AGFD 2001

2 After the September 2004 high flow event

3 Plus 1 redear sunfish

MIDDLE VERDE RIVER SUB-WATERSHED

Physical Geographic Description

Drainage Area

The Middle Verde Watershed contains eight proposed stocking locations. These locations form three distinct stocking complexes (Middle Verde, Wet Beaver Creek and West Clear Creek). This area of the assessment begins at the Peck's Lake Diversion Dam (TAPCO) and extends down the Verde River to Beasley Flats (downstream of Camp Verde) and includes the perennial tributaries of West Clear Creek, Oak Creek and Wet Beaver Creek (Figure 72). Riparian vegetation can be found along Oak and Wet Beaver Creeks made up of mixed broadleaf (ADWR 2007). Several diversion dams exist in this reach of the river. The Peck's Lake diversion (Figure 73) is located upstream of Clarkdale and also may be known as the TAPCO diversion. Designated wilderness areas along the middle Verde River include West Clear and Wet Beaver Creeks. Unique waters, as designated by the Arizona Department of Environmental Quality, includes Oak Creek.

Range of elevations

Elevations in the watershed range from about 7600 feet near Mingus Mountain down to 3000 feet at Beasley Flats.

Tributaries

The significant tributaries in this sub watershed are Oak Creek, Wet Beaver Creek and West Clear Creek.

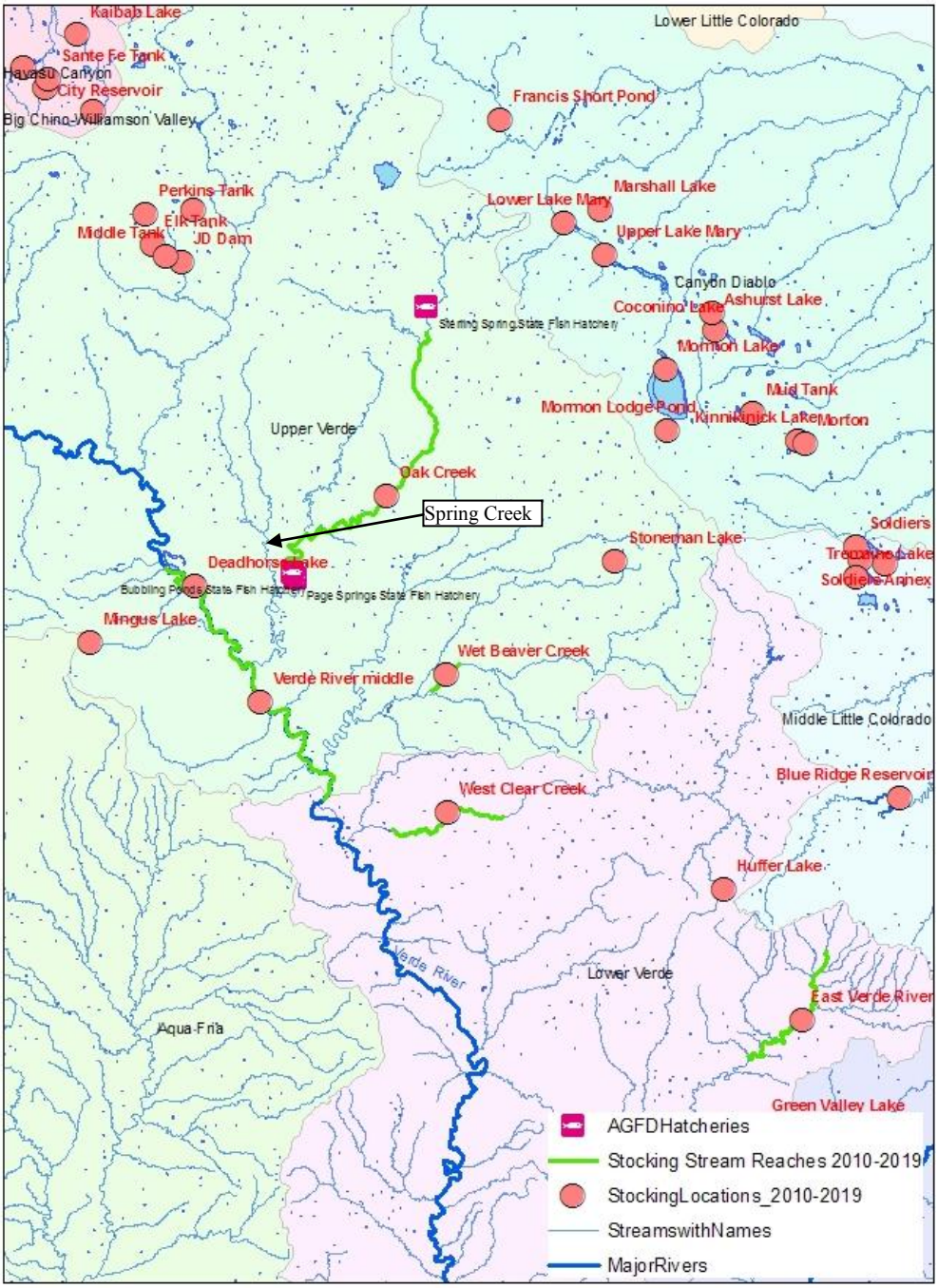

Figure 72. Middle Verde stocking locations and hatchery overview

Figure 73. Pecks Lake diversion on the Verde River near Clarkdale as barrier to upstream movement of fish

MIDDLE VERDE COMPLEX

Oak Creek

Site Description

Oak Creek extends from the Mogollon Rim to its confluence with the Verde River near Cornville. Stocking occurs in Oak Creek over an approximate 29 mile area from near Page Springs Hatchery in Cornville upstream to approximately 10 miles north of Sedona in Oak Creek Canyon. The stocking area starts upstream from the Verde River and extends upstream to the top of the canyon near the switchbacks of Highway 89A.

Land ownership within a 1.6 km (1.0 mi) buffer along Oak Creek is comprised of Coconino National Forest (73%), private (22%), Arizona State Land Department (4%), Coconino County (1%), AGFD (<1%), and Prescott National Forest (<1%) lands. Private lands are found primarily in the Sedona, Cornville, and Oak Creek Canyon areas.

There are multiple camping and picnic grounds managed by the Coconino National Forest that are vehicle accessible via paved roads or foot accessible.

Three department hatcheries are located along Oak Creek Sterling Springs Hatchery, Page Springs Hatchery, and Bubbling Ponds Hatchery (Figure 74). Sterling Springs Hatchery is located near the upper end of Oak Creek Canyon. Page Springs Hatchery and Bubbling Ponds Hatchery are located across Oak Creek from each other downstream of Sedona near Cornville. A private fee fishing fish farm known as the "Rainbow Trout Farm" is located on Oak Creek upstream of Sedona and is also spring fed.

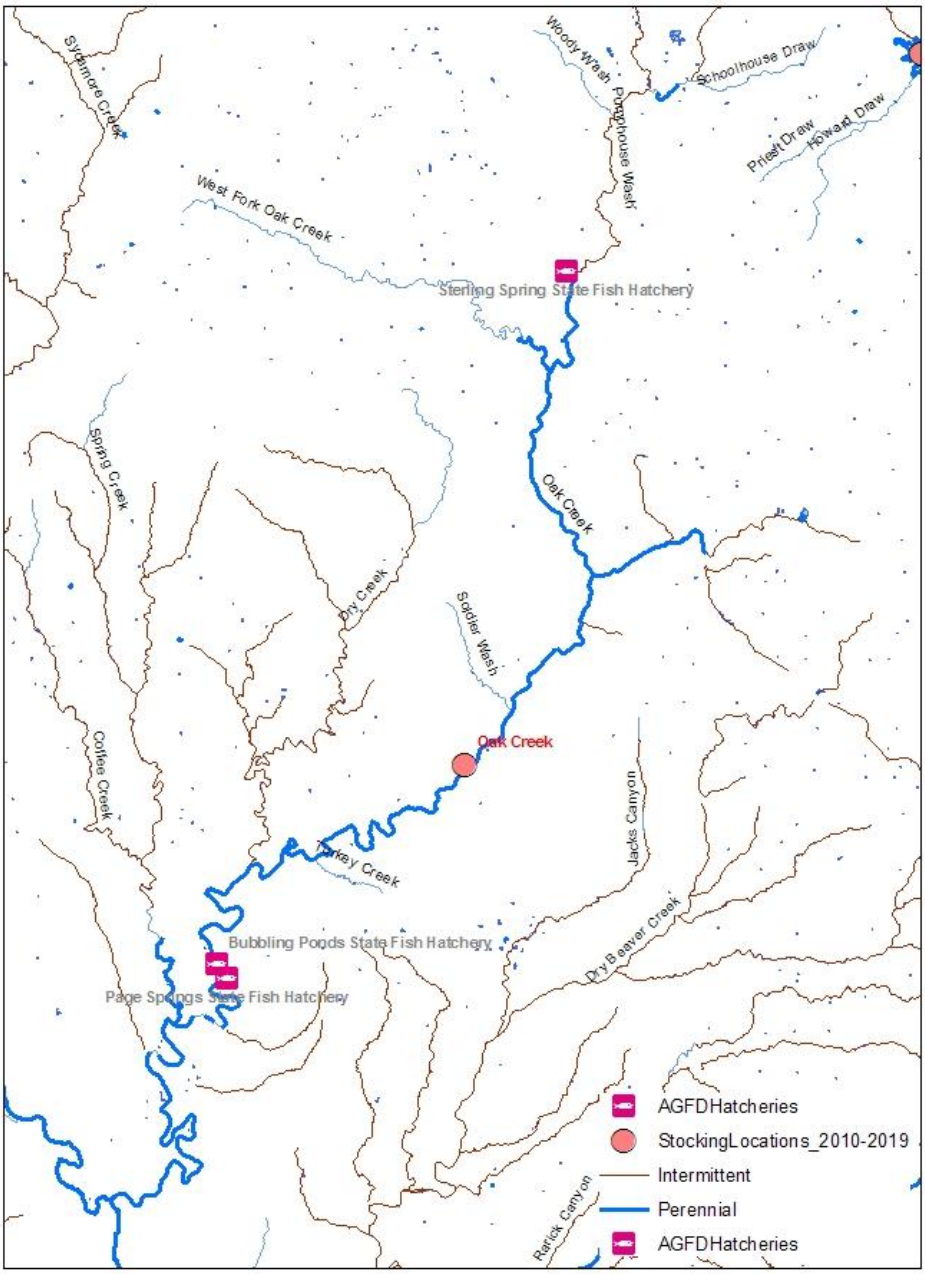

Figure 74. Oak Creek and Department Hatcheries

Management of Water Body

Angling for trout in Oak Creek began shortly after the area was settled in the late 1800's. According to information in Arizona Wildlife – The Territorial Years 1863-1912 (Brown 2009) Dr. E. A. Mearns fished for Gila trout in Oak Creek in 1886 and caught fish up to approximately 3 lbs. Other early anglers of Oak Creek reported that "Native trout as long as 16 inches were abundant as far downstream as the falls." According to the book the falls were "Upstream of Sedona". There are preserved specimens of Gila trout from Oak Creek collected in 1888-1889.

Arizona Wildlife – The Territorial Years 1863-1912 also reports of a newspaper account of trout, either brook trout or rainbow trout, first being stocked into Oak Creek in the spring of 1892 and a 1908 newspaper report of rainbow trout being stocked into Oak Creek.

Today, the primary fishery for Oak Creek is a high intensity, put and take rainbow trout fishery. Secondary fishery is a catch and release coldwater fishery for self sustaining rainbow and brown trout in the 2 mile long catch and release section of the creek. The catch and release section of Oak Creek extends from the Call of the Canyon Crossing and day use area downstream about 2 miles to the Junipine Resort Crossing. The only angler use data on Oak Creek comes from the 2001 Statewide Angler Survey. According to the results of the mail survey 30,423 coldwater angler use days and 7,442 warmwater angler use days were estimated for Oak Creek in 2001 (Pringle, 2004). This creek had the third highest estimated use for coldwater anglers in the region below Lees Ferry and Ashurst Lake.

Approximately 25 locations are stocked at various times during the year on Oak Creek (

Table 52). Beginning on the downstream end and progressing upstream the stocking sites are:

- Cornville Area
- Mormon Crossing below Oak Creek Elementary School.
- Adjacent to the Page Springs Hatchery nature area.
- At the bridge on Page Springs Rd.
- Sedona Area
- Red Rock Crossing/Crescent Moon Camp Ground (day use).
- End of the road at Chavez Crossing.
- Adjacent to the Tlaquepaque Resort.
- Upstream of Sedona
- At Grasshopper Point (day use).
- By the "Ropes that Rescue" sign on Highway 89A.
- Parking area Across from Indian Gardens.
- Big pool before Dairy Queen.
- At the end of the old road across from Encinoso Picnic Area (day use).
- Bridge at Shangri La.
- Pull out before Manzanita Camp Ground.
- Manzanita Camp Ground.
- Under the bridge at Slide Rock State Park.
- Banjo Bill Camp Ground.
- Junipine Resort, upstream.
- Large pools both up and downstream across from Don Hoel's.
- Call of the Canyon camp ground.
- Low water crossing upstream from Call of the Canyon camp ground .
- Pools upstream from house on bluff.

- Cave Springs Camp Ground. Several places throughout campground, starting upstream from entrance crossing.
- Meadow Stocking.
- Pine Flats Camp Ground. (Depending on water levels, very intermittent).
- Suicide Hole, North of blue "Adopt a HWY" sign large pool down from northernmost guardrail

Table 52 .Stocking history in Oak Creek (1933 to present).

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Rainbow trout	1933	2008	2,064	6,298,320
Brown trout	1933	1994	134	380,382
Brook trout	1936	1937	5	38,275
Channel catfish	1981	1987	12	46,795
Bluegill	1937	1969	2	4,050
Redear sunfish	1968	1969	2	60
Smallmouth bass	1941	1990	2	1,500
Largemouth bass	1937	1975	5	14,507
Apache trout	1936	1984	4	20,116
Cutthroat trout	1949	1949	2	4,200
Razorback sucker	1991	1991	1	1920
Arctic grayling	1969	1969	1	10,000
Total			2,234	6,820,125

Proposed Action

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

Catchable rainbow trout would be stocked multiple times annually from March-November; numbers of rainbow trout stocked may be from 0 – 60,000 annually.

Water Distribution / Connectivity

The Oak Creek watershed includes areas both above and below the Mogollon Rim in Central Arizona. Tributaries to Oak Creek in Oak Creek Canyon, upstream of Sedona, include West Fork Oak Creek, Pumphouse Wash, and Munds Canyon (Figure 74). West Fork Oak Creek is the only permanent stream of these tributaries. Springs are common along Oak Creek. Spring Creek is a tributary of Oak Creek downstream of the town of Sedona. Oak Creek has permanent flow from its beginning near Sterling Springs downstream to its confluence with the Verde River near Cornville.

Fish Movement

Fish can move freely throughout the system. A low flow natural barrier to upstream migration may be present at Grasshopper Point (Figure 76) where a set of small waterfalls are located. This set of falls may be the same one mentioned by trout fishermen in the 1880's as the downstream limit of trout fishing and marks the current upstream limit of warm water nonnatives and roundtail chub captures during surveys since 1991. Grasshopper point is located about 2 miles upstream of the City of Sedona.

Community Description

Table 54 provides a summary of past survey data from 1991 through 2007. Recently, Rinker (2007a) reported rainbow trout, brown trout, smallmouth bass, green sunfish, bullhead catfish, flathead catfish, rock bass, speckled dace, Sonoran sucker, and desert sucker from Oak Creek. The majority of the fish collected were brown trout at 41.63% of the total catch and speckled dace at 37.77% of the total catch. Rainbow trout, desert sucker and Sonora sucker were also relatively abundant during the 2007 July-August survey.

The Native Fish Database contains fish survey data from the following years: 1987, 1989, 1990, 1992-1996 and 2000. During those surveys, 1008 fish were collected and identified and consisted of the following species: longfin dace, yellow bullhead, rock bass, Sonoran sucker, carp, red shiner, mosquitofish, channel catfish, green sunfish, warmouth, bluegill, smallmouth bass, rainbow trout, desert sucker, flathead catfish, speckled dace and brown trout (Table 53 and Figure 75). Notably, no roundtail chub were collected. The collection of Apache trout cannot be explained with certainty but may be the result of mis-identification.

In 2007, the fish assemblage in Oak Creek upstream of the Grasshopper Point recreation site included: rainbow trout (stocked and wild spawned), speckled dace, brown trout (wild spawned because they are no longer stocked), Sonora sucker and desert sucker. The fish assemblage downstream of the Grasshopper Point recreation site in 2007 included: rock bass, green sunfish, smallmouth bass, channel catfish, bullhead catfish, carp, rainbow trout (stocked), Sonora sucker, speckled dace and desert sucker.

Roundtail chub were last collected in Oak Creek in 2001, during surveys near Sedona. One large adult was caught near the Tlaquepaqui Resort and an angler was found with 2 near a set of houses just upstream of Sedona (Voeltz 2002, L. Luedeker, pers. comm).
In addition to fish, Oak Creek supports a large population of narrow-head gartersnakes (Brennan and Rosen 2009). Northern Mexican gartersnakes also persist along Oak Creek near the Page Springs and Bubbling Ponds state fish hatcheries (V. Boyarski pers. comm.).

Table 53. Fish collected from Oak Creek, 1987-2000 from AGFD NFDB. Collection localities depicted in Figure 75.

Species collected	**Num.**
longfin dace	4
yellow bullhead	8
rock bass	119
Sonoran sucker	58
unidentified sucker juv	31
carp	4
red shiner	43
mosquitofish	16
channel catfish	3
green sunfish	257
warmouth	25
bluegill	4
unid sunfish	1
smallmouth bass	184
Apache trout?	3
rainbow trout	45
desert sucker	101
flathead catfish	4
speckled dace	57
brown trout	41
Total	**1008**

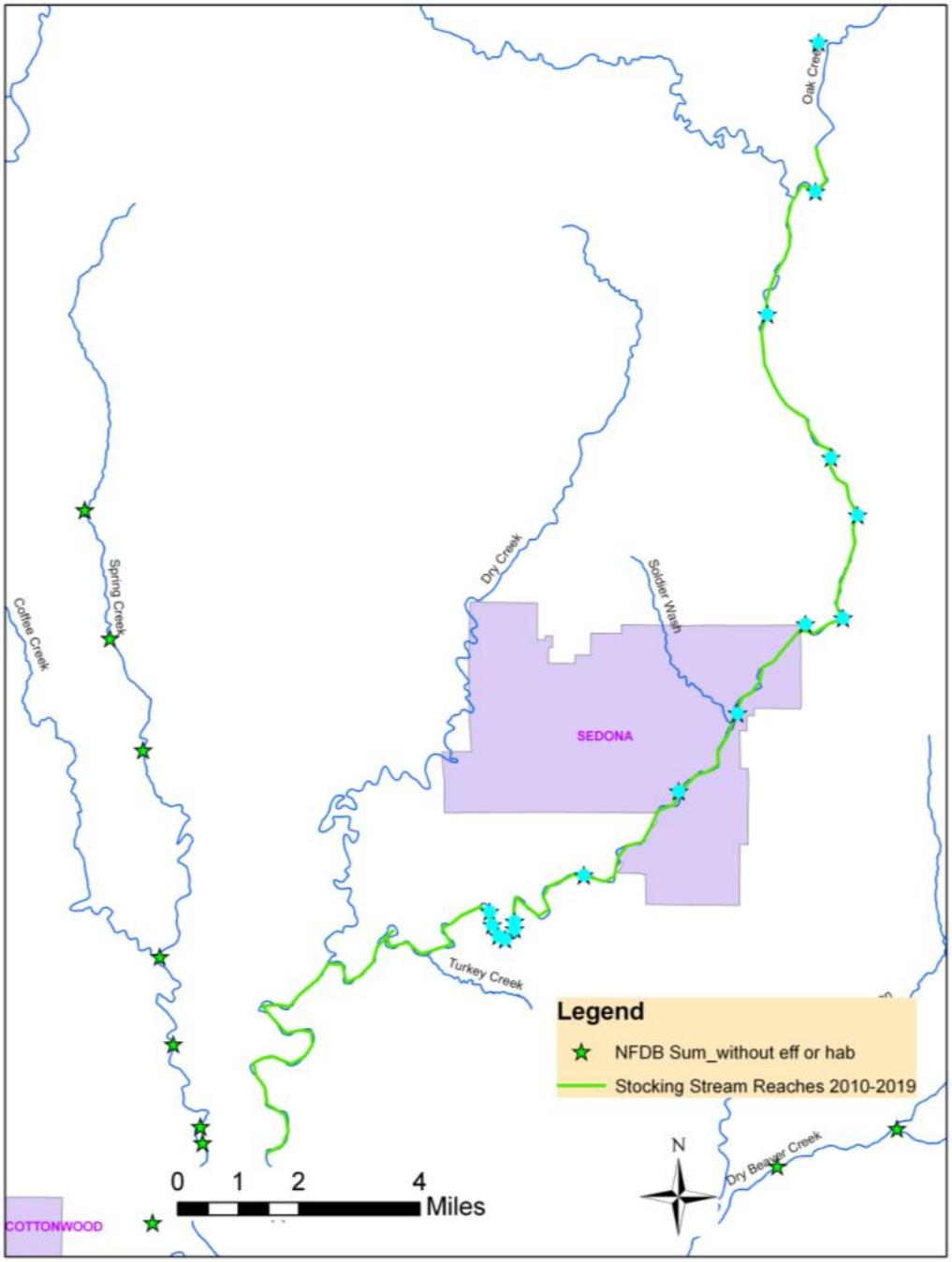

Figure 75. Fish collection locations for data in Table 53.

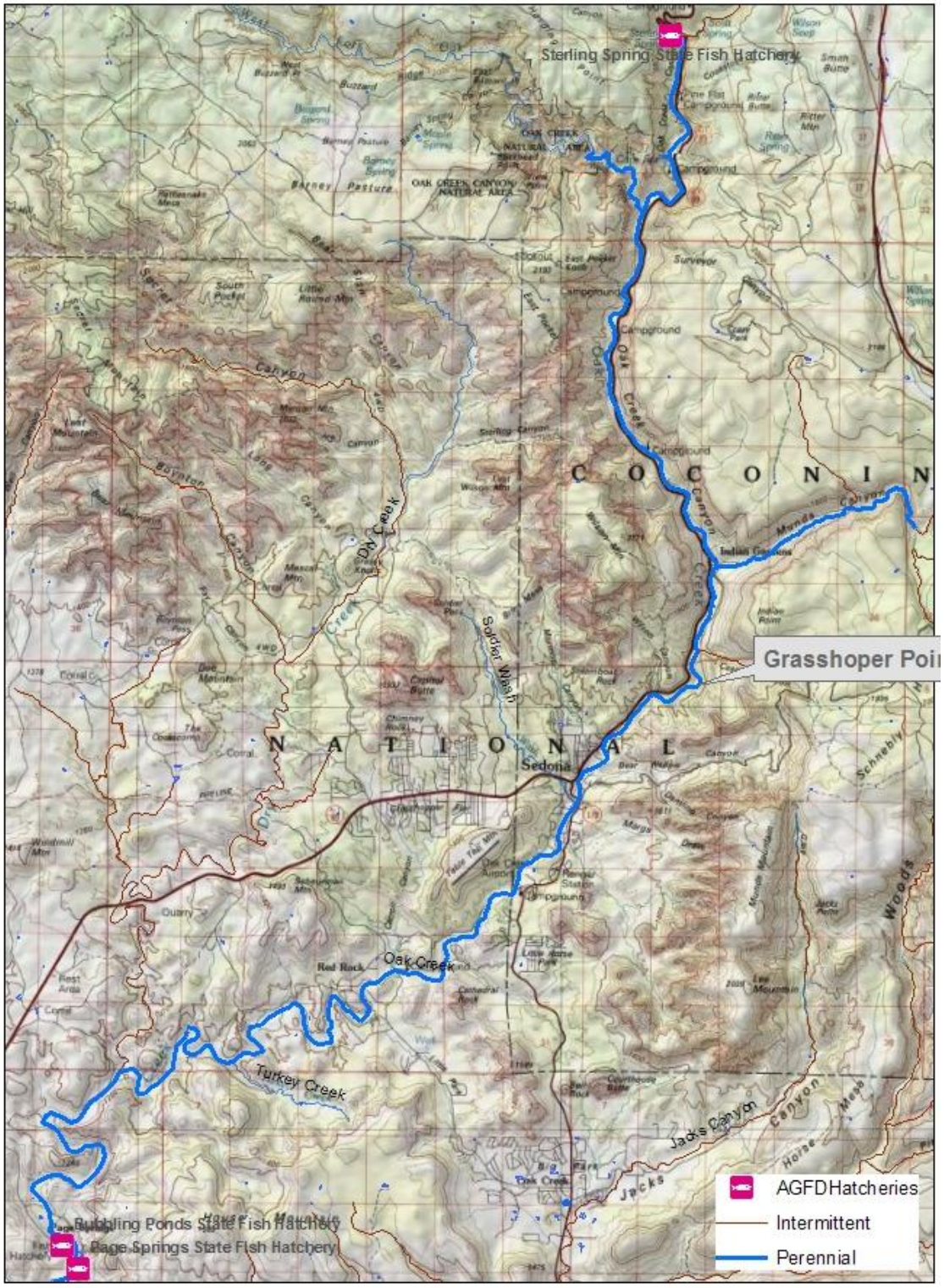
Sterling Spring State Fish Hatchery
Grasshoper Poi
C O C O N I N
N A T I O N A L
Sedona
Oak Creek
Red Rock
Turkey Creek
Jacks Canyon
Bubbling Ponds State Fish Hatchery
Page Springs State Fish Hatchery
AGFD Hatcheries
Intermittent
Perennial

Figure 76. Oak Creek with Grasshopper Falls location

Table 54. Summary of fish collection data from Oak Creek, 1991-2007 (AGFD unpublished data).

LOCATION/YEAR	Smallmouth bass	Channel catfish	Brown trout	Green sunfish	Desert sucker	Sonora sucker	Speckled dace	Red Shiner	carp	Rock bass	Flathead catfish	Rainbow trout	Bullhead catfish
Below Grasshopper point 1991				1	10	3							
Above Grasshopper point 1991			2			3	25						
Oak Creek 1991			2		5		6						
Pine Flats 1991							81						
Oak Creek 1991												2	
West Fork Tailhead 1991			5										
Oak Creek 1992			1		24	8	2					9	
Grasshopper point 1992					45	13	4					9	
Red Rock State Park 1994	18	1		37			1	1	1				2
Oak Creek South of Hatchery 1994					5								1
Oak Creek Campground 1994	9			5									5
Troutdale 1994			35		2		63					16	
Red Rock State Park 1996	18			24	1	3						28	
Chavez Crossing 1996	1				12	11						19	
Grasshopper Point 1996			1		19		5					11	
Garland below bridge 1996			23		3		7					10	
Encinoso 1996			2		3		16					3	
Sterling Springs 1996												13	
Troutdale 1996			19				5					1	
Downstream of trout farm rd x-ing 1996					9		22					5	
Talaquepaque 1996	2				15	4							26
West fork Trailhead 1998			3		8		63					2	
Oak Creek 1999			4	1								4	
Above West Fork Confluence 2000			20				36						
Oak Creek Hotel 2000			12									1	
Above catch and release section 2003			19				27					5	
Catch and release section 2003			34				3					4	
Below Catch and release 2003			14		6	4	2					15	

LOCATION/YEAR	Smallmouth bass	Channel catfish	Brown trout	Green sunfish	Desert sucker	Sonora sucker	Speckled dace	Red Shiner	carp	Rock bass	Flathead catfish	Rainbow trout	Bullhead catfish
Totals from 2007sampling stations above Grasshopper Point			485	12	60	31	438					82	
Totals from 2007sampling stations below Grasshopper Point	11			12	8	13	2			13	1		3
TOTALS	59	1	681	80	235	93	805	1	1	13	1	239	37

Consultation Species or Critical Habitat
Potential impacts to bald eagle, Gila chub and critical habitat, northern leopard frogs, Mexican spotted owl and critical habitat, page springsnail, roundtail chub, and Western yellow-billed cuckoo are discussed below. Potential downstream impacts to Colorado pikeminnow, northern Mexican and narrow-headed gartersnakes, razorback sucker and critical habitat, Southwestern willow flycatcher and critical habitat, spikedace with critical habitat and Western yellow-billed cuckoo are analyzed within the Middle Verde River complex analysis later in the document.

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

Northern leopard frogs are analyzed at the 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; however, due to large drops along the stream courses and the differing elevation limits of both northern and Chiricahua leopard frogs in various areas of the watershed, the Middle Verde River complex was divided into 3 smaller buffered complexes for analysis that included the vicinity of: 1) Stoneman Lake, 2) Oak Creek and 3) the Verde River proper.

Bald Eagle
Oak Creek Breeding Area is approximately 5.6 miles from Oak Creek and is within the Bald Eagle DPS. The eagles were first observed in 2002 and were last observed 14 April, 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Oak Creek Breeding Area productivity data shows that the nest was successful in 2007 with one nestling found dead below the nest, was successful in 2008, and failed in 2009 when a nestling was found injured on the ground and taken to rehabilitation but was deemed not releasable (Jacobson et al. 2007, McCarty and Jacobson 2008, 2009). Oak Creek does not currently have monofilament bins present.

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.

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.

Gila Chub and Critical Habitat
Gila chub are known from one tributary of Oak Creek, Spring Creek. Spring Creek joins Oak Creek downstream from the reach proposed for stocking of rainbow trout. The reach of Spring Creek currently occupied by Gila chub is a little over a mile upstream of the confluence with Oak Creek. Critical habitat is also designated in Spring Creek at three disjunct locations on public land, the nearest of which is about ½ mile upstream of the confluence.

Potential Impacts
Potential impacts to Gila chub could occur from stocking of rainbow trout in Oak Creek if Gila chub adults or juveniles move out of Spring Creek into Oak Creek during times when stocked trout may be present in this reach of Oak Creek, or if stocked rainbow trout migrate up Spring Creek to occupied or critical habitat. These streams warm in the summer time and rainbow trout do not persist through the summer. The potential response could be competition for food or space if either is limited for Gila chub or predation on juvenile Gila chub by rainbow trout. Surveys of Oak Creek near Spring Creek confluence in June 1987 and Sep 1995 did not document either rainbow trout or Gila chub. Surveys in Spring Creek in Aug. 1994, Sep. 1995 and May 1996, Sep. 1998 and Jul. 2003 did not detect rainbow trout in Spring Creek. An irrigation diversion in Spring Creek currently may be acting as a fish barrier under normal flows precluding the movement of fishes into Spring Creek from Oak Creek (Figure 77). This barrier, in conjunction with normal summer water temperatures, also may prevent rainbow trout access to critical habitat.

Exposure to stocked trout is unlikely to occur for two reasons. First, the existing warm-water nonnative fish assemblage in Oak Creek at the confluence with Spring Creek, which is dense and comprised of more predacious centrarchid and ictalurid species, would limit the opportunity for exposure because they would likely prey on the chub before the trout would. Second, the irrigation diversion prevents rainbow trout from accessing occupied Gila chub habitat during most, if not all seasons and years. Existing fisheries survey data indicate that Gila chub do not persist outside known occupied areas and stocked rainbow trout have not been found within occupied areas or critical habitat (AGFD data, Bagley 2002).

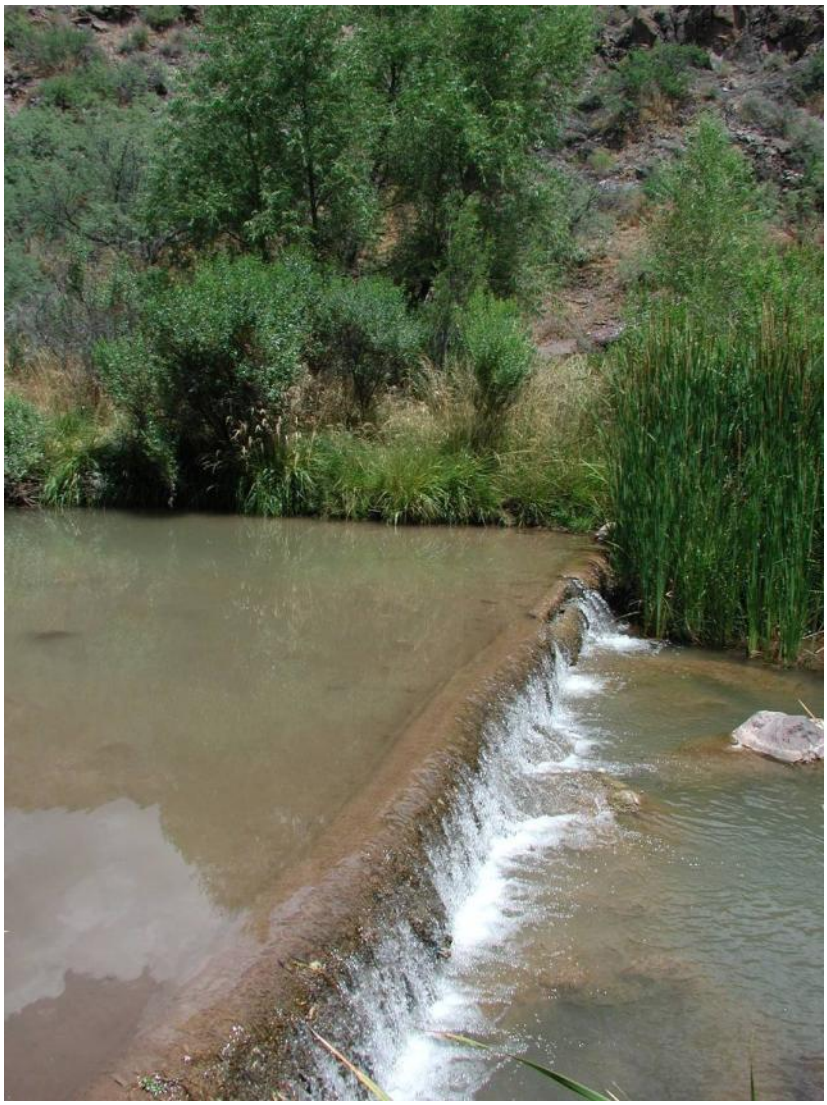

Figure 77. Diversion dam on Spring Creek, upstream from Oak Creek confluence.

Northern Leopard Frog

Local Analysis: Although Oak Creek is within the historical range of the northern leopard frog, the likelihood that frogs could be exposed to stocked fish in the Oak Creek buffered stocking reach is low. There are 3 historical records for northern leopard frogs in the buffered stocking reach: 2 records from the Oak Creek at West Fork confluence (1960, 1969) and 1 record from Foxboro Lake (=FS153) (1971) (HDMS, Arizona Game and Fish Riparian Herpetofauna Database; M. Sredl pers. comm.). There have been 89 surveys or site visits at 17 localities in the Oak Creek buffered stocking reach between 1924 and 2008 (Figure 78, AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS). Northern leopard frogs were not observed at any site, including the West Fork confluence (2000 [n=2], 2002 [n=2]) and Foxboro Lake. Given that Oak Creek has been adequately surveyed and subsequent surveys have not

detected northern leopard frogs, it is likely they no longer occupy Oak Creek or the area within its buffered stocking reach (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing fish stocked in the Oak Creek reach is low, because northern leopard frogs no longer occupy Oak Creek, the prevalence of non-natives, and the drainages where fish could disperse fall below the elevational limit of northern leopard frogs in the region (approximately 5,300 ft) (Sredl 1997; AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

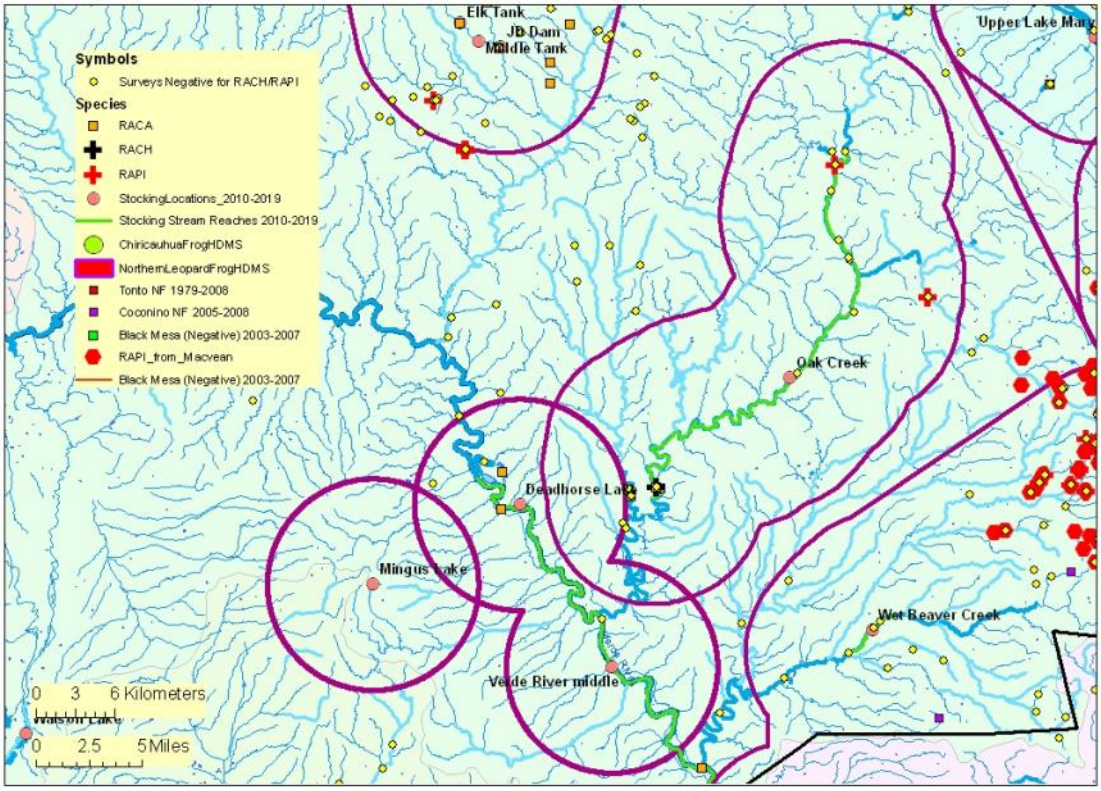

Figure 78. Map of Oak Creek and Lower Verde Sub-Complexes of Middle Verde buffered stocking complex:

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).

Mexican Spotted Owl and Critical Habitat

The stocking stream reach is within Mexican spotted owl (MSO) critical habitat (CH), with only 0.14 miles of creek in the buffer. There appears to be angler access in Oak Creek Canyon 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 the 0.25 mile buffer around MSO PACs in the general vicinity of the site. No physical effects to MSO habitat in the PAC are anticipated, since anglers are not expected to be present in the PAC. There may be some disturbance to MSOs from human presence and associated noise if those owls are using the edge of the PAC or the buffer area for foraging or other normal activities. The disturbance effects do not occur in the PAC where nesting, roosting, and most foraging occur.

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.

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.

Page Springsnail

Page springsnails are known from the vicinity of the Page Springs and Bubbling Springs Pond. Their primary habitat is in Page Springs and other springs nearby, although they have been documented in ditches and other areas nearby. A small population historically occurred at Peck's Lake (Shea Spring) along the Verde River, but that population is believed to have been extirpated in the late 1970s. A previously unknown population of Page springsnails was discovered on private property in the Spring Creek area (Sheepshead Canyon) in July 2007. A final draft Candidate Conservation Agreement with Assurances (CCAA) was prepared by the Department that thoroughly describes the history and occurrences for Page Springsnails in the area. That agreement was submitted to the USFWS in March 2009 for signature.

Potential Impacts

The proposed activity is stocking rainbow trout at various points along Oak Creek, including in the vicinity of the springs. No stocking activity occurs into occupied Page springsnail habitat, and stocked fish cannot access that habitat. Page springsnails have not been documented as occurring in or along Oak Creek. Hatchery grounds and springheads where the springsnail occurs are closed to fishing and anglers. The CCAA identifies the springsnail as occupying spring habitat, not stream habitat where they would encounter sport fish. The CCAA does not identify sport fish as a potential threat to the species, since the springsnail occupies habitat not suitable for sport fish. Access to springsnail occupied habitat by the angling public is limited. Springsnail habitat is mostly too shallow and limited in area to support sport fish, and all these sites are isolated (no direct connection) from Oak Creek. Likewise, the Bubbling Springs Pond is an isolated site that has a fish barrier in place that prevents sport fish from Oak Creek from moving up channel into the site. All springsnail sites on AGFD hatcheries are fenced and closed to fishing from the public.

Exposure between the stocked rainbow trout and the springsnail is not expected to occur because of inability for them to come in contact with each other. Indirect impacts from angler activity would not occur in occupied springsnail habitat because the angling public is not allowed access to those habitats.

Roundtail Chub

Roundtail chub are known from Oak Creek as far upstream as the City of Sedona. The last collection of roundtail chub on Oak Creek occurred during surveys in 2001 downstream of Grasshopper Point near the city of Sedona. Roundtail chub have not been collected in department

surveys upstream of Grasshopper Point. Roundtail chub have been documented in the Verde River upstream and downstream of the confluence of Oak Creek.

Potential impacts
Potential impacts to roundtail chub could result from the predation on roundtail chub by stocked rainbow trout, competition for food or competition for space. Rainbow trout are primarily insectivorous, but may consume small fish. The significance of the effects of the stocked species is diminished by the fact that roundtail chub do not appear to be very abundant in Oak Creek, and by the fact that the area proposed for stocking where roundtail chub have been captured is occupied by several other competing and predatory warm-water nonnative species that occur independent of the proposed stocking actions including smallmouth bass, flathead catfish, green sunfish, red shiner, and rock bass.

Exposure of roundtail chub to stocked species is likely to occur based on the proximity and timing of the stocking action and the known distribution of roundtail chub.

Western Yellow-Billed Cuckoo
Western yellow-billed cuckoos have been documented along Oak Creek downstream of the town of Sedona. Suitable breeding and/or foraging habitat exists within Oak Creek.

Documented occurrences from 2004-2006 were within the proposed stocking reach. Breeding birds have been documented near Page Springs Hatchery and Red Rock confluence.
Corman and Magill (2000) reported them as being present only near Cornville and Page Springs Hatchery prior to 1998. They are not known to occur upstream of Sedona in the canyon bound section of stream, although they may be present there periodically, as well. Suitable nesting habitat may exist in riparian gallery forests along Oak Creek throughout the lower reach. Western yellow-billed cuckoos arrive on breeding grounds beginning in June; the earliest egg reported in Arizona is June 15. Nesting activity continues through August and frequently into September (Corman and Magill 2000). Corman and Magill also documented nests in four different tree species: salt cedar, Arizona alder, Fremont cottonwood and Gooding willow. Nest heights varied between 2.5 – 12.2 m with a mean of 5.2 m. Nest height data indicate that cuckoos use tall, old climax vegetation.

Potential impacts are identified below and described in greater detail in the methodology and criteria contained in Chapter 3.

Potential Impacts
There may be some limited amount of habitat degradation and some amount of disturbance to nesting cuckoos from anglers using or creating new trails to access the stocking site.

<u>Wet Beaver Creek</u>

Site Description
The reach of Wet Beaver Creek proposed for stocking is an approximately 4.5 mile stretch of stream about 15 miles upstream from its confluence with the Verde River (Figure 72). The area is 12 miles northeast of Camp Verde on the Coconino National Forest. The Forest Service manages a campground near the old Beaver Creek Ranger Station and hiking trails and recreation opportunities in the area. Access to the creek is by hiking along the banks.

Management of Water Body
Angler use data on Wet Beaver Creek from the 2001 Statewide Angler Survey showed 3,192 coldwater angler use days and 2,800 warmwater angler use days for Wet Beaver Creek (Pringle, 2004). The creek is managed primarily as an intensive use, put and take rainbow trout fishery. Secondary fishery is a warm water fishery. Limits were removed on smallmouth bass, channel catfish and flathead catfish in the late 1990's to encourage the removal of undesirable warm-water nonnative fish by anglers to benefit native fish. Warm water sport fish have not been stocked in Wet Beaver Creek since 1941 (Table 55).

Table 55. Stocking history in Wet Beaver Creek.

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Rainbow trout	1939	2008	589	507,846
Brook trout	1961	1961	1	5,400
Brown trout	1933	1985	17	28,900
Largemouth bass	1941	1941	1	1,000
Smallmouth bass	1941	1941	2	4,000
Total			610	547,146

Proposed Action
The Department proposes to stock rainbow trout for the period covered by this consultation.

Catchable rainbow trout would be stocked multiple times annually during the spring (March-May) and fall (October-November); numbers of rainbow trout stocked may be from 0 – 6,000 annually.

Water Distribution / Connectivity
The Wet Beaver watershed includes areas below the Mogollon Rim in Central Arizona. Flows begin in the area down slope of Stoneman Lake and Apache Maid Mountain. Tributaries to Wet Beaver Creek include Walker Creek and Red Tank Draw. Wet Beaver Creek flows downstream to the area near McGuireville where it joins Dry Beaver Creek to form Beaver Creek which flows to the Verde River thru Camp Verde. Beaver Creek is usually dry during the summer because of water diversions in the Camp Verde area. Walker Creek has a diversion upstream of

Rancho Roco Roja that is located upstream of the confluence of Walker Creek and Wet Beaver Creek that appears to serve as a fish barrier to upstream migration. There is no barrier between Red Tank Draw and Wet Beaver Creek.

Fish Movement
Fish can move freely throughout the system. The small diversion on Walker Creek appears to be an effective fish barrier to upstream movement since no nonnative fish have been caught during surveys in Walker Creek above the diversion.

Community Description
Nonnative fishes of the family Centrachidae, primarily smallmouth bass and green sunfish, have long dominated the fish community of Wet Beaver Creek (Table 56). Results from the 1985 Beaver Creek Fish Management Report (Reger 1985) show that Wet Beaver Creek was dominated by nonnative smallmouth bass. "We sampled 200 fish at the 3 sites on Wet Beaver Creek. Smallmouth bass comprised 53% of this sample, Gila mountain-sucker 36% (desert sucker), Gila sucker 5% (Sonora sucker), rainbow trout 4%, roundtail chub 1%, and speckled dace, longfin dace, brown trout, and green sunfish each less than 1%" (Reger 1985). The 1985 survey was conducted along the lower reaches of the creek during July at elevations and water temperatures reaching the lethal limit for trout. "We surveyed fish and habitat during 1-3 July 1985 at three sites on Wet Beaver Creek: Lawrence Crossing (mi. 17, elev. 3,630 ft.), Boy's School (mil 20.5, elev. 3920 ft.), and approximately 3 miles above Bell trail (mi. 27, elev. 4,540 ft.). Water temperatures ranged from 70-78 ° F and pH from 6.0-7.0." Only 7 rainbow trout were collected during the 1985 survey and all were determined to be hatchery fish. A survey conducted in October 1986 (which was appended to the end of Reger 1985) reported that the upper reaches of the creek also contained a nonnative dominated fish assemblage. "The only self-sustaining trout population in Beaver Creek is of brown trout, and appears to be limited to a 3-5 mi. stretch. We saw only speckled dace above the falls; smallmouth bass, speckled dace, chubs (*Gila robusta grahami*), and Gila mountain-suckers occur though out the remainder of the creek" (Reger 1985). The falls mentioned are in the canyon somewhere upstream of the proposed stocking reach.

Results of a 1987 survey of Wet Beaver Creek (1 mile below the USGS gauge station and about 1/3 mile above the stocked reach) by AGFD Non-game biologist Bill Leibfried, shows a strong nonnative fish assemblage. Of the 50 fish collected in this station of Beaver Creek, 94% of the total catch was nonnative and 86% of the total catch was smallmouth bass. Only 6% of the total catch was native fish, all of which were Sonora suckers.

Table 56. Arizona Game and Fish Department Wet Beaver Creek Sampling 1985 -1998. Below, "in" or" above" indicates where the sampling site was relative to the stocked reach.

Species	Lawrence (below)	Ranger (in)	Boy's School (in)	3Mi. Above trail (above)	Upper Wet Beaver Creek (above)	unnamed location
Smallmouth Bass	154	32	55	25	16	11
Desert Sucker	95	35	9			11
Roundtail Chub	8			2		
Brown Trout	5			1		
Sonora Sucker	35	2	30	21		
Green Sunfish	1					
Rainbow Trout	2	1	7			
Bullhead	21					
Longfin Dace				1		
Speckled Dace				1		

A summary of the population status in the 2002 Roundtail Chub Status Survey Of The Little Colorado River Basin by Voeltz, suggest a steady decline of roundtail chub within Beaver and Wet Beaver Creek. "Barrett and Maughan (1995) found the roundtail chub population in Beaver Creek comprised entirely of large adults, with no juveniles found, during surveys conducted from 1988-1990. Presence of smallmouth bass may have displaced roundtail chubs from preferred habitats, resulting in a sub viable roundtail population below canyon-bound reaches. Surveys noted a simultaneous increase in abundance of all size classes of smallmouth. Montgomery et al (1994) did not find chubs during spring and fall 1993 surveys near Montezuma Castle National Monument (located on Beaver Creek about 3.5 miles downstream the Dry Beaver Creek Wet Beaver Creek confluence), indicating their rarity in the system. One roundtail was found during surveys during 1995 at Davis Hole on Montezuma Castle National Monument (L. Montgomery, pers. comm.). Surveys conducted by AGFD personnel during July 1998, found roundtail common in canyon-bound reaches above the gauge station in the upper reaches of the stream. In the stream reach above a barrier waterfall, brown trout, desert sucker and roundtail chub were common, with smallmouth bass first being sampled below the fall, and increasing in abundance with distance traveled downstream. Cumulatively, this suggests that the occasional roundtail sampled in lower Wet Beaver Creek may be moving down from the population remaining in the upper portions of the drainage." Voeltz gives both Beaver and Wet Beaver Creek's a status of "Unstable – Threatened"

Voeltz goes on to describe how roundtail chub have been essentially extirpated from Dry Beaver Creek due to drought conditions and invasions by nonnative fishes. "Intermittent water and

invasions by nonnative predatory fish have likely caused extirpation of the chub population in Dry Beaver Creek. A complete and thorough survey is needed before chub populations should be declared extirpated. Except for a pool in the vicinity of Beaverhead Spring, Dry Beaver Creek was believed entirely dry during drought conditions of summer 2000 (C. Benedict, pers. comm.). Green sunfish were reportedly abundant in the pool." Voeltz gives Dry Beaver Creek a status of "Extirpated" for roundtail chub.

A 2006 AGFD hoop netting and electro fishing survey reflects the continuing trend of high numbers of nonnative centrachids compared to low numbers of native fishes including roundtail chub. Of the 222 total fish collected 86.49% of the total catch comprised of nonnative fishes and 82.88% of the total catch was smallmouth bass. 13.51% of the total catch was native fishes and only 1.8% (4 fish) of the total catch was comprised of roundtail chub (M. Rinker pers. comm.).

Surveys were conducted in 2007 on Walker Creek (Rinker and Benedict 2007c) and Red Tank Draw (Rinker 2007c) (Table 57, Table 58, Table 59 and Table 60).

Only native fish were captured during the Walker Creek surveys. The Red Tank Draw surveys were dominated by nonnatives including smallmouth bass and green sunfish. Rainbow trout have not been collected in Red Tank Draw or Walker Creek.

Table 57. Walker Creek 2007 Electrofishing Station 1. Upstream From Private Property Fence.

Species	Number	% of total	Mean Length (mm)	Min-Max length (mm)
Longfin Dace	97	76.38	54.1	31-70
Gila Chub	3	2.36	113.33	105-117
Desert Sucker	22	17.32	92.53	36-126
Speckled Dace	5	3.94	86.2	62-106
TOTALS	127	100	-	-

The GPS coordinates for this station are 12S 0435346 UTM3833441.

Table 58. Walker Creek 2007 Electrofishing Station 2. Upstream From Private Property/Below Diversion Dam.

Species	Number	% of total	Mean Length (mm)	Min-Max length (mm)
Longfin Dace	65	73.03	58.79	30-78
Desert Sucker	8	8.99	119.13	103-137
Gila Chub	16	17.98	150.31	101-247
Totals	89	100	-	-

Table 59. Walker Creek 2007 Electrofishing Station 3. Diversion Dam.

Species	Number	% of total	Mean Length (mm)	Min-Max length (mm)
Longfin Dace	13	54.17	67.15	54-101
Desert Sucker	2	8.33	115.5	97-134
Gila Chub	9	37.5	119.67	56-187
TOTAL	24	100	-	-

Table 60. Red Tank Draw 2007 Fish Survey

Species	Number	% of total	Mean Length (mm)	Min-Max length (mm)
Sonora Sucker	10	6.99%	315	258-411
Smallmouth Bass	35	24.48%	142.91	91-249
Green Sunfish	98	68.53%	121.58	48-228
TOTAL	143	-	-	-

Consultation Species or Critical Habitat
Potential impacts to bald eagle, Gila chub and critical habitat, roundtail chub and Western yellow-billed cuckoo are discussed below. Potential downstream impacts to Chiricahua and northern leopard frogs, Colorado pikeminnow, northern Mexican and narrow-headed gartersnakes, razorback sucker and critical habitat, spikedace with critical habitat and Western yellow-billed cuckoo are analyzed within the Middle Verde River complex analysis later in the document.

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.

Bald Eagle
Non-breeding bald eagles can occur within the vicinity of the stocking site and may be present at any time of the year.

Potential Impacts

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.

Gila Chub and Critical Habitat

Gila chub are known from two tributaries to Wet Beaver Creek; Red Tank Draw and Walker Creek (Weedman et al 1996). Walker Creek joins Beaver Creek about two miles downstream from the stocking locations. Red Tank Draw joins Beaver Creek about three miles downstream from the proposed stocking locations. Critical habitat is designated in Red Tank Draw from the confluence with Wet Beaver Creek upstream to Mullican Canyon and in Walker Creek from Forest Road 618 upstream to Spring Creek confluence. This is a different Spring Creek than the other Spring Creek previously discussed in the Oak Creek Drainage for Gila chub.

Red Tank Draw is also occupied by green sunfish and smallmouth bass. Green sunfish have been documented as having severe impacts to chub species to the point of eliminating their persistence (Dudley and Matter 1996).

Potential Impacts

Potential impacts to Gila chub could occur from stocking of rainbow trout in Wet Beaver Creek. The impacts could result if Gila chub adults or juveniles move out of Red Tank Draw or Walker Creek into Wet Beaver Creek during times when stocked trout may be present in this reach of Wet Beaver Creek, or if stocked rainbow trout migrate up these streams to occupied or critical habitat. All of the streams in this area become warm in the summer time and rainbow trout do not persist anywhere through the summer. The rainbow trout could compete for food or space with Gila chub if they move into Red Tank Draw or Walker Creek during the cooler seasons. However, this has not been shown to occur. Predation on juvenile Gila chub which could move out of Red Tank Draw into Wet Beaver Creek by rainbow trout is also possible, although not likely because of the abundance of other predatory fishes that would likely consume the juveniles before trout could come in contact with them. Alternatively, adult Gila chub may move out of Red Tank Draw or Walker Creek into the stocked reach or just downstream of the stocked reach where rainbow trout may be present during or shortly after the stocking seasons. This could result in competition for food or space until the trout die off from warm temperatures. However, Gila chub have not been documented in or downstream from the area of rainbow trout stocking. Predation on eggs is not expected to occur because trout don't appear to move into occupied chub habitat and Gila chub eggs are adhesive and would not drift down into areas shown to support rainbow trout during the stocking season. Additionally, naturally reproducing populations of warmwater nonnative species such as green sunfish and smallmouth bass are common in Wet Beaver Creek and Red Tank Draw. These species are known to compete and predate on native fish species. Surveys of Red Tank Draw in 1995 (twice) (Weedman et al 1996), 2005 (Knowles 2005) and 2007 (Rinker 2007c) did not document rainbow trout in Gila chub

occupied or critical habitat, nor have surveys of Wet Beaver Creek documented the presence of Gila chub. Green sunfish and smallmouth bass were found in large numbers in Red Tank Draw in 2007.

Surveys in Walker Creek in 1994 and 1995 (Weedman et al 1996), 1996 (AGFD data) and 2007 (Rinker and Benedict 2007c) also did not detect any nonnative species in occupied or critical habitat in Walker Creek, only native fish species were present. An irrigation diversion in lower portion of Walker Creek just below critical habitat removes most of the water during low flow periods (C. Benedict, pers. comm.).

Exposure to stocked rainbow trout is unlikely to occur in Red Tank Draw because of the existing warm-water nonnative fish assemblage in Red Tank Draw and at its confluence with Wet Beaver Creek. Rainbow trout are not expected to access critical or occupied habitat in the tributaries and would not persist if they entered Red Tank Draw because of warm water temperatures. Fisheries survey data (citations noted above) indicate that Gila chub don't persist outside known occupied areas and stocked rainbow trout are not found within Red Tank Draw or Walker Creek.

Roundtail Chub

Roundtail chub are known from the Verde River beginning below Sullivan Dam and extending down the Verde River past Granite Creek and throughout its entirety to the confluence with the Salt River. Available collection records from the Verde River document roundtail chub occurrence in that vicinity historically up through 1994. Data in that area are lacking since 1994. In Beaver Creek, just downstream from the stocking locality, roundtail chub were documented through 1999. In Wet Beaver Creek near the Ranger Station and in the stocked reach, roundtail chub were collected in 1961 and 1962. Roundtail chub were not reported in HDMS in 1971, 1989 or 2001 when other native fishes were reported. No more recent survey data are available. Roundtail chub are not believed to persist in Wet Beaver Creek due to the abundance of warm-water nonnative fishes, primarily green sunfish and smallmouth bass, occupying the reach from the stocking area downstream to the Verde River confluence. Green sunfish have been documented as having severe impacts to chub species to the point of eliminating their persistence (Dudley and Matter 1996).

Potential impacts

Potential impacts of stocked rainbow trout on roundtail chub could result from the predation on roundtail chub, competition for food or competition for space if stocked rainbow trout move downstream into the Verde River or upstream into areas known to be occupied by roundtail chub. Rainbow trout are primarily insectivorous, but may consume small fish. The significance of the effects of the stocked species is diminished by the fact that they have not been found to persist in Wet Beaver Creek or the Verde River and by the fact that the area proposed for stocking is occupied by several other competing and predatory nonnative species that occur

independent of stocking actions (smallmouth bass, flathead catfish, green sunfish, red shiner, crayfish, bullfrogs, etc.). Roundtail chub have not been captured recently in the reach proposed for rainbow trout stocking, but numerous smallmouth bass and green sunfish have been documented in the reach in the past.

Western Yellow-Billed Cuckoo

Suitable breeding and/or foraging habitat exists within the stocking reach and along the creek. Documented occurrences within the proposed stocking reach and along the creek from 2004-2006 with additional occurrence near the confluence of Wet Beaver and the Verde River. Potential impacts are identified below and described in greater detail in the methodology and criteria contained in Chapter 3.

Potential Impacts

There may be some limited amount of habitat degradation from anglers using or creating new trails to access the stocking site.

Deadhorse Ranch State Park Lagoons

Site Description

Three lagoons are located at Deadhorse Ranch State Park. The park is managed by Arizona State Parks and is located in the town of Cottonwood. The lagoons are approximately one-quarter mile from the Verde River and are above the 100 year floodplain (the 1993 flooding event did not inundate the lake).

Management of water body

Since the mid 1980's, Arizona State Parks (ASP) had planned to expand their fishing and lake recreation opportunities at Deadhorse Ranch State Park (Park). Plans were set in motion in 2002 to build and expand lagoons within the Park to over 20 surface acres. This expansion was completed in 2003. There are now three lagoons within the Park. The lakes are filled using an irrigation ditch from a diversion (Hickey Ditch) on the Verde River that flows through canals and a series of pipes to reach the upper lagoon. There are containment structures that prevent egress of stocked fish out of the lagoons back through the canal to the Verde River. Any outflow occurs over sandy permeable substrates that prevents flowing water and stocked fish, fry, or eggs from reaching the Verde River. Thus, the lakes are closed and isolated waters except with each other.

The upper lagoon is now 3.7 acres. The middle lagoon is 6.4 acres and the lower lagoon is 9.9 acres in size. Each lagoon can be independently filled by ditch or gravity filled from upper to lower ponds. Once filled, the lagoons would be kept at relatively constant levels. A percolation pad is used for outlet water from the lower lagoon. This pad is just east and south of the lower lagoons's outlet. Water drained onto this pad is allowed to naturally percolate into the sandy

substrate. No water from the lagoons is released directly into the Verde River or its tributaries. During large flood events, all water in the ditch supplying the park is shut preventing overflow of the ponds and diverting all water back into the Verde River before it reaches the lakes.

Table 61. Stocking history at Deadhorse State Park

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Black crappie	1980	1980	1	2,000
Bluegill	2006	2006	1	4,727
Channel catfish	1977	2008	21	14,790
Largemouth bass	1987	1988	3	714
Rainbow trout	1985	2008	234	550,935
Redear sunfish	1978	1989	2	6,080
Tadpole	1977	1978	2	2,660
Total			245	539,742

The Verde River Greenway state natural area is also managed by ASP with offices located at Deadhorse Ranch State Park (Park). The most significant natural resource in the Greenway, in addition to the year-round flowing river, is the dense forest of riparian trees and shrubs along its riverbank. This Fremont Cottonwood & Gooding Willow Riparian Gallery Forest is one of five remaining stands in Arizona and one of 20 such stands in the world. This is extensive Cottonwood/willow gallery riparian woodland. The park is an extension of this riparian woodland.

It is estimated that the original lagoon (upper) received over 19,500 angler use days in 2001 (Pringle 2004). An angler use day is defined as any portion of a day that an angler is in the act of fishing. Anglers have historically used the Park heavily in the winter months, typically from November to March. During these months, the Department has stocked roughly 30,000 catchable sized rainbow trout since 1994. In addition, Arizona State Parks and the Prescott National Forest for specific fishing events have stocked warmwater species such as bluegill and channel catfish.

The Regional Fisheries Program with the assistance other Regional Personnel conducted a 13 month roving creel survey from June 1st 2008 – June 30th, 2009. This survey was designed to determine the utilization of stocked fish and angler demographics for the Park. Outlined below are the key findings from this investigation.

- 1,702 people were interviewed with a total of 59,000 angler hours or 36,835 angler use days. An angler use day is defined as any portion of a day that an angler is in the act of fishing.
- An estimated 89,745 fish were caught and 33,134 harvested. Overall, 0.96 fish/hr were caught with a harvest of 0.36 fish /hr. 40,626 fish were stocked into the middle and lower lagoons at the Park during the sampling period, 38,616 trout and 2,010 catfish. Of the trout stocked, 71% were harvested. Fifty-three percent of anglers were successful in catching at least one fish.
- Rainbow trout were the most highly targeted species at 54%. If anglers listed more than one species, they were categorized as targeting anything. This accounted for 22% of the anglers. Catfish was the next highest at 17%.
- Average angler satisfaction with their fishing experience was 4.3 on a scale of 1-5.
- Ninety-six percent of anglers were residents of Arizona. 90% of anglers came from Yavapai County (57%) or Maricopa County (33%).
- The Statewide survey of 2001 Arizona Anglers (Pringle 2004) estimated the annual angler use days to be 19,500 and an annual economic value (direct and indirect) of $2,710,500. We estimate the total number of angler use days to be 36,835 over the 13 month period. If we take into account the difference in the number of months, we still see a 174% increase in angler use days and an increase of $2,015,500 annual economic value.

The fishery at the Park is managed to be an intensive use rainbow trout fishery with high harvest rates (Bovee and Clark 2003) with a secondary warmwater component. Winter trout stocking provides opportunities for local residents, winter tourists and residents, and often special functions (e.g., Boy Scout campouts and AGFD or State Parks outreach events, such as Verde River Days).

These waters are managed similar to an urban park setting with accommodations for intensive use. Extensive facilities including fish cleaning stations, restrooms, parking areas, trails, camping and group sites are available to visitors. A two lane boat ramp is available at the lower lagoon. Boating is restricted to non-motorized rafts, kayaks or canoes only and only on the lower lagoon. No boats are allowed on the middle or upper lagoon. A fishing pier is also available at the lower lagoon. Trails are available around the entire perimeter of both the middle and lower lagoons.

Proposed Action

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

Fingerling, sub-catchable, and catchable rainbow trout would be stocked multiple times from January to March and from November to December annually; total numbers of trout stocked into all three lagoons combined would be from 0 to 300,000 trout annually.

Threadfin shad (any size) would be stocked anytime as needed to augment or recover the fishery following catastrophic events; numbers of shad stocked may be from 0 – 10,000 fish annually.

Largemouth bass (fry/fingerling, sub-catchables, catchables), channel catfish (sub-catchables, catchables), bluegill sunfish (sub-catchables, catchables), black crappie (sub-catchables, catchables) may be stocked as needed at any time during the year to augment existing populations 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

The Hickey Ditch (ditch) diversion sits just upstream of the larger Cottonwood City Diversion at roughly river mile 49.5 (Figure 79). The Hickey Ditch was destroyed in the flooding February 1993 but was rebuilt by 1998. Flooding in September of 2004 also damaged the ditch and as in 1993, the Park used groundwater to supplement the lagoons until the ditch was repaired. When the ditch is inoperable, the Park does not receive Verde River water. When it is functional, water comes through the Ditch into the upper lagoon via an open canal and then drops several feet over a concrete spillway. No upstream movement of fishes is possible from the upper lagoon back into the ditch. Water then can be released via a screened outlet from the upper lagoon into the middle lagoon. A similar structure allows water to pass from the middle lagoon to the lower lagoon. Water leaving the lower lagoon simply drains into the sandy alluvium and has no surface connection with the Verde River.

Figure 79. Diversions above Deadhorse Ranch State Park.

Figure 80. Intake structure with screened top, middle lagoon at Deadhorse State park.

Fish Movement

No upstream movement of fishes is possible between lagoons, only downstream. Movement of larval and small lifestages of fish is possible in a downstream direction from upper lagoon to lower lagoon within the Park. Adult fishes cannot pass from lagoon to lagoon except by human transport. As referred to above, water discharge leaving the lower lagoon simply drains into the sandy alluvium and has no surface connection with the Verde River.

Community Description

The lagoons currently harbor populations of channel catfish, largemouth bass, black crappie, bluegill sunfish, yellow bullhead and green sunfish as well as rainbow trout on a seasonal basis. Threadfin shad were reportedly present in Deadhorse State Park pond prior to its re-configuration in 2002-2003, although no survey data were available to corroborate this report (A. Clark, pers. comm.). Threadfin shad were not documented during subsequent surveys in 2006-2008. According to Department hatchery records, threadfin shad were previously stocked into Peck's Lake just upstream from the park in 1958 and 1959.

Cattail infestation is an ongoing problem that requires the park to physically cut and remove plants several times per year. Rooted aquatic vegetation is also problematic especially at the lower lagoon. Spiny naiad, curly leave pondweed, and *Chara* are common and necessitate the annual use of aquatic herbicides to ensure open areas for anglers.

Table 62. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Middle Lagoon July 2006. Effort in minutes.

N= 244			Total Weight= 2631 g		Total effort units = 15	
Common Name	# Sampled	# Measured	% Total	CPUE	Total Wt. (g)	% Total
Black Crappie	1	1	0.41%	0.07	56	2.13%
Largemouth Bass	4	4	1.64%	0.27	696	26.45%
Bluegill	239	239	97.95%	15.93	1879	71.42%

Table 63. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Lower Lagoon July 2006. Effort in minutes.

N= 328	Total Weight= 11338 g			Total effort units = 17		
Common Name	# Sampled	# Measured	% Total	CPUE	Total Wt. (g)	% Total

Black Crappie	6	6	1.83%	0.35	244	2.15%
Largemouth Bass	14	14	4.27%	0.82	471	4.15%
Bluegill	302	302	92.07%	17.76	5738	50.61%
Channel Catfish	6	6	1.83%	0.35	4885	43.09%

Table 64. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Middle Lagoon April 2008. Effort in minutes.

N= 133	Total Weight= 7750		Total effort units = 15			
Common Name	# Sampled	# Measured	% Total	CPUE	Total Wt. (g)	% Total
Black Crappie	2	2	1.50%	0.13	243	3.14%
Largemouth Bass	8	8	6.02%	0.53	2938	37.91%
Bluegill	117	117	87.97%	7.80	2575	33.23%
Green Sunfish	4	4	3.01%	0.27	199	2.57%
Channel Catfish	1	1	0.75%	0.07	1606	20.72%
Rainbow Trout	1	1	0.75%	0.07	189	2.44%

Table 65. Number, relative abundance, relative biomass and catch per unit effort by electrofishing at Dead Horse State Park Lower Lagoon April 2008. Effort in minutes.

N= 106		Total Weight= 8073			Total effort units = 15	
Common Name	# Sampled	# Measured	% Total	CPUE	Total Wt. (g)	%Total
Black Crappie	5	5	4.72%	0.33	210	2.60%
Largemouth Bass	8	8	7.55%	0.53	2890	35.80%
Bluegill	70	70	66.04%	4.67	773	9.58%
Channel Catfish	1	1	0.94%	0.07	621	7.69%
Rainbow Trout	21	21	19.81%	1.40	3447	42.70%
Yellow Bullhead	1	1	0.94%	0.07	132	1.64%

Consultation Species or Critical Habitat

Deadhorse Ranch State Park is a closed system. No downstream or upstream movement of stocked fishes is anticipated to occur. Potential impacts to bald eagle and Western yellow-billed cuckoo are discussed below. Chiricahua and northern leopard frogs, Southwestern willow flycatcher and critical habitat, and Western yellow-billed cuckoo (again) are discussed in the Middle Verde complex analysis.

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.

Bald Eagle

Oak Creek Breeding Area is approximately 7.0 miles from Dead Horse Lake and is within the Bald Eagle DPS. The eagles were first observed in 2002 and were last observed 14 April, 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Oak Creek Breeding Area productivity data shows that the nest was successful in 2007 with one nestling found dead below the nest, was successful in 2008, and failed in 2009 when a nestling was found injured on the ground and taken to rehabilitation but was deemed not releasable (Jacobson et al. 2007; McCarty and Jacobson 2008, 2009).

TAPCO Breeding Area is approximately 4.7 miles from Dead Horse Lake and is within the Bald Eagle DPS. The eagles were first observed in 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. TAPCO Breeding Area productivity data shows that the nest failed in 2009 (McCarty and Jacobson 2009). Dead Horse Lake does have monofilament bins present.

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.

Continued stocking of rainbow trout into the middle Verde River may have adverse effects to the bald eagle prey base diversity that is important for the successful fledging of eaglets from this BA. The additive effect of rainbow trout predation on larval suckers to that from existing warm water fish populations is unknown. Alternatively, the benefit of an additional forage species through stocking of rainbow trout is also unknown.

Western Yellow-billed Cuckoo

No occurrences have been documented at or adjacent to the lake; however, suitable breeding and/or foraging habitat exists at or adjacent to the lake. Several occurrences for migratory and breeding birds have been documented along the middle Verde River. Potential impacts are

identified below and described in greater detail in the methodology and criteria contained in Chapter 3.

Potential Impacts
There may be some limited amount of habitat degradation and some amount of disturbance from anglers using or creating new trails to access the stocking site.

Mingus Lake
Site Description
Mingus Lake is a 3 acre impoundment sitting atop Mingus Mountain at an elevation of 7,573feet above sea level (Figure 81 and Figure 82). Constructed in the 1920's on the Prescott National Forest to benefit cattle it now mainly serves as a recreational fishery and nature destination for neighboring religious camps. Access by dirt road exists only during summer months. The road is generally closed for the winter due to bad road conditions. The lake is located on Prescott National Forest with private land located nearby. There are no improvements at the lake, but there are campgrounds and picnic/recreation areas nearby.

Figure 81. View of Mingus Lake from dam circa 2002.

Management of Water Body
The lake has historically been managed as a warmwater fishery, infrequently stocked with largemouth bass, smallmouth bass, black crappie, bluegill, channel catfish, and fathead minnow. In August 1996, the lake was re-constructed removing approximately 6,500 cubic yards of sediment material from the basin of the lake. The dam was also repaired and a plastic liner was

installed to prevent bottom seepage. A separate consultation was completed after renovation in 1996 to add rainbow trout to the list of approved species. Although records indicate the warmwater species above were approved for stocking into Mingus, no stockings other than rainbow trout have occurred since the re-construction by the Department. An illegal introduction of yellow bullhead occurred sometime around 2002 and that species has increased in numbers. No formal creel surveys have been done at Mingus Lake. A mail out survey done in 2001 by the Department suggested 4,346 angler use days were expended at Mingus Lake during that year. Stocking history for Mingus Lake is listed in Table 66.

Figure 82. Mingus Lake from dam in June 2009.

Table 66. Stocking History for Mingus Lake.

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Rainbow trout	1997	2009	131	68,896
Total			131	68,896

Future management objectives involve providing stock size rainbow trout, bluegill sunfish, and black crappie for anglers to enjoy most months of the year. If consecutive low water years facilitated, the Department would pursue removal of yellow bullhead from the lake by dewatering or chemical means. Once yellow bullheads are removed, a warmwater fishery

component would be pursued using bluegill and black crappie. By establishing a bluegill/crappie fishery, illegal introductions of problematic species such as yellow bullhead may be averted. Rainbow trout stockings would continue seasonally and would not be affected by these activities.

Proposed Action

The Department proposes to stock rainbow trout, bluegill sunfish, and black crappie for the period covered by this consultation.

Catchable rainbow trout would be stocked from April to October annually; numbers of trout stocked may be from 0 to 10,500 fish annually.

Bluegill sunfish (fry/fingerling, sub-catchables, catchables), black crappie (fry/fingerlings, sub-catchables, catchables) may be stocked as needed at any time during the year to augment 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

Runoff from the lake follows ephemeral drainages 12 mi through Gaddes and Black Canyons to the confluence with the Verde River. Mingus Lake spills very infrequently due to the small contributing watershed and its position at the very top of that watershed. According to Chris Hill (D. Weedman pers. comm.), manager of the United Methodist Camp just down the road from Mingus Lake, the lake would occasionally fill to over flowing and she has seen water running over the engineered spillway. She reported that overflow events are only in response to heavy winter snowpack that melts and fills the lake slowly. She and her husband Brandon have never seen the lake overflow as a result of summer monsoon storms. Chris stated that the lake levels drop in early summer to the point that the run-off can be captured and stored. The watershed above Mingus Lake is estimated to be roughly 180 acres based on estimates as measured from the USGS topo map.

Fish Movement

It would be possible for fish in Mingus Lake to move downstream out of the lake into drainages leading to the Verde River. This would be very rare as the lake does not maintain high water levels despite the liner installed in 1996. For a spill to occur and fishes to move downstream, the lake would need to be near full and a very large localized storm would have to be centered over the relatively small watershed that feeds the lake. This is possible but far more likely is a localized storm filling the lake and little to now water spilling due to the small drainage contribution area. Extensive steep canyons exist downstream of the lake. These canyons are bedrock dominated or thick with terrestrial vegetation (Figure 83) and provide little habitat for fishes. Since only rainbow trout and yellow bullhead are known from Mingus Lake, and both

these species are either resident or are seasonally stocked into the Verde River, it is impossible to know if these species have moved out of the lake and into the Verde River.

Community Description

The lake maintains self-sustaining populations of yellow bullhead as confirmed by swarms of fry being observed and dip netted. Angler reports of adult yellow bullhead being caught are not uncommon. Rainbow trout are present seasonally as a result of past stocking, and some over-wintering by trout may occur. The lake has not been sampled by net or electrofishing. No angler reports are known of other species being caught or seen in Mingus Lake.

Consultation Species or Critical Habitat

Potential downstream impacts to Chiricahua and northern leopard frogs, Colorado pikeminnow, Gila chub and critical habitat, northern Mexican and narrow-headed gartersnakes, razorback sucker and critical habitat, roundtail chub, spikedace with critical habitat, Southwestern willow flycatcher and critical habitat and Western yellow-billed cuckoo are analyzed within the Middle Verde River complex analysis later in the document.

Figure 83. Channel immediately downstream from Mingus Lake Dam.

Huffer Lake

Site Description

Huffer Lake is a small impoundment (approximately 1.4 acres when full) located on the Coconino National Forest about 15 miles north of Strawberry along Highway 87 at mile marker 282 near the Mogollon Rim. The Lake is fed by annual snowmelt and can achieve maximum depths of 20 to 25 feet when full. Illegally stocked green sunfish inhabited the lake until the summer of 2006 when it completely dried up (G. Fabian pers. comm.). The lake has peak late summer water temperatures of 72°F and pH values in the 8's. Access is walk-in only with small pull off areas on the north and south side of Highway 87. The lake has no other recreational facilities available.

There are several access points to the lake to aid in stocking and angler usage. There is a small turn off on the North side of Highway 87 and a pair of two track roads that travel on either side (East and West) of the lake. The two-track road on the east side of the lake splits and travels right down to the lake for easy stocking access.

Management of Water Body

Prior to 2008 Huffer Lake had not been stocked since 2002. An illegally introduced green sunfish population was present in the lake before it went dry in 2006. The local Wildlife Manager requested that the department start stocking rainbow trout in the lake again when it refilled to provide a recreational fishery and to help reduce the likelihood that someone would illegally reintroduce green sunfish. Primary fishery management is an intensive use, put and take rainbow trout fishery with high harvest rates. Recent management has focused on the stocking of catchable rainbow trout in the spring and summer when water quality is sufficient to support fish. Table 67 provides a summary of historical stocking at Huffer Lake.

Table 67. Stocking history at Huffer Lake

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Rainbow trout	1978	2009	9	4,215
Total			9	4,215

Proposed Action

The Department proposes to stock rainbow for the period covered by this consultation.

Catchable rainbow trout would be stocked multiple times annually from April-October; numbers of rainbow trout stocked may be from 0 – 4,000 annually.

Water Distribution / Connectivity

Huffer Lake is the headwaters of Rock Canyon which lies in a drainage that when spilling flows into Clover Creek (A major tributary of West Clear Creek). Clover Creek and Willow Creek join to form West Clear Creek and contain self-sustaining populations of rainbow trout. Huffer Lake would spill mostly in response to winter snow and precipitation events in the spring before the stocking would begin in April. This lake may also spill in response to extreme monsoon rainfall events between July and September. The frequency of spill events cannot be determined with certainty because no discharge or water level measuring devices are present. However, due to the small size of the watershed (about 0.3 mi^2) (Figure 84) Huffer Lake is not expected to spill very frequently, nor for very long during either season.

Figure 84. Approximate watershed area for Huffer Lake.

In the event of flooding outflow from the tank would travel approximately 0.21 miles to Huffer Spring. From Huffer Spring, Pivot Rock Canyon continues approximately 3.96 miles into Toms Creek. Toms Creek Flows for approximately 7.05 miles to Clover Creek, which flows approximately 2.57 miles to the confluence of Clover Creek and Willow Creek to form West Clear Creek. West Clear Creek eventually flows approximately 36.70 miles into the Verde River just south of the town of Camp Verde.

Fish Movement
Fish can move downstream of Huffer Lake via the culvert under Highway 87 eventually to West Clear Creek.

Community Assemblage
No fish surveys have been conducted on Huffer Lake. Rainbow trout are currently stocked in the Lake. Green sunfish have not been reported by anglers since the lake went dry in 2006 and trout stocking resumed in 2008.

West Clear Creek downstream of Huffer Lake has headwater chub, speckled dace, desert sucker, Sonora sucker, self sustaining rainbow trout and self sustaining brown trout populations.

Consultation Species or Critical Habitat
Potential impacts to Chiricahua and northern leopard frogs, headwater chub and Mexican spotted owl are discussed below. Potential downstream impacts to Colorado pikeminnow, Gila chub, northern Mexican and narrow-headed gartersnakes, razorback sucker and critical habitat, roundtail chub, spikedace with critical habitat, Southwestern willow flycatcher and critical habitat and Western yellow-billed cuckoo are analyzed within the Middle Verde River complex analysis later in the document.

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 the 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.

Chiricahua Leopard Frog
Local Analysis: Although Huffer Lake is within the historical range of the Chiricahua leopard frog the likelihood that frogs could be exposed to stocked fish in the buffered stocking complex that includes Huffer Lake is low. There are no historical records for Chiricahua leopard frogs at Huffer Lake; however, there are historical records for frogs from 16 sites within this complex, 14 of which are currently occupied (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.

and HDMS). There have been 731 surveys at 193 sites across the entire Middle Verde complex between 1914 and 2008, the majority of which are in the buffered complex that includes the Huffer Lake (Figure 85, AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS). The Middle Verde complex has been adequately surveyed and it is likely that Chiricahua leopard frogs occupy many stock tanks near the headwaters of Sycamore Canyon. Dispersing fish can swim into West Clear Creek and then move into Verde River but it is very unlikely for stocked fish to swim downstream in the Verde River and upstream in to an intermittent stream in Sycamore Canyon and get into the headwaters where there are occupied frog sites (M. Rinker pers. comm.). Additionally, it is unlikely that frogs would disperse to lower Sycamore Canyon where fish that may have dispersed from the Verde River because it is below the elevational limit of the species (approximately 4,500 feet) (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

Broad Scale Analysis: The likelihood that Chiricahua leopard frogs could be exposed to dispersing fish stocked at Huffer Lake is low. Stocked fish cannot disperse outside the buffered area and it is not likely for frogs from nearby sites to disperse into lower Sycamore Canyon or the Verde River because the location exceeds the elevational limits of the species and the distance is beyond the distance we expect them to disperse.

Northern Leopard Frog

Local Analysis: Although Huffer Lake is within the historical range of the northern leopard frog, the likelihood that frogs could be exposed to stocked fish in Huffer Lake is low. There are no records for northern leopard frogs from Huffer Lake; however, there are historical records for northern leopard frogs from 30 sites within this complex; 26 of which are currently occupied by frogs. There have been 731 surveys at 193 sites across all three buffered stocking complexes in the Middle Verde between 1914 and 2008, the majority of which are in the portion of the buffered stocking complex that includes Huffer Lake (Figure 85, AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS). Susi MacVean (S. MacVean-unpublished data) has surveyed 71 sites within the buffered stocking complex regularly from 2005-2009 and as of 2009, has confirmed 25 sites occupied by northern leopard frogs. Additional data (2005-2008) from The Coconino National Forest confirms 25 of 247 surveys were positive for northern leopard frogs (Coconino National Forest unpublished data). Although survey data confirms that northern leopard frogs occupy numerous sites within the buffered stocking complex, there are only historical records for northern leopard frogs near the Huffer Lake stocking site and it is likely they no longer occupy those sites (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS). The Middle Verde complex has been adequately surveyed and northern leopard frogs may occupy the complex that includes Huffer Lake. Fish stocked directly into Huffer Lake cannot disperse to occupied frog sites, nor is it likely for frogs to move into Huffer Lake because the location exceeds the distance a northern leopard frog would likely disperse.

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing fish in Huffer Lake is low. There are no records for northern leopard frogs outside the buffered complex and it is not likely that fish can disperse out of Huffer Lake (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

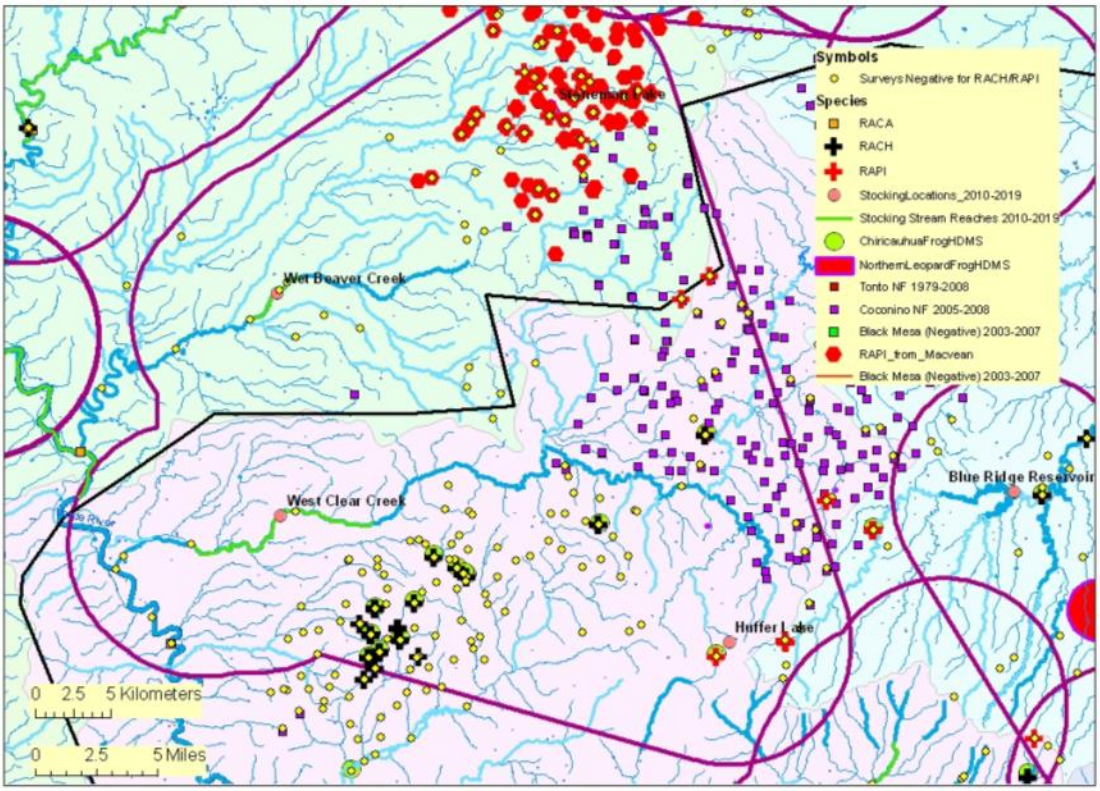

Figure 85. Wet Beaver and West Clear creeks Sub-Complex of Middle Verde buffered stocking complex.

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). NOTE: Stoneman Lake was removed as a proposed stocking location after the analysis and maps were produced.

Headwater Chub

Headwater chub are believed to be the species of chub occupying the upper and middle portions of West Clear Creek (Schwemm 2006), downstream from Huffer Lake. The upstream portions of

West Clear Creek occupied by headwater chub are also occupied by self-sustaining and naturally reproducing populations of rainbow trout and brown trout.

Potential Impacts
Potential impacts to headwater chub could result from the predation on chub by stocked rainbow trout, competition for food or competition for space. Rainbow trout are primarily insectivorous, but may consume small fish, larvae or eggs. For these impacts to occur rainbow trout must escape Huffer Lake; migrate through the ephemeral portions of Toms Creek to Clover Creek and down to the occupied area of the perennial portion of West Clear Creek, a distance of more than 14 miles, where rainbow trout and brown trout are already present and reproducing.

If Huffer Lake stocked fish were transported downstream during a flood, they would not be expected to survive the conditions of transport. There are factors that influence how successfully transport can occur, since water velocities and sediment loads can be quite high which may result in injury or mortality of fish caught in the flows. Fine clay sediments transported with runoff often prohibit fish survival in pools following runoff events. High sediment loads can also result in fish mortality as a result of decreased dissolved oxygen concentrations concurrent with increased suspended sediments (Bozek and Young 1994; Robinson et al. 2004a; Rinne and Carter 2008). During a flood event, there may be safer eddies or shallow waters where fish can ride out the worst; however, depending on the duration of the high flows, these areas may become isolated and not allow further downstream movement.

Mexican Spotted Owl Critical Habitat
This stocking location is within Mexican spotted owl (MSO) critical habitat (CH).

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.

<u>West Clear Creek</u>
Site Description

The proposed stocking site is 8.5 miles southeast of the town of Camp Verde and 8.5 river miles upstream of the mainstem Verde River. It is managed as an intensive use trout fishery with a high harvest rate. Approximately 0.5 miles of the creek is stocked at and slightly above Bullpen Campground. The lower reaches below the stocking site and near the Verde River confluence contain water diversions, gravel mines and does not contain suitable habitat for any fish to persist (Voeltz 2002).

West Clear Creek originates on the Mogollon Rim in the Coconino National Forest. The creek flows from east to west into the Verde River approximately three miles south of the town of Camp Verde. Approximately 15-18 miles of the creek is in the West Clear Creek Wilderness Area on the Coconino National Forest. The creek flows through a deep slot canyon with sheer rock cliff's and has many deep long pools.

There are two USFS campgrounds along West Clear Creek, Clear Creek Campground near Hwy 260 and Bullpen Campground about 6 miles upstream. Both provide access to West Clear Creek for recreational activity.

Management of Water Body
The only angler use data for West Clear Creek comes from the 2001 Statewide Angler Survey. According to the results of the mail survey 2,309 coldwater angler use days and 525 warmwater angler use days were estimated for West Clear Creek in 2001 (Pringle, 2004). The creek is managed primarily as an intensive use, put and take rainbow trout fishery with high harvest rates. Secondary fishery is a warm water fishery. Limits were removed on smallmouth bass, channel catfish and flathead catfish in the late 1990's to encourage the removal of undesirable warm-water nonnative fish by anglers to benefit native fish. Rainbow trout are only stocked near the Bullpen Campground.

Table 68. Stocking history in West Clear Creek

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Razorback sucker	1988	1988	1	10,000
Rainbow trout	1981	2008	40	29,474
Total			924	4,584,114

Proposed Action
The Department proposes to stock rainbow trout for the period covered by this consultation.

Catchable rainbow trout would be stocked multiple times annually during the spring (March-May) and fall (October-November); numbers of rainbow trout stocked may be from 0 – 6,000 annually.

Water Distribution / Connectivity
The head waters of West Clear Creek begin above the Mogollon Rim near the town of Clints Well. Pivot Rock Creek and Tom's Creek join with Clover Creek (which originates at Clover Springs) and flow into West Clear Creek Canyon west of Clints Well. Clover Creek joins Willow Creek, which originates north of Clints Well, in the canyon to form West Clear Creek. West Clear Creek flows through a steep rocky canyon with large deep pools until it opens into the Verde Valley near the town of Camp Verde at its confluence with the Verde River. All of the canyon reaches of West Clear Creek are perennial but flows are intermittent downstream of Clear Creek Campground where the creek crosses Highway 260, particularly during the summer months. A large waterfall (approximately 50 feet high) is located on the creek approximately 7 miles upstream of the Bullpen stocking site.

Fish Movement
Fish can move freely downstream from the stocking sites to the Verde River when flows are significant enough to make a connection with the Verde River. Fish can also move freely upstream from the stocking sites until they reach the waterfall approximately 7 miles upstream of the Bullpen stocking site.

Community Description
Historically, roundtail chub were believed to be the species of chub occupying West Clear Creek. More recently they have been reconsidered to be headwater chub. Throughout this section, roundtail chub as a name may appear based on historic use of the nomenclature, but the fish are still considered to be headwater chub today.

West Clear Creek continually boasts stable populations of both roundtail chub and nonnative salmonid species. Voeltz (2002) reported "the earliest identified collection of roundtail chubs from West Clear Creek was made in 1937 by Tarzwell, approximately 1 mile above its confluence with the Verde River. Additional collections of roundtail chubs from West Clear Creek were made in 1967, 1970, 1974, 1975, 1977, 1978, 1982, 1983 and 1992. Surveys were roundtail chubs were sampled from West Clear Creek were conducted in 1988, 1992, 1995, 1998, 2000". Voeltz goes on to summarize the results of the surveys conducted for the 2002 project. "Roundtail chubs were common during surveys conducted in summer of 2001 in upper West Clear Creek, upstream of Tramway Trail (C. Benedict, pers. comm.)." Voeltz gives West Clear Creek a status of "Stable – Threatened".

Voeltz summarized past sampling efforts to justify the roundtail chub status in West Clear Creek. Information provided in Minckley and Demarias (2000) indicated the West Clear Creek

population is *Gila robusta*. Brouder et al (2000) found roundtail chubs common during 1998-1999 at Bullpen campground (approximately 16 km upstream of the confluence) on lower West Clear Creek. During this period roundtail chubs were the most abundant species sampled. "The majority of fish collected at the Bullpen Campground site on West Clear Creek from 1998 through 1999 was native species. In 1998 and 1999, roundtail chub comprised 28.6% and 49.7%, respectively." A USFS employee reported catching chubs by hook and line in lower Willow Creek (headwater tributary) in 2001 (C. Benedict pers. comm.) Brouder et al. (2000) found multiple cohorts present during sampling in 1998 and 1999, with no age-0 chubs found during sampling in 1999. In the lower drainage the suitability to support aquatic species may be reduced due to residential development, grazing, and sand and gravel activities on private lands within one mile of the confluence with the Verde River (Girmendonk and Young 1997). Threats include nonnative fishes, crayfish, and water depletion at the extreme lower end of the creek.

Table 69. West Clear Creek Fish Composition 1994-1998 by Site Location. Downstream to Upstream

Species	**Site 2**	**Site 3**	**Campground**	**Site 4**	**Site 5**	**Falls**	**Cash**	**Tramway**
Speckled Dace	22	39	12	74	45		85	425
Sonora Sucker	1	118	13	32	39	1		
Desert Sucker	2	68	62	93	122	43	31	47
Roundtail Chub	30	21	214	104	28	36	25	33
Rainbow Trout				21		16	6	24
Longfin Dace		38		7				
Golden Shiner		15						
Bullhead		11	20	17	14			
Red Shiner		34						
Green Sunfish		4	1	2		3		
Brown Trout							3	4
Smallmouth Bass							8	
Fathead								1

Species	Site 2	Site 3	Campground	Site 4	Site 5	Falls	Cash	Tramway
Minnow								
Bluegill					2			

The results from the 2002 West Clear Creek Tramway Trail sampling data (West Clear Creek 2002b) indicate stable numbers of native fish. Native fish comprised 95.3% of the total catch (mostly speckled dace) with roundtail chub making up only 2.04% (3 individuals). Nonnative salmonids only comprised 2.04% of the total catch. The low numbers of the larger bodied fishes might be attributed to the inefficiency of the backpack electrofishing unit to effectively sample the deep and complex pools found within the reach.

The results from the 2002 West Clear Creek Bullpen Sampling data (West Clear Creek 2002a) indicate stable numbers of desert sucker (with roundtail chub and speckled dace present). Native fish comprised 66.66% of the total catch with desert sucker at 44.44%, roundtail chub at 8.33% (3 individuals), Sonora sucker at 2.78%, and speckled dace at 11.11%. Nonnative fishes comprised the remaining 33.33% with the majority being red shiner at 22% of the total catch. Three bullhead catfish and one green sunfish were collected.

The results from the 2004 West Clear Creek Trip Report (Rinker 2004) indicate stable numbers of both native fish and headwater chubs around Tramway Trail (upstream of the waterfall near the Clover Creek Willow Creek confluence). Native fish comprised 89.14% of the total catch with chubs making up 6.39% (20 individuals) of the total catch. Nonnative salmonids only comprised 0.64% of the total catch. Rinker describes how the low numbers of the larger bodied fishes might be attributed to the inefficiency of the backpack electrofishing unit to effectively sample the deep and complex pools found within the reach. Many chubs were observed in the deeper pools that were not sampled due to their depth.

The results of the 2005 West Clear Creek Trip Report (AGFD 2005) summarize sampling efforts in the lower portion of West Clear Creek near Bullpen Campground. 100% of the fish collected during this survey were nonnative of these 75% were smallmouth bass. Both bullhead catfish and green sunfish comprised the remaining 25%.

The results of the 2008 West Clear Trip Report (Rinker et al 2008) summarize sampling efforts in the lower portion of West Clear Creek from Bullpen Campground upstream approximately 5 miles. Only 27.52% of the fish collected were native desert suckers. The remaining 72.48% were nonnative fish with 42.20% smallmouth bass and 29.36% bullhead catfish. One green sunfish was also collected.

Consultation Species or Critical Habitat

Potential impacts to bald eagle, Chiricahua and northern leopard frogs, headwater chub, Mexican spotted owl, roundtail chub and Western yellow-billed cuckoo are discussed below. Potential downstream impacts to Colorado pikeminnow, Gila chub, northern Mexican and narrow-headed gartersnakes, razorback sucker and critical habitat, spikedace with critical habitat, Southwestern willow flycatcher and critical habitat and Western yellow-billed cuckoo are analyzed within the Middle Verde River complex analysis later in the document.

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 the 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.

Bald Eagle

Ladders Breeding Area is approximately 7.6 miles from West Clear Creek and is within the Bald Eagle DPS. Eagles were first observed in 1962 and were last observed 19 May, 2008. Nest watchers were able to observed the prey types and in some cases species that were delivered to the nest by the eagles. In 2008 fish accounted for 40%, mammals 20%, birds 12%, amphibians and reptiles 4%, and unknown 24%. Of the prey items further identified to species, there was one catfish and one sucker. Ladders Breeding Area productivity data shows that the nest was successful in 2007 with one nestling that died in the nest, failed in 2008 when a non-resident, subadult bald eagle entered the nest and took the nestling, and was occupied with the breeding pair exhibiting signs of pre-nesting activity but failed to lay eggs in 2009 (Jacobson et al. 2007, McCarty and Jacobson 2008, 2009). West Clear Creek does not currently have monofilament bins present.

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.

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.

Chiricahua Leopard Frog

Local Analysis: West Clear Creek is within the historical range of the Chiricahua leopard frog and the likelihood that frogs could be exposed to stocked fish in this buffered stocking complex is low. There are no historical records for Chiricahua leopard frogs at West Clear Creek; however, there are historical records for frogs from 16 sites within this complex, 14 of which are currently occupied. There have been 731 surveys at 193 sites across the three buffered complexes in the Middle Verde complex between 1914 and 2008, the majority of which are in the buffered stocking complex that includes West Clear Creek (Figure 78, AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS). The Middle Verde complex has been adequately surveyed and it is likely that Chiricahua leopard frogs occupy many stock tanks near the headwaters of Sycamore Canyon. Even during high flows or extreme storm events, it is very unlikely that stocked fish from West Clear Creek would swim downstream in the Verde River and upstream through several large diversion structures (including Pecks Lake diversion, Figure 73) to an intermittent stream in Sycamore Canyon and get into the headwaters where there are occupied frog sites (M. Rinker pers. comm.). Additionally, it is unlikely that frogs would disperse to lower Sycamore Canyon where fish that may have dispersed from the Verde River because it is below the elevational limit of the species (approximately 4,500 feet,) (Sredl 1997).

Broad Scale Analysis: The likelihood that Chiricahua leopard frogs could be exposed to dispersing fish in West Clear Creek is low. There are no records for Chiricahua leopard frogs outside the buffered complex where fish from West Clear Creek could disperse and the presence of nonnative fish and crayfish in the Verde River preclude their establishment or persistence there (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

Northern Leopard Frog

Local Analysis: Although West Clear Creek is within the historical range of the northern leopard frog, the likelihood that frogs could be exposed to stocked fish in West Clear Creek is low. There are no records for northern leopard frogs from West Clear Creek. There have been 731 surveys at 193 sites across the entire Middle Verde complex between 1914 and 2008, the majority of which were in the buffered stocking complex that includes West Clear Creek. There are historical records for northern leopard frogs from 30 sites within this complex; 26 of which are currently occupied by frogs (Figure 78, AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.). The Middle Verde complex has been adequately surveyed and it is likely that northern leopard frogs occupy the complex that includes West Clear Creek (AGFD Riparian

Herpetofauna Database; M. Sredl pers. comm.; HDMS). Susi MacVean (S. MacVean-unpublished data) has surveyed 71 sites within the buffered stocking complex regularly from 2005-2009 and as of 2009, had confirmed 25 sites occupied by northern leopard frogs. Additional data (2005-2008) from the Coconino National Forest confirm 25 of 247 surveys were positive for northern leopard frogs. Although northern leopard frogs occupy numerous sites within the buffered complex, fish stocked directly into West Clear Creek cannot disperse to occupied frog sites due to lack of water connectivity, nor is it likely for frogs to move into the stocked reach of West Clear Creek because it is over 13 miles away and exceeds the distance a northern leopard frog would likely disperse (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing fish in West Clear Creek is low. There are no records for northern leopard frogs outside the buffered complex where fish from West Clear Creek could disperse and the presence of nonnative fish and crayfish in the Verde River preclude their establishment or persistence there (AGFD Riparian Herpetofauna Database; M. Sredl pers. comm.; HDMS).

Headwater Chub

Headwater chub are believed to be the species of chub occupying the area of West Clear Creek above the waterfall (Schwemm 2006). Chubs in lower portions of West Clear are listed as roundtail chub but may be genetically influenced by headwater chub migrating over the waterfall down West Clear Creek along with roundtail chub migrating upstream out of the Verde River. The reach proposed for stocking of rainbow trout may be occupied by one or both species of chub. It is also occupied by smallmouth bass, yellow bullhead, mosquito fish, red shiner and green sunfish.

Potential Impacts

Potential impacts to chub could result from the predation on small (juvenile) headwater chub, larvae or eggs by stocked rainbow trout, competition for food or competition for space if headwater chub move downstream over the falls into the reach proposed for trout stocking. Rainbow trout are primarily insectivorous, but may consume small fish. Headwater chub do not appear to be very abundant in West Clear Creek in the reach proposed for stocking. This stocking reach is also occupied by several other competing and predatory warmwater nonnative species such as green sunfish, smallmouth bass, bullhead catfish and crayfish that occur independent of stocking actions.

Chance for exposure of headwater chub to rainbow trout stocked in the lower reach of West Clear Creek is limited because known distribution of headwater chub is mostly upstream of the stocked reach and the trout are only stocked seasonally and do not persist through the summer.

The exposure could result if chub move downstream into the stocked reach and into the population of other nonnative fishes.

In addition few trout were found in the sampling data. The results from the 2002 West Clear Creek Tramway Trail sampling data (West Clear Creek 2002b) indicate stable numbers of native fish. Native fish comprised 95.3% of the total catch (mostly speckled dace) with roundtail chub making up only 2.04% (3 individuals). Nonnative salmonids only comprised 2.04% of the total catch. The low numbers of the larger bodied fishes might be attributed to the inefficiency of the backpack electrofishing unit to effectively sample the deep and complex pools found within the reach.

The results from the 2004 West Clear Creek Trip Report (Rinker 2004) indicate stable numbers of both native fish and headwater chubs around Tramway Trail (upstream of the waterfall near the Clover Creek Willow Creek confluence). Native fish comprised 89.14% of the total catch with chubs making up 6.39% (20 individuals) of the total catch. Nonnative salmonids only comprised 0.64% of the total catch. Rinker describes how the low numbers of the larger bodied fishes might be attributed to the inefficiency of the backpack electrofishing unit to effectively sample the deep and complex pools found within the reach. Many chubs were observed in the deeper pools that were not sampled due to their depth.

Roundtail Chub

Headwater chub are believed to be the species of chub occupying upper and middle portions of West Clear Creek (Schwemm 2006) upstream of the waterfall. Chubs in lower portions of West Clear are listed as roundtail chub but may be genetically influenced by headwater chub migrating down West Clear Creek along with roundtail chub migrating upstream out of the Verde River. The reach proposed for stocking of rainbow trout may be occupied by one or both species of chub. It is also occupied by smallmouth bass, yellow bullhead, mosquitofish, red shiner and green sunfish.

Potential Impacts

Potential impacts to roundtail chub could result from the predation on (juvenile) roundtail chub, larvae or eggs by stocked rainbow trout, competition for food or competition for space. Rainbow trout are primarily insectivorous, but may consume small fish. Based on recent survey data, roundtail chub has declined in the reach and do not appear to be very abundant in West Clear Creek in the reach proposed for stocking. This stocking reach is occupied by several other competing and predatory warmwater nonnative species such as green sunfish, smallmouth bass, bullhead catfish and crayfish that occur independent of stocking actions.

Exposure of roundtail chub to stocked species is likely to occur based on the proximity and timing of the stocking action and the known distribution of roundtail chub.

Western Yellow-billed Cuckoo

Suitable breeding and/or foraging habitat exists along the stocking reach and the creek. Western yellow billed cuckoo have been documented at the downstream end of the reach of West Clear Creek proposed for stocking with rainbow trout. In 2004, a documented occurrence in the stocking reach in the area of the campground was recorded with additional occurrences at the confluence with the Verde River 2004 and 2006. Breeding birds were recorded at the West Clear Creek campground. Potential impacts are identified below and described in greater detail in the methodology and criteria contained in Chapter 3.

Potential impacts

There may be some limited amount of habitat degradation from anglers using or creating new trails to access the stocking site.

Middle Verde River

Site Description

For purposes of this consultation, the middle Verde River is defined as that portion of the Verde River beginning at the Diversion known locally by several different names including Pecks Lake, TAPCO or Brewers Tunnel (river-mile 48.5) and terminating at Childs (river-mile 106.5).

The stocking reach includes approximately 32 miles of river from below Pecks Lake Diversion downstream to near the confluence of West Clear Creek. Land ownership is various National Forests (Prescott, Coconino and Tonto), State Land Department, State Parks, and various private entities. The area includes the communities of Clarkdale, Cottonwood, and Camp Verde. The stocking area is also adjacent to lands of the Yavapai Apache Tribe. There are multiple stocking locations along the reach which were originally chosen for ease of access for both the hatchery vehicles and anglers. The five trout stocking sites in descending order are Tuzigoot Bridge crossing, vicinity of Dead Horse Ranch State Park, vicinity of Cottonwood Riverside Park, Bignotti Beach (Thousand Trails) and the Highway 260 crossing (formerly known as the White Bridge) in Camp Verde.

Management of Water body

The stockings support a high-use winter trout fishery. An intensive creel survey was conducted from 1996 to 2003. Initially harvest rates were estimated to be fairly high at around 60%. However, as creel techniques and analysis became more refined, harvest rates came down and were estimated in the 40% range by 2000. Evaluations of the creel data in 2000 reflected dropping catch rates at certain sites. In addition changes in river flows, and access points due to flooding could greatly influence availability of trout for anglers. Because of this, the Region began reducing the number of trout requested and also cancelled stockings during high runoff events. By 2006, trout stocked had been cut almost in half. In contrast, because of newly created

lagoons, stockings at Deadhorse Ranch State Park increased to supplement the new trout fishing opportunity for the area.

Access is maintained by Arizona State Parks at some points along the Verde River Greenway. Extensive trails, parking areas and signage currently exist throughout the Verde Valley. Canoeing guides and maps also exist to direct recreational boaters, hikers and others on locations to recreate.

The upper and middle Verde River has historically been managed as a self-sustaining warm-water fishery with a seasonal trout stocking program through the Verde Valley. Initial stockings of nonnative sport fish species and support forage species began in the 1940's. A stocking history of the middle Verde River is listed below. The Department began stocking rainbow trout in the middle Verde River in 1989. By 1997, a more comprehensive trout-stocking program had evolved with 30,000 catchable sized trout stocked in 5 different locations. From 1999 to 2001 over 40,000 trout were stocked at these sites. In addition, West Clear Creek, Wet Beaver Creek and lower Oak Creek are also stocked in fall and spring each year. In 1996 because of concerns on how trout may affect spikedace; the Department began tagging trout to be stocked into the middle Verde. Coded wire tags were used in various tagging locations. Research into potential impacts of rainbow trout stocking on spikedace began. All trout were and still are stocked downstream of the Tuzigoot Bridge. Immediately upstream of the Tuzigoot Bridge is a diversion dam that feeds Peck's Lake. The Tuzigoot Diversion or Peck's Lake Diversion Dam is a barrier to upstream fish movement. Studies were done by the Department's Region III fisheries personnel, to monitor upstream movement of stocked rainbow trout, the presence or absence of larval native fish below the Tuzigoot Diversion and creel surveys were performed to monitor the harvest of stocked rainbow trout (Liles 1996, Kubacki 1998). Results from these studies indicated that there was no rainbow trout movement upstream and no larval threatened or endangered native fishes were floating into trout stockings areas during stocking times. The results of intensive creel surveys showed that between 60 to 70% of the stocked rainbow trout were harvested within two weeks of stocking. Stocked rainbow trout have been sampled in the river though July. However data suggest stocked trout do not persist through the end of summer. Temperatures over 75°F regularly occurred after July according to temperature data loggers installed and monitored by United States Forest Service (USFS). Rainbow trout do not persist above their incipient lethal temperature of 75°F (Raleigh et al. 1984). As a result of these studies the Service determined trout stockings would have no effect on spikedace or razorback sucker in the Verde River (Langley 1999). Other information on rainbow trout effects to razorback sucker indicate that stocked rainbow trout can prey upon larval razorback sucker in Lake Mohave (Mueller 1993) and in a laboratory setting (Carpenter and Mueller 2008) as well as on other native fishes in the Gila River (Propst et al 1998).

Table 70. Stocking history in the Middle Verde River

Species	First Year	Last Year	Num. of Stockings	Num. Stocked
Colorado Pikeminnow	1988	1992	3	60,005
Northern pike	1968	1968	1	44
Razorback sucker	1987	1994	6	70,107
Total			10	130,156

Table 71. Total numbers of rainbow trout stocked in the Middle Verde River since 1999.

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Rainbow trout	40,500	40,501	36,832	30,060	22,631	33,766	13,605	26,640	24,510	21,671

Table 72. Creel Summaries for Middle Verde River trout fishery.

Place*	Creel Days	Num. of Anglers	Anglers/ Day	Hours	Success	Rbt Caught	Rbt/ Hour	Rbt/ angler
1995- 1996 Summary								
1	39	116	2.97	155.53	53	160	1.03	1.38
2	39	80	2.05	109.60	43	180	1.64	2.25
3	39	137	3.51	172.88	66	286	1.65	2.09
4	39	133	3.41	210.68	64	189	0.90	1.42
5	39	253	6.49	388.9	119	342	0.88	1.35
Totals	39	719	18.44	1037.6	345	1157	1.12	1.61
1996- 1997 Summary								
1	58	136	2.34	210.13	43	84	0.40	0.62
2	57	89	1.56	81.57	40	160	1.96	1.80
3	57	96	1.68	80.78	43	149	1.84	1.55
4	57	83	1.46	64.15	19	44	0.69	0.53
5	58	121	2.09	98.77	31	64	0.65	0.53
Totals	57.40	525	9.15	535.40	176	501	0.94	0.95
1997- 1998 Summary								
1	60	120	2	189.17	55	143	0.76	1.19
2	57	42	0.74	56.83	22	80	1.41	1.90

3	57	60	1.05	102.33	25	131	1.28	2.18
4	59	79	1.34	111.50	41	119	1.07	1.51
5	60	147	2.45	170	46	110	0.65	0.75
Totals	58.60	448	7.65	629.83	189	583	0.93	1.30
1998- 1999 Summary								
1	54	92	1.70	133.42	46	120	0.90	1.30
2	52	66	1.27	93.33	35	143	1.53	2.17
3	55	102	1.85	205.83	74	343	1.67	3.36
4	55	129	2.35	252.58	61	194	0.77	1.50
5	55	146	2.65	224.85	50	154	0.68	1.05
Totals	54.20	535	9.87	910.02	266	954	1.05	1.78
1999- 2000 Summary								
1	61	130	2.13	175.08	62	159	0.91	1.22
2	57	47	0.82	89.50	34	177	1.98	3.77
3	58	133	2.29	245.42	69	321	1.31	2.41
4	60	135	2.25	291.33	71	226	0.78	1.67
5	61	107	1.75	125.50	49	138	1.10	1.29
Totals	59.40	552	9.29	926.83	285	1021	1.10	1.85
2000- 2001 Summary								
1	62	111	1.79	146.82	48	107	0.73	0.96
2	61	28	0.46	32.75	16	82	2.50	2.93
3	61	131	2.15	209.83	82	297	1.42	2.27
4	62	121	1.95	155.08	38	125	0.81	1.03
5	61	77	1.26	84.18	14	25	0.30	0.32
6	45	630	14	973.42	353	1277	1.31	2.03
Totals	58	987	17.02	1602.1	551	1913	1.19	1.94

*1=Tuzigoot Bridge, 2= vicinity of Dead Horse Ranch State Park, 3=vicinity of Cottonwood Riverside Park, 3=Bignotti RM86 and 4 =White Bridge Crossing (Hwy 260) below Camp Verde. Site 6 was added in 2001 as creel data collection began at Deadhorse Ranch State Park lagoon.

Though the Verde River is an extremely important resource for native aquatic species conservation, human occupation and development within this reach (diversions, groundwater pumping, housing and business development etc.) dictate it is best managed as a recreational fishery using existing nonnative and native sport fish. This reach would be critical in balancing the dual Department mandate to enhance and conserve both native aquatic species as well as enhance and conserve sport fishing in Arizona.

Proposed Action

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

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

Water Distribution / Connectivity
This reach harbors several significant water diversion structures in the river channel that form barriers to upstream fish movement. These barriers are flow dependant but in low water times, are complete barriers to movement and remove nearly all surface flow from the main channel. The first of these is the Cottonwood Diversion at river mile 50.2. The next complete barrier during low water is Woods Ditch at river mile 71.6. Various other diversions exist in this stretch of the Verde but none prevent downstream movement of fishes in all life stages. Several main tributaries contribute to the Verde in this stretch including Wet Beaver Creek, Oak Creek, and West Clear Creek. No known barriers exist on these that would prevent upstream movement of fishes out of the Verde River and into the tributary.

Fish Movement
Refer to previous discussion above in the Water Distribution / Connectivity.

Community Description
The middle Verde River from the Peck's diversion to Beasley Flats has been sampled every 3 years since 2003. The stretch of the middle Verde from Beasley Flats to Childs had been sampled by the Region VI Fisheries Program prior to the year 2000 (Table 73, Table 74 and Table 75) (Jahrke and Clark 1999). The Region III Fisheries Program has surveyed that stretch in 2002, 2006 and 2009 (Table 76 and Table 77). Results from those surveys indicate this reach of river supports populations of desert sucker, Sonora sucker, roundtail chub, longfin dace, smallmouth bass, green sunfish, yellow bullhead, channel catfish, common carp, red shiner, bluegill, flathead catfish and largemouth bass. Other data are available in the AGFD Native Fish database, which adds the following species to the historic collections: rock bass, mosquitofish and Colorado pikeminnow. Black and white crappie were known from lakes in the watershed throughout the mid-late 1900's (Peck's, Watson and Bartlett lakes) but were not collected from the river. Northern Pike are also locally known to occur in Peck's Lake though no samples have confirmed pike presence.

The Region III Fisheries Program with assistance from Region VI, Prescott National Forest, local Wildlife Manager and Regional Law Enforcement Program Manager surveyed the Verde River from Beasley Flat to the Childs Power plant by electrofishing in May 2002. A Smith-Root 5.0 GPP mounted in a canoe was used to sample fishes in available habitats for 16.9 miles of stream. Eight sampling efforts were done in an average of one per every two miles of river. 203.13 minutes of effort were expended to sample 363 fishes of 13 species. This resulted in a catch per unit effort (CPUE) of 1.788 fish per minute. Unusually low base flow in the river (100 cfs @ Chasm Creek Gage) that year resulted in a reduced number of sample efforts. Notable

results were the collections of Colorado pikeminnow below Beasley Flat and razorback sucker just upstream of the former Childs Power plant. All were of sizes stocked the previous winter. Also worth noting was the apparent, continued abundance of desert and Sonora sucker (adults), and the lack of large flathead catfish. The following is a breakdown of relative abundance and percent of sample by species: largemouth bass 103 (28%), red shiner 54 (15%), flathead catfish 46 (13%), green sunfish 40 (11%), smallmouth bass 37 (10%), Sonora sucker 33 (9%), desert sucker 19 (5%), channel catfish 16 (4%), Colorado pikeminnow 6 (2%), razorback sucker 3 (1%), bluegill 3 (1%), roundtail chub 1 (.5%), common carp 1 (.5%). Numbers reported are from fish measured or enumerated by the survey crew. Common carp were neither netted or measured and were far more numerous than these numbers suggests. A more extensive data examination and summary is currently in progress. Data from other surveys in the middle Verde River can be found in Table 76.

Table 73. Summary of Region VI electrofishing data from the Verde River, Beasley Flat to Childs reach, 1997-1998.

Parentheses indicate relative abundance as a percent of total. Brackets indicate CPUE reported as fish per minute.

SPECIES	**1997 [440.7 minutes]**	**1998 [134.2 minutes]**
razorback sucker	3 (0.7) [07]	-
Colorado pikeminnow	6 (1.4) [0.01]	2 (0.7) [0.01]
desert sucker	3 (0.7) [0.07]	12 (6.6) [0.09]
Sonoran sucker	107 (25.7) [0.2]	47 (30.0) [0.4]
roundtail chub	7 (1.7) [0.02]	2 (1.1) [0.01]
largemouth bass	12 (2.8) [0.03]	13 (7.3) [0.1]
smallmouth bass	8 (1.9) [0.02]	14 (7.7) [0.1]
channel catfish	54 (13.0) [0.1]	12 (6.6) [0.09]
flathead catfish	36 (8.7) [0.08]	14 (7.7) [0.1]
carp	150 (36.2) [0.3]	58 (32.0) [0.4]
green sunfish	29 (7.0) [0.07]	6 (3.3) [0.05]
yellow bullhead	1 (0.2) [02]	-
walleye	-	2 (0.7) [0.01]
TOTAL	416 [0.9 fish/minute]	181 [1.3 fish/minute]

Table 74. Summary of Region VI trammel and gill netting data from the Verde River, Beasley Flat to Childs reach, 1997-1998.

Parentheses indicate relative abundance. Brackets indicate CPUE. A net unit (nu) is defined as a single net regardless of type or size deployed for 12 hours.

SPECIES	1997 [14.8 nu]	1998 [1.7 nu]
Sonoran sucker	2 (9.1) [0.1]	2 (33.3) [1.2]
smallmouth bass	4 (18.2) [0.3]	-
channel catfish	4 (18.2) [0.3]	1 (16.7) [0.6]
flathead catfish	8 (36.3) [0.5]	3 (50.0) [1.8]
carp	4 (18.2) [0.3]	
TOTAL	22 [1.5 fish/nu]	6 [3.5 fish/nu]

Table 75. Summary of Region VI seining data from the Verde River, Beasley Flat to Childs reach, 1997-1998. Parentheses indicate relative abundance. Brackets indicate CPUE.

SPECIES	1997 [202.6 M^2]	1998 [930.2 M^2]
desert sucker	7 (0.7) [0.03]	-
Sonoran sucker	7 (0.7) [0.03]	-
roundtail chub	3 (0.3) [0.01]	-
longfin dace	1 (0.1) [05]	-
largemouth bass	120 (11.6) [0.6]	4 (0.4) [04]
smallmouth bass	12 (1.2) [0.06]	1 (0.1) [01]
carp	-	1 (0.1) [01]
green sunfish	2 (0.2) [0.01]	6 (0.6) [06]
red shiner	768 (73.6) [3.8]	1,004 (97.9) [1.1]
mosquitofish	120 (11.6) [0.6]	9 (0.9) [0.01]
TOTAL	1,033 [5.1 fish/M^2]	1,025 [1.1 fish/M^2]

Table 76. Region III electrofishing data from Middle Verde River 1998-2009, including species and total numbers sampled by year.

Years prior to 2000 do not include the stretch from Beasley Flat to Childs.

Species	1998	2000	2002	2003	2004	2006	2009	Totals
yellow bullhead		1		4	11	13	10	39
rock bass						1	15	
Sonoran sucker	268	178	33	36	19	86	73	693
sucker hybrid				107				107
carp	71	478	1	8	23	145	86	812

Species	1998	2000	2002	2003	2004	2006	2009	Totals
red shiner	182	35	44	470	481	461	1095	2768
mosquitofish					5	5		10
channel catfish	3	22	16	1	14		24	80
green sunfish	4	24	37	27	87	61	63	303
bluegill		3	3	7		15	42	70
largemouth bass	27	44	91	198		208	191	759
rainbow trout		1		3			1	5
desert sucker	175	98	19	39	25	138	51	545
flathead catfish	11	177	44	10	10	15	17	284
razorback sucker		8	10			1		19
Totals	741	1069	298	910	675	1149	1668	6494

Table 77. Region III seine netting from the Middle Verde River 2003-2009, including species and total numbers sampled by year.

Species	2003	2006	2009	Totals
yellow bullhead			3	3
Sonoran sucker			1	1
hybrid sucker	106			106
carp	1			1
red shiner	56	34	650	740
mosquitofish	57	312	44	413
roundtail chub	8		8	16
green sunfish		1		1
bluegill			15	15
smallmouth bass			1	1
largemouth bass	133	18	3	154
desert sucker			8	8
Totals	361	365	733	1459

Consultation Species or Critical Habitat

Bald Eagle

Oak Creek Breeding Area is approximately 1.0 miles from Verde River Middle and is within the Bald Eagle DPS. The eagles were first observed in 2002 and were last observed 14 April, 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Oak Creek Breeding Area productivity data shows that the nest was successful in 2007

with one nestling found dead below the nest, was successful in 2008, and failed in 2009 when a nestling was found injured on the ground and taken to rehabilitation but was deemed not releasable (Jacobson et al. 2007, McCarty and Jacobson 2008, 2009).

Beaver Breeding Area is approximately 0.13 miles from the Verde River Middle and is within the Bald Eagle DPS. The eagles were first observed at the breeding area in 2006 and were last observed at the breeding area in 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Beaver Breeding Area productivity data shows that the nest was successful in 2006, 2007, 2008, and 2009 (Jacobson et al 2006, 2007; McCarty and Jacobson 2008, 2009).

TAPCO Breeding Area is approximately 2.6 miles from the Verde River Middle and is within the Bald Eagle DPS. The eagles were first observed in 2009. Nest watchers have not been monitoring the breeding area so the prey base specifics are largely unknown. Tapco Breeding Area productivity data shows that the nest failed in 2009 (McCarty and Jacobson 2009). The Verde River Middle does not currently have monofilament bins present.

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.

Continued stocking of rainbow trout into the middle Verde River may have adverse effects to the bald eagle prey base diversity that is important for the successful fledging of eaglets from this BA. The additive effect of rainbow trout predation on larval suckers to that from existing warm water fish populations is unknown. Alternatively, the benefit of an additional forage species through stocking of rainbow trout is also unknown.

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.

MIDDLE VERDE SUB-WATERSHED ANALYSIS

Water Distribution / Connectivity
The major perennial streams contributing to the middle Verde River include: Verde River, Sycamore, Oak and Beaver Creeks. Hell Canyon is a major ephemeral stream with other smaller ephemeral washes that also feed into the middle Verde River. Described below is a summary of connectivity between all of the proposed stocking sites (with exception of Stoneman as it is a

closed system) with the middle Verde River. Refer to the individual sections for detailed information.
Oak Creek has permanent flow from its beginning near Sterling Springs Hatchery downstream to its confluence with the Verde River downstream of the town of Cornville.

Wet Beaver Creek flows downstream to the area near McGuireville where it joins Dry Beaver Creek to form Beaver Creek which flows to the Verde River thru Camp Verde. Beaver Creek is usually dry during the summer because of water diversions in the Camp Verde area.

Deadhorse Lake receives water from the middle Verde River when the Hickey Ditch is operable and the water is used for the upper lagoon through a canal with large drop and concrete spillway.

Runoff from Mingus Lake follows ephemeral drainages 12 miles through Gaddes and Black Canyons to the confluence with the Verde River.

Huffer Lake spill flows into Clover Creek (A major tributary of West Clear Creek).

West Clear Creek flows through a steep rocky canyon with large deep pools until it opens into the Verde Valley near the town of Camp Verde at its confluence with the Verde River.

Fish Movement
The potential impacts of stocking rainbow trout into the middle Verde River are similar to, and cannot with certainty be separated from, the potential impacts of stocking rainbow trout in Oak Creek, Wet Beaver Creek, Mingus Lake, Huffer Lake or West Clear Creek. However, the potential for the impacts to occur are more certain for the stocking action into the middle Verde River as compared to the other stocking sites. The probability of transport of rainbow trout out of the other stocking sites cannot be accurately determined, but is expected to occur at a much lower frequency, with a lower magnitude and for a shorter duration than the occurrence of rainbow trout in the middle Verde River resulting from their direct stocking there. Stocking of fish species other than trout in this complex are not expected to access the mainstem of the Verde River because they are all closed systems.

Middle Verde reach harbors several significant water diversion structures in the river channel that form barriers (Cottonwood diversion and Woods Ditch) to upstream fish movement. These barriers are flow dependant but in low water times, are complete barriers to movement and remove nearly all surface flow from the main channel. Various other diversions exist in this stretch of the Verde but none prevent downstream movement of fishes in all life stages.

In Oak Creek, fish can move freely throughout the system with a low flow natural barrier to potentially prevent upstream migration present at Grasshopper Point (refer to previous discussion within Oak Creek).

In Wet Beaver Creek, Fish can move freely throughout the system with small diversion on Walker Creek that appears to be an effective fish barrier to upstream movement since no nonnative fish have been caught during surveys in Walker Creek above the diversion (refer to previous discussion within Wet Beaver Creek).

Deadhorse Lake has no upstream movement of fishes between lagoons, only downstream movement of larval and small lifestages of fish is possible from upper lagoon to lower lagoon within the Park.

It would be possible for fish in Mingus Lake to move downstream out of the lake into drainages leading to the Verde River; however, this would be very rare as the lake does not maintain high water levels despite the liner installed in 1996 (refer to previous discussion for Deadhorse Lake).

Fish can move downstream of Huffer Lake via the culvert under Highway 87 eventually to West Clear Creek (refer to previous discussion for Huffer Lake).

In West Clear Creek, fish can move freely downstream to the Verde River, when flows are significant enough to make a connection. Additionally, fish can also move freely upstream from until they reach the waterfall approximately 7 miles upstream of the Bullpen stocking site (refer to previous discussion within West Clear Creek).

Community Description

The reach of the middle Verde River supports populations of desert sucker, Sonora sucker, roundtail chub, longfin dace, smallmouth bass, green sunfish, yellow bullhead, channel catfish, common carp, red shiner, bluegill, flathead catfish and largemouth bass. Other data are available in the AGFD Native Fish database, which adds the following species to the historic collections: rock bass, mosquitofish and Colorado pikeminnow. Black and white crappie were known from lakes in the watershed throughout the mid-late 1900's (Peck's, Watson and Bartlett lakes) but were not collected from the river. Northern Pike are also locally known to occur in Peck's Lake though no samples have confirmed pike presence. Threadfin shad have been documented from the Verde River downstream of this reach, but no records exist for their presence in the watershed upstream of the East Verde confluence. Refer to the previous discussion for the middle Verde River for detailed information and survey results.

Consultation Species or Critical Habitat

Potential impacts to Chiricahua and northern leopard frogs, Colorado pikeminnow, Gila chub and critical habitat, headwater chub, northern Mexican and narrow-headed gartersnakes, razorback sucker and critical habitat, roundtail chub Southwestern willow flycatcher and critical habitat, spikedace with critical habitat and Western yellow-billed cuckoo are discussed below.

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 the 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. The potential impacts from Mingus Lake, Wet Beaver Creek, Deadhorse Ranch State Park Lagoons and the Middle Verde River discussed below. Refer to Oak Creek Stoneman, Huffer Lake and West Clear Creek for site specific analysis.

Northern Mexican and narrow-headed 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.

Western Yellow-Billed Cuckoo

Several documented occurrences for cuckoo's are along the middle Verde River and entire Verde River Valley and its tributary streams from the headwaters to Horseshoe Lake. Several occurrences for migratory and breeding birds have been documented along the middle Verde River. Several occurrence records exist at Tavasci Marsh, Peck's Lake and along the Verde River, about 1 mile to the northwest of the lake. Suitable nesting habitat may exist in riparian gallery forests along the Verde River throughout this reach. Breeding birds have been documented near the confluence at Oak Creek and West Clear Creek with the Verde River. Cuckoos arrive on breeding grounds beginning in June; the earliest egg reported in Arizona is June 15. Nesting activity continues through August and frequently into September (Corman and Magill (2000). They also documented nests in four different tree species: Salt Cedar *Tamarix spp.*, Arizona alder, Fremont cottonwood, and Goodding willow. Nest heights varied between 2.5 – 12.2 m with a mean of 5.2 m. Nest height data indicates that cuckoos use vegetation taller and older.

Potential impacts are identified below and described in greater detail in the methodology and criteria contained in Chapter 3.

Potential Impacts

Exposure between anglers pursuing the stocked rainbow trout and cuckoos may occur at some point over the life of this consultation. However, these interactions are not expected to result often because of the timing of the arrival of cuckoos in late May and the cessation of trout stocking by March 31.

There may be some limited amount of habitat degradation and some amount of disturbance to nesting from anglers using or creating new trails to access the stocking site. Please refer to site specific analysis for identification of habitat and/or disturbance impacts.

Potential impacts to migrant cuckoos can occur statewide and are most frequently found in the riparian zones along aquatic habitats (rivers, creeks, etc.), it is difficult to identify areas where they could not occur during migration. Additionally, the habitat requirements for migrant cuckoos are not as specific as nesting birds and specific stopover locations used are unpredictable in timing, duration, location, and abundance.

Southwestern Willow Flycatcher and Critical Habitat

The middle Verde River reach occurs within designated critical habitat and a documented occurrence in 2004 was recorded downstream within the stocked reach near the confluence at Gaddis Wash and upstream in the stocking reach from 1993-95-96, 1.5 miles upstream of Deadhorse Lake. An occurrence was also documented along the Verde River near Gaddis Wash. Deadhorse Lake and the middle Verde River reach are within designated critical habitat for the flycatcher.

Potential impacts are identified below and described in greater detail in the methodology and criteria contained in Chapter 3.

Potential Impacts

The primary stocking and angling actions in the Verde Valley would primarily overlap the time when breeding flycatchers are on their wintering grounds in central and northern South America. This time frame would also occur when tree species that flycatchers rely upon are mostly dormant. However, there is some warm water fish stocking at Dead Horse State Park during the flycatcher's breeding season.

There may be some limited amount of habitat degradation from anglers using or creating new trails to access the stocking site.

Impacts to migrant willow flycatchers can occur statewide and are most frequently found along aquatic habitats (rivers, creeks, etc.), it is difficult to identify areas where willow flycatchers could not occur. Additionally, the habitat requirements for migrant flycatchers are not as specific as nesting birds and specific stopover locations used are unpredictable in timing, duration, location, and abundance. In fact as noted before migrating passerines typically remain at one

location for only one to three days before continuing their journey to breeding or wintering grounds (Carlisle et al. 2009).

Critical Habitat
Similar to areas where suitable nesting habitat occurs, critical habitat occurs within the action area along the Verde River in the middle Verde Valley. However, because of specific methodology used to designate critical habitat, it does not mirror all the locations where suitable nesting habitat is found or where all territories have been located.

There may be some limited amount of habitat degradation from anglers using or creating new trails to access the stocking site.

Chiricahua Leopard Frog
Local Analysis: Mingus Lake, Wet Beaver Creek, Deadhorse Ranch State Park Lagoons and the Middle Verde River are not within the historical range of the Chiricahua leopard frog and there are no records for frogs at the Lakes, reaches or within the buffered complex (Figure 78 and Figure 85; AGFD Riparian Herpetofauna Database; M.Sredl, pers. comm.). Refer to Oak Creek, Huffer Lake and West Clear Creek for local analysis.

Broad Scale Analysis: Mingus Lake, Wet Beaver Creek, Deadhorse Ranch State Park Lagoons Middle and the middle Verde River are not within the range for the Chiricahua leopard frog and there are no records of frogs in areas where frogs can disperse (AGFD Riparian Herpetofauna Database; M.Sredl, pers. comm.). Refer to Oak Creek, Stoneman, Huffer Lake and West Clear Creek for broad scale analysis.

Northern Leopard Frog
Local Analysis: Mingus Lake, Wet Beaver Creek, Deadhorse Ranch State Park Lagoons and the Middle Verde River are not within the historical range of the northern leopard frog and there are no historical or recent records for frogs at the Lakes, reaches or within the buffered complex (Figure 78 and Figure 85; AGFD Riparian Herpetofauna Database; M.Sredl, pers. comm.). Refer to Oak Creek, Stoneman, Huffer Lake and West Clear Creek for local analysis.

Broad Scale Analysis: Mingus Lake, Wet Beaver Creek, Deadhorse Ranch State Park Lagoons and the Middle Verde River are not within the range for the northern leopard frog and there are no records of frogs in areas where frogs can disperse (AGFD Riparian Herpetofauna Database; M.Sredl, pers. comm.). Refer to Oak Creek, Stoneman, Huffer Lake and West Clear Creek for broad scale analysis.

Northern Mexican Gartersnake
Stocking complex analysis: Northern Mexican gartersnakes occupy the Middle Verde River buffered stocking complex, much of which lies within the current and historical range of the

species. In addition to recent northern Mexican gartersnake records from Oak Creek near the Page Springs and Bubbling Ponds state fish hatcheries, there are recent records of gartersnakes from the Middle Verde River near Dead Horse Ranch State Park. Northern Mexican gartersnakes are not known from Stoneman, Mingus, or Huffer Lakes, which likely lie outside the historical range of the species.

Northern Mexican gartersnakes have been documented within and downstream of the Oak Creek stocking reach and they are likely to be exposed to stocked rainbow trout (HDMS, AGFD Riparian Herpetofauna Database, V. Boyarski pers. comm.). Currently, northern Mexican gartersnakes are primarily found in and around the Page Springs and Bubbling Ponds state fish hatcheries with records from 1950, 1985-86, 2004, and 2007-09 (Rosen and Schwalbe 1988, Holycross et al. 2006, V. Boyarski pers. comm.). A 1975 record along Oak Creek near Midgley Bridge indicates that they once occurred farther upstream and potentially as far upstream as Manzanita Campground where an unvouchered observation was reported as recently as 1992 (Holycross et al. 2006, HDMS). Northern Mexican gartersnakes have also been observed downstream of the Oak Creek stocking reach. There are unvouchered, though reliable, records from Spring Creek which joins Oak Creek downstream of Page Springs and Bubbling Ponds fish hatcheries (Holycross et al. 2006). In addition to the community of nonnative fishes that persist along Oak Creek, bullfrogs and crayfish are also present (V. Boyarski pers. comm.).

Northern Mexican gartersnakes are not known to occupy Stoneman Lake or the surrounding area. The nearest gartersnake records are from Page Springs and Bubbling Ponds state fish hatcheries along Oak Creek and the Middle Verde River, both of which are >20 air miles away. Stoneman Lake is a closed basin and stocked yellow perch, bluegill, and redear sunfish would not be able to disperse downstream. Therefore, northern Mexican gartersnakes would not be exposed to fish stocked into Stoneman Lake.

There are no northern Mexican gartersnake records from Wet Beaver Creek or any of its tributaries, though the area has not been systematically surveyed for gartersnakes. Northern Mexican gartersnakes likely do not occupy the Wet Beaver Creek stocking reach, though they persist in the Verde River with a recent (2003) record near Camp Verde (HDMS). Northern Mexican gartersnakes persist in low numbers within the Middle Verde River, thus, the likelihood that gartersnakes would disperse from the Verde River into Wet Beaver Creek and encounter stocked rainbow trout is low. Additionally, the likelihood that stocked rainbow trout that disperse downstream would encounter northern Mexican gartersnakes is low because the snakes persist at low densities. Holycross et al. (2006) suggest that Wet Beaver Creek may provide suitable habitat for northern Mexican gartersnakes, however, a nonnative fish community, including spiny-rayed fishes, is present, thus making the habitat less suitable.

Northern Mexican gartersnakes occupy Dead Horse Ranch State Park and the neighboring Middle Verde River and gartersnakes would likely be exposed to rainbow trout, largemouth bass, black crappie, channel catfish, bluegill, and threadfin shad stocked into the State Park's lagoons (HDMS, AGFD Riparian Herpetofauna Database, V. Boyarski pers. comm.). In 2003, a northern Mexican gartersnake was observed from the Verde River immediately adjacent to Dead Horse Ranch State Park (Holycross et al. 2006, HDMS), and in 2004 in the park. The species has been observed above Tapco in 1987 (Holycross et al. 2006, HDMS), and along the Verde River near Cottonwood, approximately 3 river miles downstream of Pecks Lake in 2003 and 2004. The presence of crayfish and a community of nonnative fish, including spiny-rayed fishes, within the Verde River make the habitat less suitable for northern Mexican gartersnakes, but the species appears to persist in the Verde River below Clarkdale, at least in low numbers (Holycross et al. 2006, USFWS 2008, HDMS). Even though there is no surface water connection to the Verde River and stocked fish would not be able to disperse out of the lagoons, northern Mexican gartersnakes would be exposed to stocked fish because the snakes can move into the stocking sites.

Northern Mexican gartersnakes are not known to occupy Mingus Lake. Though there are records for the species along the Verde River near Dead Horse Ranch State Park, approximately 12 miles away through ephemeral drainages, northern Mexican gartersnakes are unlikely to disperse to the high elevation lake, which is considered outside its historical range in Arizona. If the lake spills, which occurs infrequently, northern Mexican gartersnakes within the Verde River are likely to be exposed to dispersing stocked rainbow trout, bluegill, and black crappie.

Northern Mexican gartersnakes are not known to occupy Huffer Lake or the surrounding area, nor is the high elevation habitat in and around the lake appropriate (Holycross et al. 2006). There is a single, possibly misidentified, northern Mexican gartersnake record (1970) from upper Willow Creek, a tributary to West Clear Creek, approximately 12 air miles from Huffer Lake (HDMS). Most of upper West Clear Creek and its tributaries, Tom's and Clover creeks, are deeply incised canyon habitat unsuitable for northern Mexican gartersnakes. There are no substantiated northern Mexican gartersnake records from West Clear Creek, although they occur in the Verde River. Therefore, even though stocked rainbow trout might disperse through the nearly 14 river miles to reach West Clear Creek if Huffer Lake spills, northern Mexican gartersnakes are not likely to be exposed to stocked fish escaping from Huffer Lake.

Northern Mexican gartersnakes do not likely occupy the West Clear Creek stocking reach, though they persist in the Verde River. Aside from the possibly misidentified gartersnake record listed above, there are no substantiated northern Mexican gartersnake records from West Clear Creek (HDMS). There is also a (*ca*. 1984) gartersnake record along the Verde River near the confluence with West Clear Creek (HDMS). There are no other northern Mexican gartersnake records from West Clear Creek or the proposed stocking reach, though no recent systematic

surveys for gartersnakes have been conducted in this area. Northern Mexican gartersnakes persist in low numbers within the Middle Verde River, thus, the likelihood that gartersnakes would disperse from the Verde River into West Clear Creek and encounter stocked rainbow trout is low. Additionally, the likelihood that stocked rainbow trout that disperse upstream or downstream would encounter northern Mexican gartersnakes is low because the snakes persist at low densities or do not occur (i.e., upstream). The presence of a nonnative fish community, including spiny-rayed fishes, makes the habitat along West Clear Creek less suitable for the species.

Northern Mexican gartersnakes occupy the Middle Verde River stocking reach and have been observed near Cottonwood, approx. 3 river miles downstream of Pecks Lake in 2003 and 2004, at Dead Horse Ranch State Park in 2004, and from the Verde River immediately adjacent to the park in 2003 (Holycross et al. 2006, HDMS). In 2003, a northern Mexican gartersnake was observed near Camp Verde, approx. 25 river miles downstream of Pecks Lake (HDMS). An extant population persists along Oak Creek, a tributary to the Verde River, at Page Springs and Bubbling Ponds fish hatcheries and gartersnakes may disperse downstream to the stocking reach. Additionally, there are 3 historical (1954-1986) northern Mexican gartersnake records downstream of the lower end of the stocking reach on the Verde River between West Clear Creek and the East Verde River (HDMS, Rosen and Schwalbe 1988). The presence of crayfish and a community of nonnative fish, including spiny-rayed fish, within the Verde River make the habitat less suitable for northern Mexican gartersnakes, but the species appears to persist in the Verde River below Clarkdale, at least in low numbers (Holycross et al. 2006; HDMS). Therefore, northern Mexican gartersnakes would be exposed to stocked fish because the snakes occupy the Middle Verde River.

Downstream analysis:
Northern Mexican gartersnakes occupy the Middle and Lower Verde River, which lies within the current and historical range of the species, although likely in low numbers (Holycross et al. 2006, HDMS). Downstream of the Middle Verde River buffered stocking complex, there are two unvouchered, though reliable, northern Mexican gartersnake observations. In 1986, a northern Mexican gartersnake was observed at the confluence of the East Verde and Verde Rivers and another at Horse Creek, north of Horseshoe Reservoir (Rosen and Schwalbe 1988, HDMS). The likelihood that northern Mexican gartersnakes downstream of the Middle Verde River buffered stocking complex would be exposed to stocked sport fish dispersing from the Oak Creek, Wet Beaver Creek, West Clear Creek and Middle Verde River stocking reaches, and Mingus and Huffer Lakes is low because gartersnakes persist in low numbers. Stoneman Lake is a closed basin and fish cannot escape. (See methods for discussion of habitat.)

Narrow-headed Gartersnake

Stocking complex analysis: Narrow-headed gartersnakes occupy the Middle Verde River stocking complex, though in most locations they persist in low numbers. Narrow-headed gartersnakes are found throughout Oak Creek Canyon above Sedona, however, they are not known from Stoneman, Mingus, or Huffer Lakes, which do not provide suitable habitat for the species.

Narrow-headed gartersnakes have been documented within and upstream of the Oak Creek stocking reach and they would be exposed to stocked rainbow trout (HDMS, AGFD Riparian Herpetofauna Database, V. Boyarski pers. comm.). Most of the observations (>80%) for this species have been documented from Oak Creek. There are historical and current narrow-headed gartersnake records along Oak Creek from above Sterling Springs state fish hatchery and the upper end of the stocking reach near Cave Springs Campground downstream to the Midgley Bridge area and the West Fork tributary to Oak Creek (Nowak and Santana-Bendix 2002, Brennan and Rosen 2009, HDMS, AGFD Riparian Herpetofauna Database). Historically, narrow-headed gartersnakes likely occupied all of Oak Creek, but habitat has been made less suitable by introduced fishes and crayfish. During surveys from 1999-2001, Nowak and Santana-Bendix (2002) did not find narrow-headed gartersnakes downstream of Oak Creek Canyon, though prior records and unvouchered (but reliable) observations exist from those areas. There are historical (1954, 1957) narrow-headed gartersnake observations from Oak Creek at Chavez Crossing in Sedona (Schwalbe and Rosen 1988). Nowak and Santana-Bendix (2002) also summarized additional narrow-headed gartersnake records and they include the following: "Fowlie (1965) lists one locality from 'Maury Ranch, 7 mi. S. of Sedona.' In addition, a snake in the Yavapai College collection was collected dead on SR 89 three miles west of Sedona on June 30, 1989, although it is possible this animal was originally collected elsewhere (Nowak and Santana-Bendix 2002). However, George Bradley, collection manager of herpetology at the University of Arizona, also collected a *T. rufipuntatus* two miles south of Sedona on SR 179 in February 1981 and noted the species in lower Oak Creek in the 1970's (pers. comm.). John Schreiber, park ranger at Red Rock State Park, informed us that a young *T. rufipunctatus* was found in an irrigation ditch in the park sometime in the early to mid-1990's (pers. comm.)." Though Nowak and Santana-Bendix (2002) suggest that narrow-headed gartersnake numbers below Oak Creek Canyon are low or the species is potentially extirpated, snakes could disperse downstream of Oak Creek Canyon and throughout the stocking reach. While suitable physical habitat exists for gartersnakes within the stocking reach, nonnative and predatory fishes, especially spiny-rayed sunfishes and catfishes, are also present.

Narrow-headed gartersnakes are not known to occupy Stoneman Lake, which does not provide suitable habitat for the species. The nearest gartersnake records are from Oak Creek Canyon, approximately 14 air miles away. Stoneman Lake is a closed basin and stocked yellow perch,

bluegill, and redear sunfish would not be able to disperse downstream. Therefore, narrow-headed gartersnakes would not be exposed to fish stocked into Stoneman Lake.

There are no narrow-headed gartersnake records from Wet Beaver Creek or any of its tributaries, though the area has not been systematically surveyed for gartersnakes recently. Narrow-headed gartersnakes likely do not occupy the Wet Beaver Creek stocking reach, though they persist in the Verde River. Narrow-headed gartersnakes persist in low numbers within the Middle Verde River, thus, the likelihood that gartersnakes would disperse from the Verde River into Wet Beaver Creek and encounter stocked rainbow trout is low. Additionally, the likelihood that stocked rainbow trout that disperse downstream would encounter narrow-headed gartersnakes is low because the snakes persist at low densities in the Verde. Holycross et al. (2006) suggest that Wet Beaver Creek might provide suitable habitat for narrow-headed gartersnakes, however, a nonnative fish community, including spiny-rayed fishes, persists and may make the habitat less suitable for the species.

There are no narrow-headed gartersnake records from Dead Horse Ranch State Park or its lagoons, which do not provide suitable habitat for the species. Narrow-headed gartersnakes are extant in the Upper Verde River and also occupy the Middle and Lower Verde River in low numbers (Holycross et al. 2006, HDMS). Since there is no surface water connection to the Verde River and stocked fish would not be able to disperse out of the lagoons, narrow-headed gartersnakes would not be exposed to those stocked fish.

Narrow-headed gartersnakes are not known to occupy Mingus Lake, which does not provide suitable habitat for the species. Though narrow-headed gartersnakes persist in the Upper Verde River and may occur in low numbers along the Middle Verde River, the species would not disperse through approximately 12 miles of ephemeral drainages from the Verde River to the high elevation lake. If the lake spills, which occurs infrequently, stocked rainbow trout, bluegill, and black crappie can disperse to the Middle Verde River and then move upstream and downstream. But, because densities of narrow-headed gartersnakes in the Verde are low, the likelihood that narrow-headed gartersnakes would be exposed to dispersing fish stocked into Mingus Lake is low.

Narrow-headed gartersnakes are not known to occupy Huffer Lake or the surrounding area, which does not provide suitable habitat for the species. The unsubstantiated narrow-headed gartersnake record reported in HDMS from Baker Lake is likely a misidentification because the sinkhole pond does not provide suitable habitat for the species. Holycross et al. (2006) also reported on an apparent narrow-headed gartersnake record from Pine Creek and provided this analysis: “specimens from ‘Payson’ and ‘Pine’….might have been collected from the East Verde River and Pine Creek respectively, but are not plotted due to the vague locality information.” Additionally, Holycross et al. (2006) surveyed for gartersnakes in Pine Creek upstream and

downstream of Tonto Bridge State park in 2003 and 2004, but found no narrow-headed gartersnakes. It is highly unlikely that narrow-headed gartersnakes that might be in Pine Creek would surmount the Mogollon Rim and move overland to Huffer Lake. Also, there are no records of narrow-headed gartersnakes from West Clear Creek, into which Huffer Lake eventually drains, or its tributaries (HDMS). Even though stocked rainbow trout could disperse through nearly 14 river miles to reach West Clear Creek if the lake spilled, narrow-headed gartersnakes would not be exposed to those stocked fish.

Holycross et al. (2006) suggest that West Clear Creek may provide suitable habitat for gartersnakes, though nonnative fishes, including spiny-rayed fishes, are present. Narrow-headed gartersnakes do not likely occupy the West Clear Creek stocking reach, nor are there any records of the species from elsewhere in West Clear Creek or its tributaries (HDMS). As described above, the narrow-headed gartersnake record from Baker Lake was likely misidentified. If narrow-headed gartersnakes persist in Pine Creek, it is highly unlikely that they would surmount the Mogollon Rim and move overland into the West Clear Creek stocking reach. Narrow-headed gartersnakes persist in low numbers within the Middle Verde River, thus, the likelihood that gartersnakes would disperse from the Verde River into West Clear Creek and encounter stocked rainbow trout is low. However, the gartersnakes that persist in these areas would be exposed to dispersing stocked rainbow trout.

Narrow-headed gartersnakes occupy the Middle Verde River, though likely in low numbers. There is a 1987 gartersnake record from the Verde River at The Falls, nearly 12 river miles downstream of the lower end of the proposed stocking reach (HDMS). There are also recent verified narrow-headed gartersnake records from the Upper Verde River at Bear Siding (1996, 2000) and Mormon Pocket between Perkinsville and the Verde River confluence with Sycamore Creek (2001), and a photo vouchered 1988 record from north of Tapco (Holycross et al. 2006, HDMS, T. Jones pers. comm.). Holycross et al. (2006) surveyed extensively for gartersnakes in 2004 and 2005, but found no narrow-headed gartersnakes along the Middle Verde River. The community of nonnative fishes, including spiny-rayed fishes, and crayfish present throughout the Middle Verde River has reduced habitat suitability for the snakes. Narrow-headed gartersnakes that occupy the Upper Verde River could disperse downstream to the Middle Verde River where they are likely to encounter stocked rainbow trout. Additionally, narrow-headed gartersnakes from Oak Creek Canyon, a tributary of the Verde River, could disperse downstream to the confluence of Oak Creek and the Verde River where they are likely to encounter stocked rainbow trout. Narrow-headed gartersnakes persisting in the Middle Verde River would be exposed to rainbow trout stocked into the stocking reach.

Downstream analysis:
Narrow-headed gartersnakes occupy the Middle and Lower Verde River, which lies within the current and historical range of the species, although likely in low numbers. There is a 1987

gartersnake record from the Verde River at The Falls, nearly 12 river miles downstream of the lower end of the proposed stocking reach (HDMS). Another was observed in 2005 along the Verde River *ca*. 1 mile downstream from the confluence of Fossil Creek (Holycross et al. 2006, HDMS). Narrow-headed gartersnakes persisting downstream of the Middle Verde stocking sites would be exposed to stocked sport fish dispersing from the Oak Creek, Wet Beaver Creek, West Clear Creek and Middle Verde River stocking reaches, and Mingus and Huffer Lakes. Stoneman Lake is a closed basin and fish cannot escape.

Colorado Pikeminnow

Colorado pikeminnow were extirpated from central Arizona before about 1950. They have never been detected as a reproducing population in the Verde River. The only historic natural occurrence of them in the vicinity is reported in Minckley and Alger (1968) as bone fragments discovered in an archaeological site near Perkinsville. Since the early 1980's, reintroductions of pikeminnow (previously known as Colorado River squawfish) have occurred throughout the Verde River from the headwaters down to Childs. Colorado pikeminnow in the Verde River and Salt River are designated experimental non-essential under the Endangered Species Act (10j). The species appears to only occur as a result of stocking action by the Arizona Game and Fish Department. No attempts at reproduction have been documented (lack of collection of ripe fish or spawning evidence) and no young have been detected within the Verde River. The USFWS has drafted recovery guidelines for squawfish throughout their range (USFWS 2008). No recovery potential or requirement is provided in those guidelines for a population of squawfish in Arizona.

Colorado pikeminnow were stocked into the Middle Verde River twice in 1985 at West Clear Creek (Table 78). Pikeminnow were stocked into the Upper Verde River in 1985-1988 (Hendrickson 1993) at sites near FR 638, Morgan Ranch, Perkinsville, Sycamore Creek, and near Tapco. Pikeminnow records from near Bridgeport (Ziebell and Roy 1989) and the OK Ditch in 1987 and 1988 likely came from those stockings. Stockings into the Upper Verde River of fish over 300mm continued in 1991-1993 (Hyatt 2004), but none were stocked in the Middle Verde after 1985. Two pikeminnow were collected in May 2001 by EPA EMAP crews just upstream of the Oak Creek confluence (in conjunction with bass, suckers, shiner and stocked rainbow trout). Surveys from Tuzigoot to Beasley Flat in June, 2003 (Clark 2003d), and July, 2006 (Chmiel 2006b) did not locate any pikeminnows. The last record of pikeminnow in the Middle Verde was the May 2001 collection from near Oak Creek (AGFD Scientific collecting permit report).

Table 78. Stockings of Colorado pikeminnow into the Middle Verde River

Location	Year	Number	Average Size (millimeters)
West Clear Creek	1985	8,000	76
Total	1985	5,000	76

Beginning in 1995, larger pikeminnow were stocked outside of the Middle Verde River in the Lower Verde River reach below West Clear Creek between Beasley Flats and Childs (summarized in Hyatt 2004, Gill 2007c). Pikeminnow are currently found downstream in the Lower Verde River near the stocking sites at Childs and Beasley Flats and in Horseshoe Reservoir (Table 79). There are also reports of anglers catching pikeminnow near Beasley Flats. Successful establishment of an adult population in this reach is difficult to assess, as the numbers of fish recaptured over time has not maintained the numbers seen in the late-1990s, and the fish that are captured are recently stocked, at large only a few months (Hyatt 2004, Robinson 2007). No reproduction or recruitment has been documented.

Table 79. Recaptures (post-stocking) of Colorado pikeminnow in the Lower Verde River since larger (300mm) fish began to be stocked in 1995

Year	Location	Number	Source
1995	Childs to Sheep Bridge	0	Cited in Jahrke and Clark 1999
1996	Childs to Sheep Bridge	5	Cited in Jahrke and Clark 1999
1996	Horseshoe Reservoir	22	Cited in Jahrke and Clark 1999
1997	Beasley Flats to Childs	6	Cited in Jahrke and Clark 1999
1997	Childs to Sheep Bridge	17	Cited in Jahrke and Clark 1999
1997	Horseshoe Reservoir	0	Cited in Jahrke and Clark 1999
1998	Beasley Flats to Childs	2	Cited in Jahrke and Clark 1999
1998	Childs to Sheep Bridge	37	Cited in Jahrke and Clark 1999
1998	Horseshoe Reservoir	0	Cited in Jahrke and Clark 1999
1999	Childs to Sheep Bridge	3	Cited in Jahrke and Clark 1999
1999	Horseshoe Reservoir	0	Cited in Jahrke and Clark 1999
2000	No captures noted		Cited in Hyatt 2004
2001	Unknown, probably Childs to Sheep Bridge	0	Cited in Gill 2007, probably Weedman 2001
2002	Childs to Sheep Bridge	0	Cited in Gill 2007, probably Weedman 2002
2003	Childs to Sheep Bridge	1	Cited in Gill 2007, probably Weedman 2003
2004	Childs to Sheep Bridge	0	Cited in Gill 2007, probably Weedman 2004a
2005	Childs to Sheep Bridge	0	Cited in Gill 2007: probably Duffy and Weedman 2005
2006	Childs to Sheep Bridge	0	Cited in Gill 2007
2006	Horseshoe Reservoir	4	Robinson 2007
2007	Childs to Sheep Bridge	0	Cited in Gill 2007

Potential Impacts
Colorado pikeminnow are not likely present or are in very low numbers in the Middle Verde River because they are now only stocked in the lower portion of the Verde River. No long-term survival or recruitment has been documented for stocked fish. Stocked trout are rare in what is likely to be occupied habitat (lower Verde River). Interaction would include competition for space and food; however, pikeminnow may be able to prey on trout.

Colorado pikeminnow are stocked at either Beasley Flats Recreation Area or at Childs on the Prescott and Tonto National Forests. Pikeminnow are raised at Bubbling Ponds State Fish Hatchery using State dollars and facilities. They are grown to a size exceeding 300 mm before they are stocked in the river. Potential beneficial and adverse impacts may occur to pikeminnow from stocking of rainbow trout. Trout could serve as added forage for pikeminnow or there could be competition for food or space between them. Direct predation of trout on pikeminnow is not expected to occur because there are no young pikeminnow in the river system and trout die off every year before they would be of the size to prey on a stocked 300 mm or larger pikeminnow.

Gila Chub and Critical Habitat
Gila chub populations are known to occur in several tributaries of the Verde River but have never been and do not expect to be found in the mainstem of the middle Verde River. Gila chub are known from Walker Creek and Red Tank Draw, tributaries to Wet Beaver Creek and in Spring Creek, a tributary to Oak Creek. Rainbow trout are also proposed for stocking in Wet Beaver Creek below Walker and Red Tank Draw and in Oak Creek upstream from the confluence with Spring Creek. Past surveys in Gila chub habitat have not encountered rainbow trout in any of the occupied areas. Additionally, the limited information from past surveys in streams downstream from known populations of Gila chub have failed to document their movement out of those systems or their occurrence in the downstream river systems.

Critical habitat is not designated in the Verde River. The nearest critical habitat is near Oak Creek at the confluence of Coffee and Spring Creeks and near Wet Beaver Creek confluences with Walker Creek and Rarick Canyon.

Potential Impacts
Rainbow trout may compete with Gila chub for food and space if they were to occupy the same habitats. Predation by stocked trout on age 0+ chub might occur during the stocking season if they were to occupy the same habitats. Rainbow trout do not persist in the middle Verde River stocked reach much beyond early June due to thermal limits for trout. Gila chub may actively or passively leave their occupied area and wind up in the Verde River. The middle Verde River is occupied by many nonnative and predatory species of fish that would also have negative impacts to Gila chub independent of the stocking action. Due to the presence of physical barriers (dry

reaches or vertical drops) stocked rainbow trout are not expected to access designated Gila chub Critical Habitat.

Exposure to stocked species is unlikely to occur based on the distance from occupied habitat and existing nonnative fish assemblage separating Gila chub from the rainbow trout stocking areas. This is supported by fisheries survey data indicating Gila chub not persisting outside known occupied areas and stocked rainbow trout are not being found within those occupied areas (AGFD Native Fish Database, Bagley 2002).

Critical Habitat
No impacts to critical habitats would be anticipated as stated above, due to the existing nonnative fish assemblage separating the chub from stocked trout.

Razorback Sucker and Critical Habitat
Razorback suckers were stocked into the mainstem Verde River, Oak Creek, Wet Beaver Creek, and West Clear Creek several times from 1981 to 1988 (Table 80) (Hendrickson 1993). Stockings into the Upper Verde River also occurred during this time, and stocking of fish over 300mm continued in 1991-1993 (Hyatt 2004), but none were stocked in the Middle Verde after 1988. One adult razorback sucker was captured between TAPCO and Peck's Lake in 1997 (Kubacki 1998). The stocking site for this fish is unknown. Surveys from Tuzigoot to Beasley Flat in June 2003 (Clark 2003d) and July 2006 (Chmiel 2006b) did not locate any razorback suckers. The paucity of survey data from the Middle Verde River reach makes a determination of the presence or absence of razorback suckers in the reach difficult. As with the Upper Verde River, the razorback may not be currently present in this reach.

Table 80. Stockings of razorback suckers into the Middle Verde River.

Location	Year	Number	Average Size (millimeters)
Camp Verde	1982	6,763	127
	1983	16,370	76
	1984	12,125	127
Oak Creek near Page Springs Hatchery	1981	1,000	81
	1981	1,000	81
	1982	3,000	76
	1983	10,000	76
	1986	1,000	65
	1986	145	Si
West Clear Creek (lower end)	1981	1,000	81

Location	Year	Number	Average Size (millimeters)
	1982	3,000	176
	1983	10,000	76
	1987	17,151	64
Wet Beaver Creek	1987	17,150	64
	1988	10,000	76

Source: Hendrickson 1993

Beginning in 1993, larger razorback suckers were stocked outside of the Middle Verde River in the Lower Verde River reach below West Clear Creek between Beasley Flats and Childs (summarized in Hyatt 2004, Gill 2007c). Razorback suckers are currently found downstream in the Lower Verde River near the stocking sites at Childs and Beasley Flats and in Horseshoe Reservoir (Table 81). Successful establishment of an adult population in this reach is difficult to assess, as the numbers of fish recaptured over time does not reflect the numbers seen in the late-1990s. The presence of seven ripe adult males in Horseshoe Lake in 2005 (Robinson 2007) was a promising sign.

Table 81. Recaptures (post-stocking) of razorback suckers in the Lower Verde River since larger (300mm) fish began to be stocked in 1993

Year	Location	Number	Source
1994	Unspecified	1	Cited in Hyatt 2004
1995	Childs to Sheep Bridge	0	Cited in Jahrke and Clark 1999
1996	Childs to Sheep Bridge	12	Cited in Jahrke and Clark 1999
1997	Beasley Flats to Childs	3	Cited in Jahrke and Clark 1999
1997	Childs to Sheep Bridge	27	Cited in Jahrke and Clark 1999
1998	Beasley Flats to Childs	0	Cited in Jahrke and Clark 1999
1998	Childs to Sheep Bridge	61	Cited in Jahrke and Clark 1999
1999	Childs to Sheep Bridge	17	Cited in Jahrke and Clark 1999
2000	Unknown, probably Childs to Sheep Bridge	12	Cited in Hyatt 2004
2001	Unknown, probably Childs to Sheep Bridge	2	Cited in Hyatt 2004 probably Weedman 2001,
2002	Childs to Sheep Bridge	9	Cited in Gill 2007, probably Weedman 2002
2002-2003	Beasley Flats to Horseshoe Dam	17	Bonar et al. 2004
2003	Childs to Sheep Bridge	3	Cited in Gill 2007, probably Weedman 2003

Year	Location	Number	Source
2004	Childs to Sheep Bridge	4	Cited in Gill 2007, probably Weedman 2004a
2005	Childs to Sheep Bridge	2	Cited in Gill 2007, probably Duffy and Weedman 2005
2005	Horseshoe Reservoir	7	Robinson 2007
2006	Childs to Sheep Bridge	2	Cited in Gill 2007
2006	Horseshoe Reservoir	4	Robinson 2007
2007	Childs to Sheep Bridge	0	Cited in Gill 2007

Critical habitat for the razorback sucker on the Verde River was designated in 1995 and extends from the western boundary of the Prescott National Forest west of Perkinsville to Horseshoe Dam. The biological support document for the designation said that the Verde River critical habitat unit would contribute to the delisting of the species and was, therefore, important for recovery (Maddux et al. 1993). The Middle Verde River reach was described as altered by diversions, sand and gravel operations, and agricultural and residential development adjacent to the channel and that these activities may have affected channel morphology, especially in restricting the river from meandering. The document also characterized backwaters and riparian areas as degraded and noted that the Middle Verde River supported a diverse nonnative fish community.

At the time of designation, the Middle Verde River supported several constituent elements of critical habitat as described below:

> Water: The Middle Verde River base flow is affected by the diversions that at times, can take all the flow from the river and leave it dry in spots (Kubacki 1998). Inflows from perennial tributaries provides some relief, but also are subject to diversions. There is sufficient flow through the reach to support fish populations.
>
> Physical habitat: The Middle Verde River contained mainstem and backwater habitats, with shallow waters available at the lower ends of perennial tributaries.
>
> Biological environment: At the time of designation, nonnative fish species were common in the Middle Verde River with native fishes such as Sonora and desert sucker, roundtail chub, and longfin dace also present. These native species are still present; however, with the lack of consistent surveys in the reach it is not possible to document any population trends for either native or nonnative species.
>
> Additional selection criteria besides the primary constituent elements were developed to assist in selecting critical habitat areas for the razorback sucker:

Presence of spawning population: There was no spawning population in the Verde River at the time of designation. The Verde River may have supported a spawning population of razorback suckers later in time than did the Gila or Salt Rivers. The last razorback sucker from the Verde River was documented in 1954, several years after the species was gone from the other central Arizona rivers.

Nursery habitat: Nursery habitat is available in all reaches of the Verde River.

Historic or present distribution: The reintroduction of razorback sucker into the Verde River began in the 1980s, and the river was considered occupied at the time of designation of critical habitat.

Maintenance of rangewide distribution: The last of the central Arizona rivers to support razorback suckers, the Verde River shares some physical characteristics with the Gila River in terms of elevational changes and the mixture of canyon and open alluvial floodplain areas. The Gila River is also free-flowing in the critical habitat reach. The Gila River supported a large and dominant nonnative fish community at the time of designation, similar to the nonnative fish community in the Middle Verde River.

Special management: Maintenance of a natural flow regime that would encourage native fish and discourage nonnative fish was also identified as an important management need.

Potential Impacts

Potential impacts to the razorback sucker in the Middle Verde River may result from the stocking of rainbow trout into the mainstem Verde River, Oak Creek, Wet Beaver Creek and West Clear Creek. Effects from stockings in tributaries would occur if the stocked fish moved down into the mainstem or if razorback suckers moved into the stocking reaches of Oak Creek, Wet Beaver Creek, and West Clear Creek, particularly during the spawning period.

Catchable sized rainbow trout are proposed for stocking in the mainstem from November to March and in the tributaries from March to May and October to November. All fisheries are intended for high intensity use with repeated stockings during the period to maintain sufficient fish for anglers. Kubacki (1998) estimated a return to the creel of stocked trout of 50% in 1997 and 61% in 1998. He also notes that the 78% return from 1996 was done under a different census and should not be compared with the later results. Later creel results from 2000 indicated a return of 40%.

Rainbow trout are stocked before, during and after the probable spawning period for razorback suckers in the Verde River. Robinson (2007) caught seven tuberculate, ripe males in one gill net set in Horseshoe Reservoir in April 2005 where the water had a surface temperature of 19°C. The cluster of males is indicative of staging behavior during the spawning period. No ripe

females have been found in any survey at any time. No surveys for larval razorback suckers has been initiated, so it is unknown if there is any spawning occurring. Persistence of trout until May in the river is documented and temperatures in the area currently known to be occupied by razorback suckers remain suitable for rainbow trout until at least April (Robinson 2007).

Rainbow trout in the Verde River prefer pools and runs, with razorback suckers preferring pools. Larval and young of the year razorback suckers use quiet waters, either in pools, backwaters, or shallow side channels with vegetative or rock cover for nursery habitat.

Studies in the mid-1990s indicated that stocked trout in the Middle Verde River did not move upstream (Kubacki 1998); however, there is limited information on the downstream movement of rainbow trout post-stocking into the mainstem and tributaries. Survey information on the Middle Verde River is limited; Kubacki (1998) found rainbow trout at the stocking sites, with two caught as late as May. Bonar et al. (2004) did find rainbow trout in this reach but it is not clear if captures were made in both spring (March-May) and winter (October-November). He did observe rainbow trout in the Verde River in August (four months after final stockings were done in April), but none were captured in June-September. His survey sites were on the mainstem near Wet Beaver Creek and West Clear Creek and states that rainbow trout were found near the stocking sites. Clark (2003d) surveyed between Tuzigoot Bridge and Beasley Flats in June, 2003, and did not detect any rainbow trout. Chmiel (2006b) repeated that survey in July, 2006, and did not find any rainbow trout. Water temperatures in the Middle Verde River can exceed 25°C during the summer months, reducing the opportunity for rainbow trout to persist through the summer. Wild trout (both rainbow and brown) do persist in upper Oak Creek, but the lower reaches of the three stocked tributaries also have high summer temperatures that reduce the opportunity for over-summer persistence.

In the 1996 intra-service consultation, rainbow trout were approved for stocking with a requirement for post stocking monitoring to be conducted 1995-1996 to evaluate trout movements upstream above Peck Lake Diversion, razorback and spikedace larval drift into the stocking area, and maximum summer water temperature (that would limit trout persistence). Temperatures were found to exceed 25°C from June 1 through August 15. No trout were collected above Peck's Lake Diversion Dam. No Larval drift from razorback sucker (or spikdedace) was found in the trout stocking area. Only one adult razorback sucker was collected in the stocking area (May 1996) (Kubacki 1998). After the Department submitted the report, Federal Aid lifted the requirements for further monitoring. (Langley 1999).

The distribution of rainbow trout below West Clear Creek to Horseshoe Reservoir is unclear. Bonar et al. (2004) had a survey site at West Clear Creek and the Verde River, and likely West Clear Creek is the source of the rainbow trout they captured in their Reach III, although the specific record is not included in their report. The series of surveys in the Childs to Sheep Bridge

and in Horseshoe Reservoir have not documented rainbow trout in that area (Table 82), even with some surveys done at the times of the year that rainbow trout could be expected to be in the system.

Table 82. Surveys in the Lower Verde River (Childs to Horseshoe Reservoir) that did not document rainbow trout in occupied razorback sucker habitat

Date of Survey	Location	Source
1995	Childs to Sheep Bridge	Jahrke and Clark 1999
1996	Childs to Sheep Bridge	Jahrke and Clark 1999
1997	Childs to Sheep Bridge	Jahrke and Clark 1999
1998	Childs to Sheep Bridge	Jahrke and Clark 1999
1999	Childs to Sheep Bridge	Jahrke and Clark 1999
10/2001	Childs to Sheep Bridge	Weedman 2001
5/2002	Childs to Sheep Bridge	Weedman 2002
5/2003	Childs to Sheep Bridge	Weedman 2003
6/2004	Childs to Sheep Bridge	Weedman 2004a
2/2004	Horseshoe Reservoir	Weedman 2004b
10/2005	Childs to Sheep Bridge	Robinson 2007
3 and 10/2006	Childs to Sheep Bridge	Robinson 2007
4 and 10/2005	Horseshoe Reservoir	Robinson 2007
3 and 10/2006	Horseshoe Reservoir	Robinson 2007
5/2007	Childs to Sheep Bridge	Gill 2007

For the Lower Verde, there are no records in the dataset (LCRGAP database 2009) examined of stocked rainbow trout in the current razorback sucker stocking area. If there is spawning by razorback suckers, it is most likely in the Lower Verde. Temperatures at that time are suitable for trout to survive, though they won't over-summer in the Lower Verde. The Lower Verde River is also occupied by many centrarchids, ictalurids and cyprinids (esp. carp and red shiner, known predators on razorback eggs and larvae).

Rainbow trout are documented to prey on razorback sucker larvae in the wild (Mueller 1993) and in a laboratory setting (Carpenter and Mueller 2008). While rainbow trout are not considered particularly piscivorous, they do prey on small fish (Bonar et al. 2004, Propst et al. 1998) and once stocked, can apparently turn to feeding on natural food quickly (Propst et al. 1998). Bonar et al. (2004) also noted that stocked rainbow trout were primarily feeding on insects.

Critical Habitat

Trout stocked into critical habitat for razorback sucker, the Verde River between just west of Perkinsville to Horseshoe Reservoir, or that reached critical habitat from the stocking sites in Oak Creek or West Clear Creek could impact the biological environment by adding non-native trout to the non-native assemblage that already exists in the Verde River. The critical habitat designation noted that competition and predation are elements of the biological environment but that it is out of balance due to the existing non-native fish species.

While in the river, before they mostly are caught out or succumb to summer temperatures, trout are an additional source of competition for space and to a lesser extent competition for food. This impact is somewhat minimized, however, because anglers in this reach also reduce, by some unknown quantity, the warm water fish assemblage. Anglers come to fish for the stocked trout but also catch out and keep other non-natives that are not stocked.

Roundtail Chub

Roundtail chub are known from the Upper Verde River beginning below Sullivan Dam and extending down the Verde River past Granite Creek and throughout its entirety to the confluence with the Salt River. Roundtail chub have been documented occupying the entire reach proposed for stocking of rainbow trout.

Potential Impacts

Potential impacts to roundtail chub could result from the direct predation on larval or juvenile roundtail chub by stocked trout, competition for food or competition for space. Rainbow trout are primarily insectivorous, but may consume small fish. Trout have not been found to persist in the Verde River and the area proposed for stocking is occupied by several other competing and predatory nonnative species that occur independent of stocking actions (smallmouth bass, flathead catfish, green sunfish, red shiner, crayfish, bullfrogs, etc.).

These effects may occur over the period covered by this consultation. Exposure of roundtail chub to stocked trout is likely to occur based on the location and timing of the stocking action and the known distribution of roundtail chub.

Spikedace and Critical Habitat

The nearest documented occurrence of spikedace is in the Upper Verde River between Sullivan Dam and the confluence with Sycamore Creek in 1999. Critical habitat is also present in the Upper Verde River from Sullivan Dam downstream to near Pecks Lake. There is no suitable habitat for spikedace in the reach proposed for rainbow trout stocking because of the existing warmwater nonnative species assemblage. Spikedace were last documented from the Upper Verde River in 1999, despite multiple general surveys (AGFD data) and targeted spikedace surveys (Richardson 2006). The number of spikedace has fallen to the level where detection of individuals by surveys is very difficult and it is possible they may no longer persist.

Potential Impacts
Potential impacts to spikedace could result from the movement of stocked rainbow trout upstream into formerly occupied habitat or from the downstream movement of spikedace over the diversion into the areas stocked with trout. The response would be potential predation by the stocked trout on the spikedace or potential competition for food or space. The transport of the stocked trout from the stocked locations to the occupied habitat is limited by the diversion dam and rainbow trout have not been found in the Upper Verde River above the dam (see previous discussion on Upper Verde River Impacts analysis). Results from Department research into the movement of rainbow trout show that the Peck's Lake diversion is a viable barrier to their movement (Kubacki 1998). Significance of potential movement of trout is also minimized by the fact that the Upper Verde River is occupied by several other competing and predatory nonnative species occur independent of stocking actions (smallmouth bass, flathead catfish, green sunfish, red shiner, crayfish etc.). If the Peck's Lake Diversion dam is washed out during a large scale flood event, stockings are halted and would not commence until the dam is re-constructed, as was requested by the Service in a 1999 concurrence letter (Langley 1999). This practice is proposed to continue into the future and would minimize the potential effects of the proposed action to spikedace.

Critical Habitat
Exposure to stocked trout is unlikely to occur based on the presence of the Peck's Lake diversion dam, which acts as a barrier to upstream trout movement into critical habitat.

LOWER VERDE RIVER SUB-WATERSHED

Physical Geographic Description
The lower Verde River Sub-Watershed contains two proposed stocking locations, forming one distinct complex (East Verde River Complex).

Drainage Area
The Lower Verde River watershed for the purposes of this consultation begins at Childs and extends to Horseshoe Dam and includes all tributaries within this reach of stream. The lower Verde River Sub Watershed drains approximately 2506 mi^2 of surface area.

Range of Elevations
Elevations range from a high of nearly 2590 m (8500 ft) down to approximately 600 m (1968 ft) at Horseshoe dam.

Tributaries
Major tributaries to the Verde River in this sub-watershed are Fossil Creek, East Verde River, Red Creek, Wet Bottom Creek, and Tangle Creek.

EAST VERDE RIVER COMPLEX

Site Description

The East Verde River watershed drains and area of 220 mi^2. The East Verde River is located 5 miles north of Payson, in Gila County, Arizona within the Tonto National Forest. It begins just below the Mogollon Rim at 2200 m (7200 ft) in elevation and drains into the Verde River at 800 m (2600 ft) of elevation, approximately 7 miles downstream of Childs, Arizona.

The East Verde River Complex contains two proposed stocking locations (Figure 86); the East Verde River from Highway 87 upstream to the East Clear Creek diversion, and Green Valley Lake. The East Verde River is the most upstream proposed stocking site and Green Valley Lake drains into the East Verde River via American Gulch roughly 9 miles downstream from Green Valley Lake.

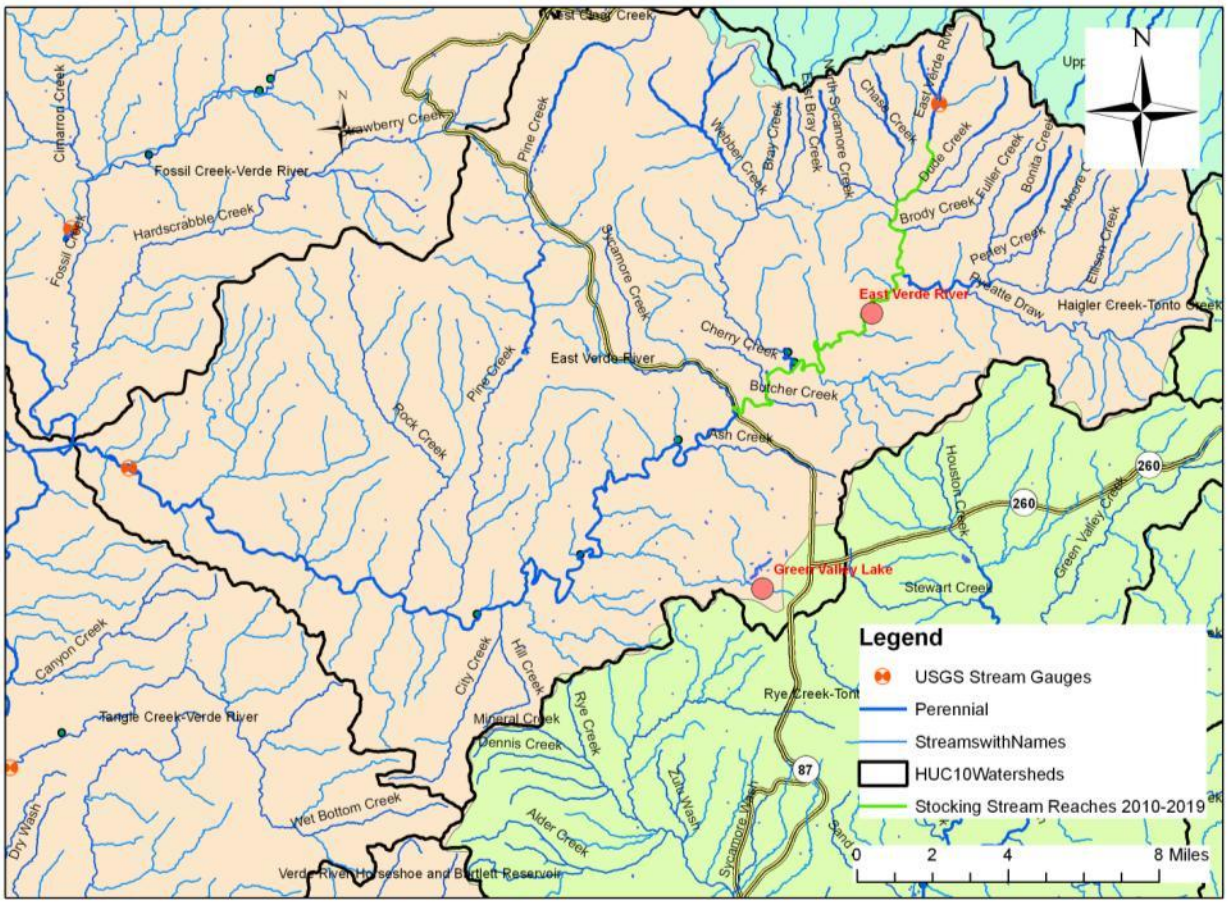

Figure 86. East Verde River watershed overview map with proposed stocking locations in red.

East Verde River

Site Description
The watershed of the East Verde River lies immediately below the Mogollon Rim. The proposed stocking reach begins at the East Clear Creek water diversion and continues downstream to Highway 87 (Figure 86). There are multiple stocking sites throughout this stretch, which include areas known as pump house, water wheel, first crossing, second crossing, third crossing, flowing springs, East Verde Estates, Beaver Valley, cold spring, waterfalls, and above highway 87. Land ownership within the stocking area is 100% owned by the Tonto National Forest.

Management of Waterbody
The East Verde River is an extremely high use cold water fishery, managed as a put-and-take rainbow trout fishery in the spring and summer months. Densities, timing, and fish size are adjusted depending on fish availability, stocking conditions, angler demands, or shifts in management strategy. A history of stocking in the East Verde River is provided in Table 83.

There is angler access where the East Verde River intersects with Highway 87 and then at several road crossings along Forest Rd 199. From a 1995 Angler Postal Questionnaire, approximately 50,700 angler use days were spent on the East Verde River that year. Creel surveys have not been conducted since 1987. The stretch of the East Verde above the pump house is managed as a naturally reproducing rainbow trout fishery.

Table 83. Stocking History for the East Verde River.

Species	**First Year**	**Last Year**	**Number of Stockings**	**Num. Stocked**
Black Crappie	1975	1975	1	6,000
Brook Trout	1935	1980	7	24,492
Brown Trout	1933	1993	10	27,290
Native Trout	1939	1939	1	15,200
Rainbow trout	1933	2008	72	1,404,642
Razorback sucker	1988	1988	1	20,000
Total			92	1,497,624

The East Verde River is managed by the Tonto National Forest for extensive recreational use including: camping, fishing, hiking, and day use are common throughout the area. It is popular with people from the Phoenix area and it is rare that all camping areas are not occupied during the summer.

Proposed action

The Department proposes to stock rainbow trout (catchable and sub-catchables) from April thru August annually; numbers of trout may be from 0 to 32,000 fish annually for the period covered under this consultation.

Water Distribution / Connectivity

The major tributaries connected to the stocking area (Figure 87), beginning at the headwaters, are Mail Creek (interrupted perennial), Dude Creek (perennial in upper end), Chase Creek (perennial in upper end), North Sycamore (intermittent in upper end only), Ellison Creek (perennial in lower end), Webber Creek (intermittent), Cherry Creek, and Butcher Creek.

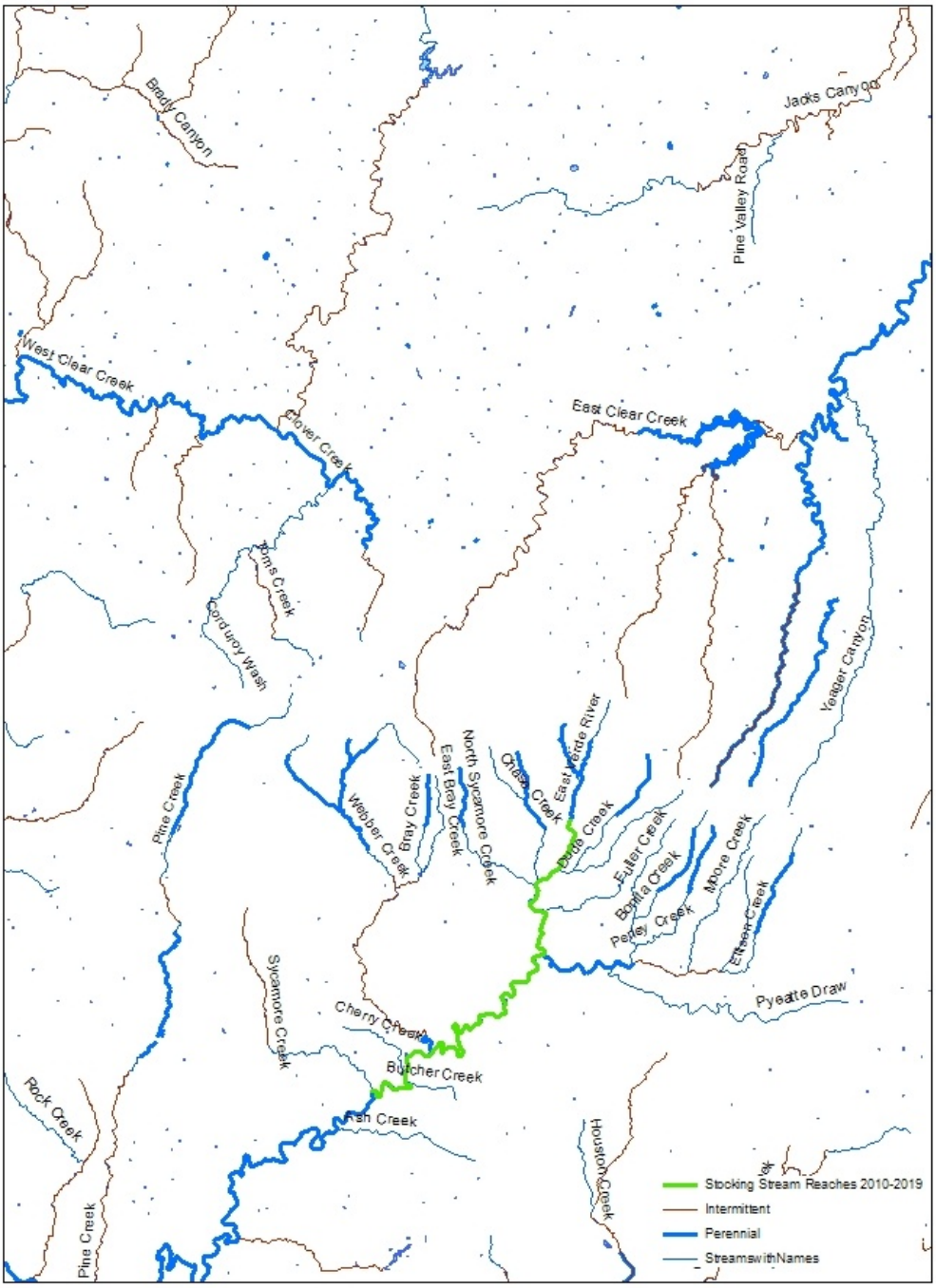

Figure 87. East Verde tributaries and connectivity.

The East Verde River is perennial or interrupted-perennial for most of its length, but is sometimes dry near the confluence with the Verde River, based on USGS gage data. Typical flows in the stream average less than 5 cfs in the winter and spring and are nearly 0 cfs in the

summer. In the summer, the East Verde River went dry in stretches at Beaver Valley (H. Apfel, pers. comm.). In the past, East Verde River flows have been augmented with Little Colorado River drainage water by a water diversion coming from Blue Ridge Reservoir, built in the 1940's by Phelps Dodge, via East Clear Creek. This has added significant flows to the East Verde River allowing trout stocking during the summer months. An average of 15 to 21 cfs was pumped from Blue Ridge Reservoir above the Mogollon Rim into the East Verde River. In 2002, SRP took over the water facilities and stopped pumping. They began making repairs to the system and testing the system in 2009 (Figure 88). Tentatively, SRP plans to divert water from Blue Ridge Reservoir to the East Verde River in 2010. They plan to add 30 cfs from early April to late September annually as Blue Ridge Reservoir levels permit (down to inlet tunnel elevation), as total SRP system storage allows, and the amount of space in Horseshoe/Bartlett is available. Payson is predicted to take between 0 - 10 cfs, probably averaging 6.5 cfs over the season. The amount diverted overall and the amount routed to Payson would likely be managed and would fluctuate in response to available storage in Blue Ridge Reservoir and seasonal demand (e.g., lower in early spring & late fall and higher during peak summer use in Payson). Historically, flows from Blue Ridge Reservoir have been highest late spring through fall and lowest in the winter months (Figure 89).

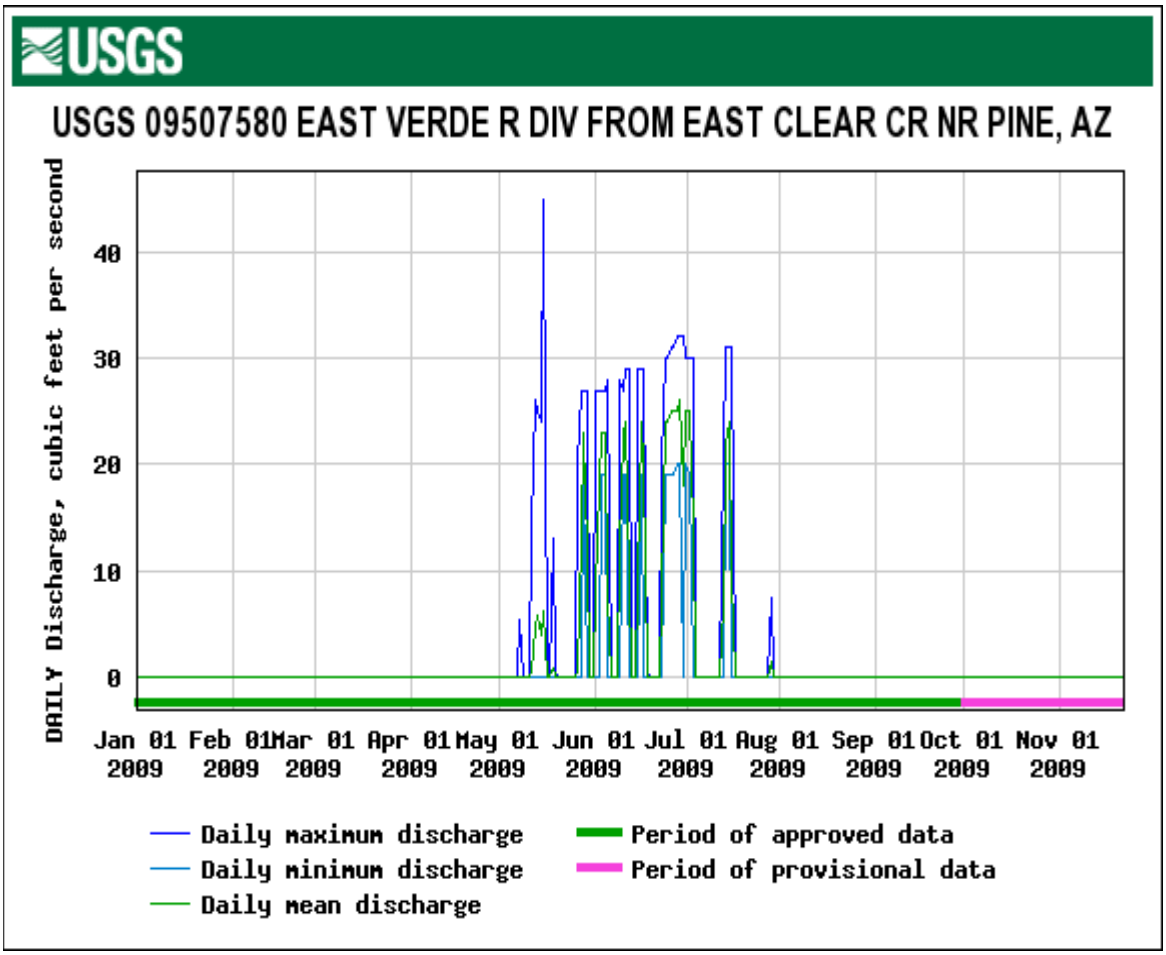

Figure 88. Daily discharge (cfs) for the East Verde River diversion from East Clear Creek during 2009.

The East Verde River flows for roughly 1.8 miles before Mail Creek enters the river. Mail Creek is a small interrupted perennial stream that enters the East Verde River from the West. Mail Creek dries before its confluence with the East Verde River.

The East Verde River flows another 2.5 miles before Dude Creek enters from the east. Dude Creek enters the East Verde River approximately 0.6 miles downstream of the East Clear Creek diversion. The confluence is within the proposed stocking reach of the East Verde River. Dude Creek is an interrupted perennial stream, with the lower portion of the stream typically dry to its confluence with the East Verde River, except during periods of high flow typically occurring in the winter. Dude Creek is a Gila trout recovery stream. The recovery section is protected by a barrier to prevent upstream fish migration from the East Verde River.

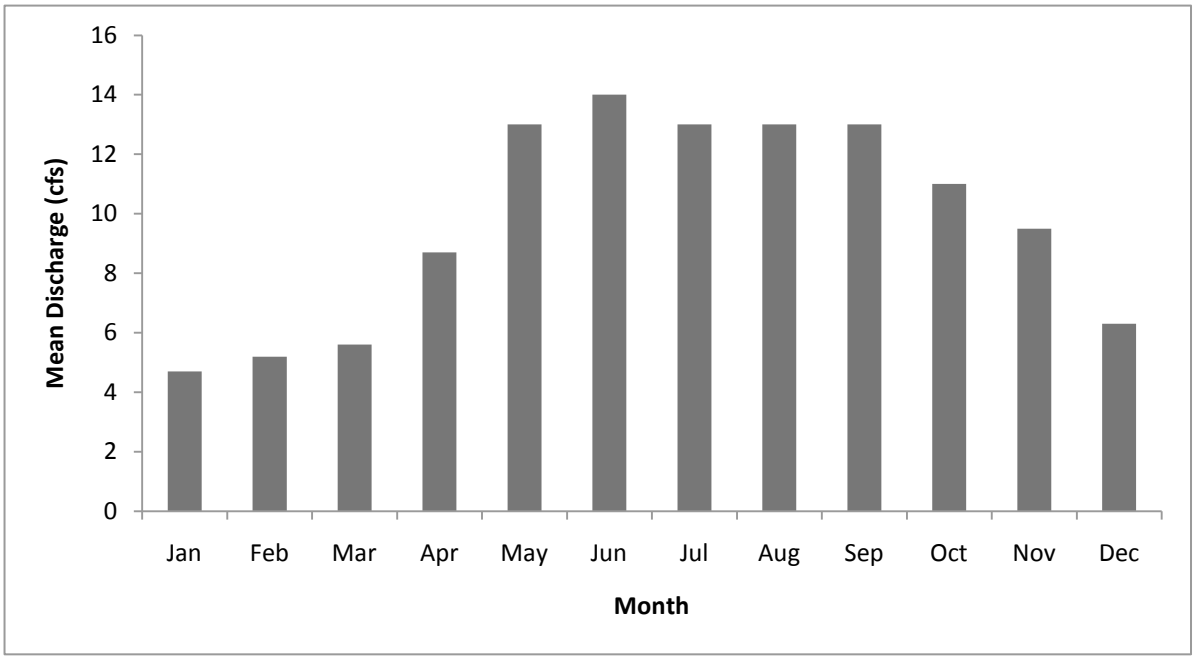

Figure 89. Mean monthly discharge (cfs) for the USGS gage at the East Clear Creek Diversion into upper East Verde River for the period from 11-1-65 to 9-30-08.

The East Verde River flows another 0.6 miles from here to the Chase Creek confluence on the west, and North Sycamore Creek enters 170 m (185 yards) farther downstream. Both of these are interrupted perennial streams that dry before reaching the East Verde River.

Ellison Creek is an approximately 10-mile long tributary that flows into the East Verde River another 2.4 miles farther downstream. Ellison Creek in another interrupted perennial stream. Ellison Creek has a roughly 2.5 miles perennial section near the base of the Mogollon Rim, dries for a long stretch, and then becomes perennial again for about 1.2 miles before entering the East Verde River.

Another 7.1 miles downstream from the Ellison Creek confluence is the Webber Creek confluence. Webber Creek is roughly 12 miles long tributary entering the East Verde River from the North. The stream is perennial from just below the Mogollon Rim to the vicinity of the Highline Train, a roughly 3 miles reach. The stream the dries until Webber Spring, which is just over 0.6 miles upstream from the East Verde River confluence.

The East Verde then travels downstream from the Webber Creek Confluence to Highway 87 through the confluences of Cherry Creek and Butcher Creek, two ephemeral drainages connected to the stocking area in this reach. This section of river is roughly estimated to be 3 miles. For the

purposes of this consultation this is the end of this stocking area. Downstream areas are addressed in the East Verde River Complex Analysis.

Fish Movement

There are at least two barriers to upstream fish movement on the East Verde River. The first is a modified natural barrier on the border of Forest Service and private land just downstream of Rim Trail Estates. It is about 1.5 m (5 ft) high and is likely a barrier to fish movement only at base flow. During storm events it may be possible for fish to circumvent this barrier. The second barrier is a natural barrier about 9 m (30 ft) high just downstream of the Ellison Creek confluence. It is a definite barrier to all upstream fish movement at all flows. Both of these barriers are within the proposed stocking reach.

Stocked fish have the ability to move upstream from stocked locations to the above described barriers. Fish stocked at the uppermost stocking location have the ability to move upstream to the headwaters, as this location is above the upstream-most barrier. Although this is possible, a recent survey from two sites upstream of the uppermost stocking location did not identify any stocked rainbow trout (Gill 2009c). As stated above, the East Verde River is perennial or interrupted-perennial for most of its length, but is sometimes dry near the confluence with the Verde River, based on USGS gauge data. Stocked fish also have the ability to move freely downstream all the way to the confluence with the Verde River. This would most likely only occur during high winter flows from rain events or spring snowmelt. A gauging station on the lower East Verde River shows that the highest flows occur during this period (Figure 92) and stream temperatures would be more amenable to trout survival at this time. The East Verde River dries in the lower portions at base flow and temperatures become too warm for trout at this time. Burger and Gill (2009) did not document any trout on a survey that began just upstream of LF Ranch (located approximately 19 miles below the stocking reach) and extended downstream to the Verde River confluence in March 2009.

Community Description

LCRB Aquatic GAP data records have indentified 11 species of fish that have at one time occupied the East Verde Stocking Area. These fish are longfin dace, yellow bullhead, goldfish, desert sucker, Sonora sucker, red shiner, headwater chub, green sunfish, smallmouth bass, rainbow trout, and speckled dace. The records are comprised of data collected from 1926 to 2000.

There is no recent fish survey data of the East Verde River within the proposed stocking reach. However, surveys have been conducted upstream and downstream of the proposed stocking reach in recent years. Self sustaining populations of wild rainbow trout have been observed in the headwaters of the mainstem East Verde River from Piper Hatchery Spring downstream to at least Mail Creek (Gill 2009c). In addition, anglers have reported numerous headwater chub being caught by hook and line around the confluence of the East Verde River and Ellison Creek (C.

Cantrell, pers. comm.). A number of recent surveys have been conducted in many of the tributaries (Table 84).

Historically, Dude Creek supported a viable population of introduced brook and rainbow trout, which were stocked between 1939 and 1942. A total of 3,500 rainbow trout were stocked in 1939 and 13,236 brook trout were stocked between 1939 and 1942. Both species maintained populations for over 50 years (Rinne and Medina 1988) until the Dude Wildfire occurred in 1990. Subsequent rains caused sediment and ash flows within the streams, eliminating all fishes (Rinne 1996). After the fire Dude Creek was identified as a Gila trout recovery stream. Dude creek was stocked with Gila trout in 1999 and 2000, however, these fish did not persist and the stream is currently fishless (Meka 2006).

Chase Creek was most recently surveyed in 1986 (Table 84). At that time young-of-the-year rainbow trout were collected, indicating natural reproduction. North Sycamore Creek was sampled in 2008 (Evans 2008) and no fish were observed (Table 84).

The upper portion of Ellison Creek, just downstream of the Highline Trail, contains a self-sustaining population of rainbow trout (Burger 2006). Rainbow trout was the only species documented in this survey.

The upper portion of Webber Creek, upstream of the Highline Trail, was surveyed by Gill (2008). He noted a self-sustaining population of rainbow trout near the Patton Spring draw confluence and speckled dace at the Highline Trail.

Narrow-headed and northern Mexican gartersnakes are present in the Verde River watershed (refer to East Verde complex and Lower Verde watershed analyses below).

Table 84. Summary of the most recent fish surveys in East Verde River Tributaries connected to the proposed stocking area.

Year	Collector(s)	Stream	Survey Type	Source	Species
1986	Henry Apfel	Chase Creek	Spot check - Backpack shocker	Data sheet	Rainbow trout Low #'s (25-127mm)
2006	Julie Meka	Dude Creek	Visual	Meka 2006. Dude Creek sampling report.	No fish seen
2006	Bill Burger Dana Warnecke Suzanne Goforth Chris Nyhart Jennifer Spawn	Ellison Creek	Visual Dipnets	Burger 2006. Ellison Creek Headwaters Survey.	Rainbow trout *Noted natural reproduction

2008	Curt Gill Aaron Kern	Webber Creek	Backpack shocker	Gill 2008. Webber Creek Fish Survey.	Rainbow trout N = 22 (138-240mm) Speckled dace

Consultation species or Critical Habitat
Potential impacts to Chiricahua and northern leopard frogs, headwater chub and Gila trout are discussed below. Potential downstream impacts to northern Mexican and narrow-headed gartersnakes, loach minnow and critical habitat, spikedace and critical habitat and roundtail chub further downstream are discussed in the East Verde Complex and Lower Verde River analysis later in the document.

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 the 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.

Chiricahua leopard frog
Local Analysis: Although the East Verde River is within the historical range of the Chiricahua leopard frog, the likelihood that frogs could be exposed to stocked fish in the buffered stocking reach is low. There is one historical record for Chiricahua leopard frogs in the East Verde River and there are historical records from 3 sites in the buffered stocking reach: Unnamed Pond (=Diller's Pond) (1972), Ellison Creek (=Highline Trail) (1995), Unnamed Trib. of Ellison Creek (East of Pyle Ranch) (1997) (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). There have been 68 surveys at 36 sites within the buffered stocking complex between 1926 and 2007 with most surveys conducted between 1972 and 2007 (Figure 90; HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Chiricahua leopard frogs were observed during subsequent surveys at Ellison Creek (=Highline Trail) (1997, 1998 and 2006) and likely occupy the site. Although Unnamed Pond (=Diller's Pond) (1972) is approximately 165 meters from the East Verde stocking area, Chiricahua leopard frogs were not observed

during subsequent surveys in 1972 and 1992 or at Unnamed Trib. of Ellison Creek (East of Pyle Ranch) (2005 and 2007). It is unlikely that Chiricahua leopard frogs still occupy sites within the buffered stocking reach (Figure 90AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Broad Scale Analysis: Given water connectivity in the stocking complex, the likelihood that Chiricahua leopard frogs could be exposed to dispersing fish from the East Verde River buffered reach is high. Recent observations show that Ellison Creek provides suitable habitat for frogs (AGFD Region VI Fish Riparian Herpetofauna Database, B. Burger pers. comm.). Because of the 9 meter natural barrier, fish stocked downstream of the confluence of the East Verde River and Ellison Creek cannot travel upstream into Ellison Creek to Ellison Creek (=Highline Trail) (1995) and impact Chiricahua leopard frogs. In contrast, fish stocked above the 9 meter barrier may be able to disperse into Ellison Creek and its tributaries during high flows and encounter Chiricahua leopard frogs. The Chiricahua leopard frog Upper East Verde Management Area (UEVMA), an actively managed Chiricahua leopard frog recovery area, is located in Ellison Creek and 3 of its tributaries (AGFD Region VI Fish Riparian Herpetofauna Database, B. Burger pers. comm.). Dispersing fish moving into Ellison Creek and its tributaries may likely encounter released Chiricahua leopard frogs.

Northern Leopard Frog

Local Analysis: Although the East Verde River is within the historical range of the northern leopard frog, the likelihood that frogs could be exposed to stocked fish in the buffered stocking reach is low. There are no historical records for northern leopard frogs in the East Verde River; however, there is 1 historical record for northern leopard frogs from 1 site in the buffered stocking reach; Unmarked Pond (= Cindy's Pond) (1984) (HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). There have been 68 surveys at 36 sites within the buffered stocking complex between 1926 and 2007 with most with most surveys conducted between 1972 and 2007 (Figure 90; HDMS, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.). Northern leopard frogs were not observed during subsequent surveys at Unmarked Pond (= Cindy's Pond) (1997 and 1998). Although some available habitats have not been surveyed within the buffered complex, it is likely that northern leopard frogs no longer occupy (= Cindy's Pond) (1984) because of negative subsequent surveys. In addition, salamanders have been documented at (= Cindy's Pond) (1984), making this area less suitable for northern leopard frogs (AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.).

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to fish stocked in the East Verde River is low because there are no historical records for northern leopard frogs in the East Verde River and its tributaries where fish may disperse outside the buffered reach. In addition, these drainages are below the elevational range of the frog

(approximately 5,300 ft) (Sredl 1997) and the habitat is less suitable for northern leopard frogs due to the presence of non-native fish, crayfish and salamanders.

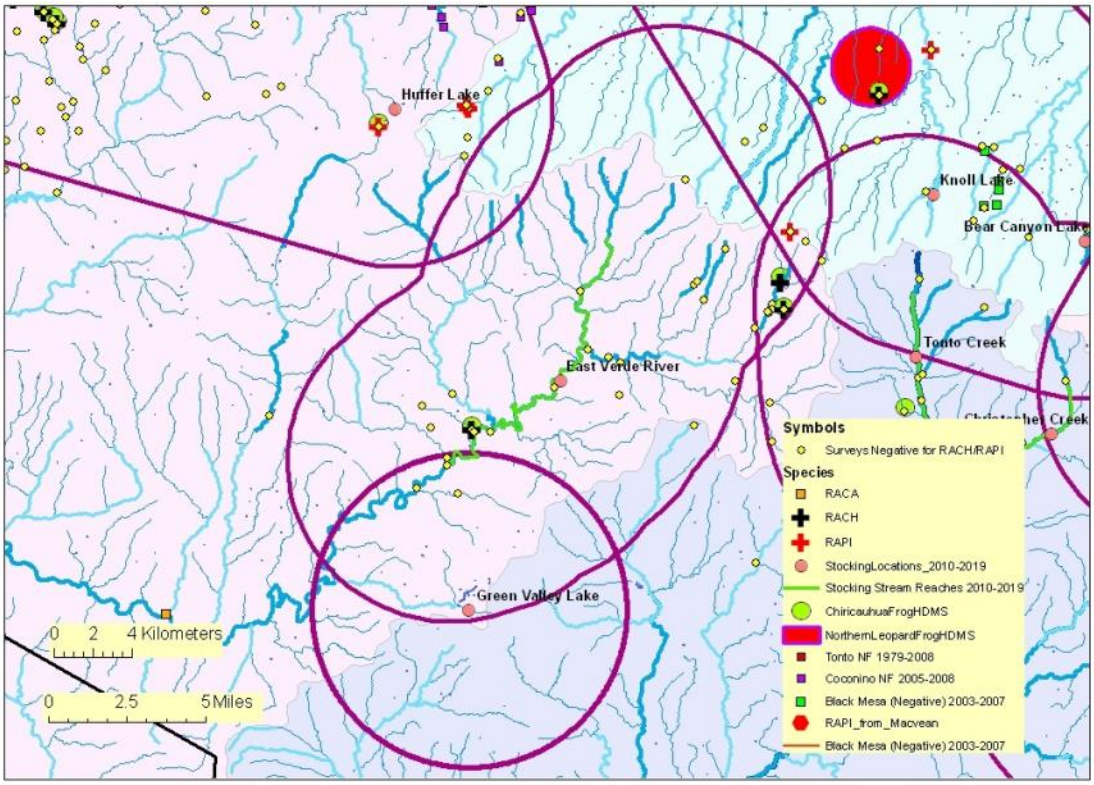

Figure 90. Lower Verde buffered stocking complex:

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).

Headwater Chub

Headwater chub have been documented to historically occupy the East Verde River Drainage (Minckley 1973). During the first status assessment of headwater chub, chub were documented near the confluence of Webber Creek in both Webber Creek and the East Verde River (Voeltz 2002). This population was identified as an Unstable and Threatened population, due to the low numbers detected and the presence of green sunfish along with other identified threats. Headwater chub were confirmed to be the species of chub occupying upper and middle portions of East Verde River in 2006 (Schwemm 2006). More recently, the reach proposed for stocking

rainbow trout is occupied by headwater chub. According to recent discussions with angler groups that frequently fish within the stocking area of the East Verde River, headwater chub are abundant and often caught with a hook and line (C. Cantrell pers. comm.).

Potential impacts

Potential impacts to chub could result from the predation on small headwater chub, larvae or eggs by stocked rainbow trout. Rainbow trout are primarily insectivorous, but may consume small fish. The area proposed for stocking is occupied by several other competing and predatory non-native species that occur independent of stocking actions (smallmouth bass, green sunfish, crayfish, bullfrogs, etc.). Rainbow trout do not survive the summer, except in the most extreme upstream portions of the East Verde River above the Mail Creek confluence (Gill 2009c).

Gila Trout

Gila trout have been stocked previously into Dude Creek, a tributary to the East Verde River but are not being considered for future stockings as part of this consultation. The last stocking occurred in Dude Creek in 2000 and recent surveys suggest that these fish no longer exist in the stream (Meka 2006). No surveys from the East Verde River have documented Gila Trout within the stocking action area.

Potential impacts

Behnke (2002) reports the maximum known age of Gila trout to be six years. The last stocking of Gila trout into Dude Creek occurred in 2000, suggesting that these fish have all died. The only way that stocked rainbow trout could have an effect on previously stocked Gila trout is if the Gila trout stocked successfully reproduced, which is not to be expected because they have not been found in surveys (Meka 2006).

Green Valley Lakes (Urban Fishing Program water)

Site Description

Green Valley Lakes are a group of three interconnected ponds totaling 13 acres located at Main Street and Green Valley Parkway in Payson (Figure 91). Constructed by the Town of Payson in 1998 as part of their urban park system, the lake was built for: park aesthetics; recreational fishing; reclaimed water use, storage and distribution; groundwater recharge; and for minor flood retention. These artificial lakes have a dirt bottom and have well maintained and grassy edges typical of urban park settings. The main, 10-acre fishing lake has an average depth of 14 feet with a maximum of 21 feet. The upper lake is 2 acres with an average depth of 7 feet and maximum of 12. The middle lake is one acre with a maximum depth of 10 feet. Green Valley Park has a variety of improvements including restrooms, ramadas, picnic tables, lighting, handicap accessibility, fishing dock, parks department office, historic buildings and museum, ball fields, playgrounds and a boat ramp.

Management of Water Body

Since its beginning in 1998, Green Valley Lakes have been managed as an Urban Fishing Program (UFP) lake that is a put-and take trout fishery intensively stocked to provide seasonal high use fishing opportunities for anglers of all ages and abilities. Special regulations are in place for this UFP water, which govern the harvest of trout, catfish, bass, sunfish, and white amur. No live baitfish use is allowed. The newly constructed Green Valley Lakes were approved for the stocking of rainbow trout. No other fish species have been stocked by the Department.

Put-and-take rainbow trout stockings occur every other week from October through May each year. Due to high temperatures, few, if any, rainbow trout persist through the summer. The origin of the existing warm water fish species is unknown.

Creel survey results from 2005 found 20,000 angler use days per year, an angler satisfaction rate of 90% and a 40% youth participation rate. The 2005 creel survey found that 56% of the angling pressure at Green Valley lakes is for rainbow trout. Angler catch rates for trout were 0.53 fish per hour (twice as high as any other Urban Fishing Program water). Over 9,000 rainbow trout were stocked in 2005 and anglers caught more than 14,000 over the year, releasing many of them to be caught again. The return to creel of the stocked trout (number kept versus number stocked) was 98%.

The only fish stocked by the Arizona Game and Fish Department since construction of the lakes has been rainbow trout (Table 85). Many other fish species have been documented from the lake over time (see Community Description below). After installing grating structures at the outflows, the Town of Payson stocked adult white amur into the upper and middle lakes for the biological control of nuisance aquatic vegetation and filamentous algae.

Table 85. Historic Urban Fishing Program fish stocking of Green Valley Lakes

Species	**Years**	**Num. of Stockings**	**Num. of Fish Stocked**
Rainbow trout	1998-2008	150	83,780

Figure 91. Green Valley Lake aerial photo showing upper middle and lower lakes, and the golf course and ponds downstream.

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 multiple times on a seasonal basis (October to May); numbers of trout stocked would range from 0 to 15,000 fish annually.

Catchable channel catfish would be stocked multiple times in the spring and fall seasons; numbers of catfish stocked would range from 0 to 3,500 fish annually.

Water Distribution / Connectivity
Green Valley Lake is an open system water body because it has a large urban watershed inflow and a spillway/overflow and is situated in the ephemeral American Gulch drainage. The main and upper lakes were constructed in the American Gulch drainage, a 3.1 mi^2 urban watershed, to collect storm water runoff for groundwater recharge and flood control. The middle lake is separated from the American Gulch floodplain, but is interconnected to the upper lake by a controlled gate structure that supplies water. A grated outflow structure at the middle lake passes water down to the main lake. The primary source water for all lakes is reclaimed water from the Gila County Wastewater Treatment facility in Payson. Reclaimed water is pumped via pipeline into the upper lake, and then goes through two outflows; a small one into the middle lake, and a large one into the main lake. A pump house is located on the main lake to withdraw water from the lake for park landscape and turf irrigation, and for pipeline deliveries to various municipal and private customers. During precipitation events typical of a 1-year storm event the upper lake spills through a large grated structure/outflow into the main lake. For small to moderate storm events, the main lake spills through a grated overflow culvert, or for larger events flows over the earthen spillway/dam into American Gulch. From Green Valley Lakes, the ephemeral American Gulch is 7 miles long before it joins the East Verde River.

Fish Movement
Because the main Green Valley Lake is part of the American Gulch drainage and floodway and can overflow and spill, stocked fish or their smaller progeny may escape and be flushed downstream traveling the same pathway described in the Water Connectivity section above. During summer or winter runoff events, Green Valley Lake overflows into ephemeral American Gulch which is 7 miles long before connecting to the East Verde River. This drainage connection could conceivably transport stocked fish and their progeny downstream to the East Verde River. No records exist for sampling on American Gulch. An attempt was made to sample American Gulch in summer 2009 but at the time of the visit the stream was dry (N. Robb, pers. comm.).

Community Description
Swanson and Hill (2006) and Rogers (2009b) report rainbow trout (seasonally); channel catfish, flathead catfish, largemouth bass, bluegill, black crappie, and red shiners are present in the lakes.

White amur are present only in the Upper and Middle lakes as a biological method of controlling nuisance aquatic vegetation.

Consultation Species or Critical Habitat
Potential impacts to Chiricahua and northern leopard frogs, headwater chub and Gila trout are discussed below. Potential downstream impacts to northern Mexican and narrow-headed gartersnakes, loach minnow and critical habitat, spikedace and critical habitat and roundtail chub further downstream are discussed in the East Verde Complex and Lower Verde River analysis later in the document.

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 the 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.

Chiricahua leopard frog
Local Analysis: Although Green Valley Lake is within the historical range of the Chiricahua leopard frog, the likelihood that frogs could be exposed to stocked fish in the buffered stocking site is low. There have been 9 surveys at 4 sites within the buffered stocking site between 1935 and 2009 with no reported observations of Chiricahua leopard frogs at Green Valley Lake or the buffered stocking complex (Figure 90, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.) Although available habitats have not been adequately surveyed, it is unlikely that Chiricahua leopard frogs occupy Green Valley Lake and its buffered complex because the area is below the range of the frog (5,300 ft) (Sredl 1997). In addition, the presence of non-native fish in Green Valley Lake and the East Verde River reduce the likelihood that northern leopard frogs can persist within the buffered stocking site.

Broad Scale Analysis: The likelihood that Chiricahua leopard frogs could be exposed to dispersing fish stocked in Green Valley Lake is low, because there are no historical records and areas where fish can disperse are below the range of the Chiricahua leopard frog (approximately

5,300 ft) (Sredl 1997). In addition, the habitat in these drainages is less suitable for Chiricahua leopard frogs due to the presence of non-native fish.

Northern Leopard Frog

Local Analysis: Although Green Valley Lake is within the historical range of the northern leopard frog, the likelihood that frogs could be exposed to stocked fish in the buffered stocking site is low. There have been 9 surveys at 4 sites within the buffered stocking site between 1935 and 2009, with no reported observations of northern leopard frogs at Green Valley Lake or within the buffered stocking site (Figure 90, AGFD Riparian Herpetofauna Database, M. Sredl pers. comm.) Although available habitats have not been adequately surveyed, it is unlikely that northern leopard frogs occupy Green Valley Lake and its buffered complex because the area is below the range of the frog (5,300 ft) (Sredl 1997). In addition, presence of non-native fish in Green Valley Lake and the East Verde River make the habitat within the buffered stocking site less suitable for northern leopard frogs.

Broad Scale Analysis: The likelihood that northern leopard frogs could be exposed to dispersing fish stocked in Green Valley Lake is low, because there are no historical records and areas where fish can disperse are below the range of the northern leopard frog (approximately 5,300 ft) (Sredl 1997). In addition, the habitat in these drainages is less suitable for northern leopard frogs due to the presence of non-native fish.

Headwater Chub

Headwater chub are not present in Green Valley Lake or in American Gulch. They are documented near the headwaters of the East Verde River, as stated above in the East Verde River stocking site consultation species description. Headwater chub have also been historically documented in some tributaries of the East Verde River (i.e. Pine Creek, the Gorge).

Potential Impacts

Potential impacts to headwater chub resulting from the stocking of rainbow trout and channel catfish in Green Valley Lake may result if those fish move out of and have access to occupied habitat in the East Verde River. Potential impacts for roundtail chub will be assessed in the East Verde River Complex Analysis, below.

EAST VERDE RIVER COMPLEX ANALYSIS

Water distribution

The East Verde River from Highway 87 to the headwaters and the Green Valley lakes were discussed in this document previously. The following discussion will cover the East Verde downstream.

The East Verde Watershed begins below the Mogollon Rim and flows into the lower Verde River (Figure 86and Figure 87). The East Verde River is interrupted-perennial for most of its length downstream of Highway 87, and is mostly dry near the confluence with the Verde River, based on USGS gage data. Major intermittent tributaries downstream of Highway 87 include Sycamore Creek, Ash Creek, Pine Creek (intermittent/perennial interspersed), and Rock Creek.

Green Valley Lake drains into the ephemeral drainage of American Gulch, which in turn empties into the East Verde River approximately 4 miles west of Payson, Arizona and 12 miles downstream from Webber Creek and 7 miles downstream of Ash Creek. City Creek, after merging with Hail Creek, intermittently enter the East Verde 7 miles downstream of American Gulch.

Pine Creek enters the East Verde River 9 miles farther downstream. Pine Creek flows off the Mogollon Rim on the Tonto National Forest north of the town of Pine, Arizona. It flows south to its confluence with the East Verde River approximately 18 miles downstream of the nearest rainbow trout stocking site. Perennial reaches (in the upper reaches below HWY 87) are interspersed with sections of intermittent flow down to the confluence with the East Verde. The section at the confluence of the East Verde was dry in late September of 2008 and then intermittent for two miles upstream. Pine Creek is also typically dry from Camp Lo Mia downstream to the Tonto Natural Bridge.

Rock Creek has intermittent/ephemeral flow into Walnut Canyon that flows intermittent into the East Verde 1.5 miles downstream of the confluence with Pine Creek. Boardinghouse Canyon also has intermittent flow to the East Verde near the confluence with Walnut Canyon.

The Gorge merges with Greenhorn Canyon intermittently to enter the East Verde River 9 miles downstream of the Pine Creek confluence. This is the last tributary to the East Verde River that is known to have perennial flow. The extent of perennial water is unknown, but a 2009 survey documented flow at the confluence to the terminus of the survey over 0.6 miles upstream with fish noted throughout (Burger and Gill 2009). From The Gorge confluence it is roughly 5 miles to the Lower Verde River confluence.

Flows in the lower East Verde River are highest from January through March and lowest in June and July (Figure 92). Burger and Gill (2009) conducted a fish survey of the lower East Verde River, from LF Ranch to the Verde River confluence, in March 2009. The LF Ranch is located approximately 13 miles from the confluence with the Verde. Discharge in the East Verde River at the time of the survey was 15 cfs. Based on historical discharge data, the East Verde River has gone dry at times though this portion of the stream (Table 86). The overall lack of fish observed or sampled in the mainstem East Verde River supports the notion that much of the stream dries. The middle portion of the sampled reach does contain several deep (> 1.5 m) pools that likely contain at least some water during dry periods. These pools may be important for the long term

survival of fish in this section of river, although at the time of sampling, the pools looked to be relatively devoid of fish.

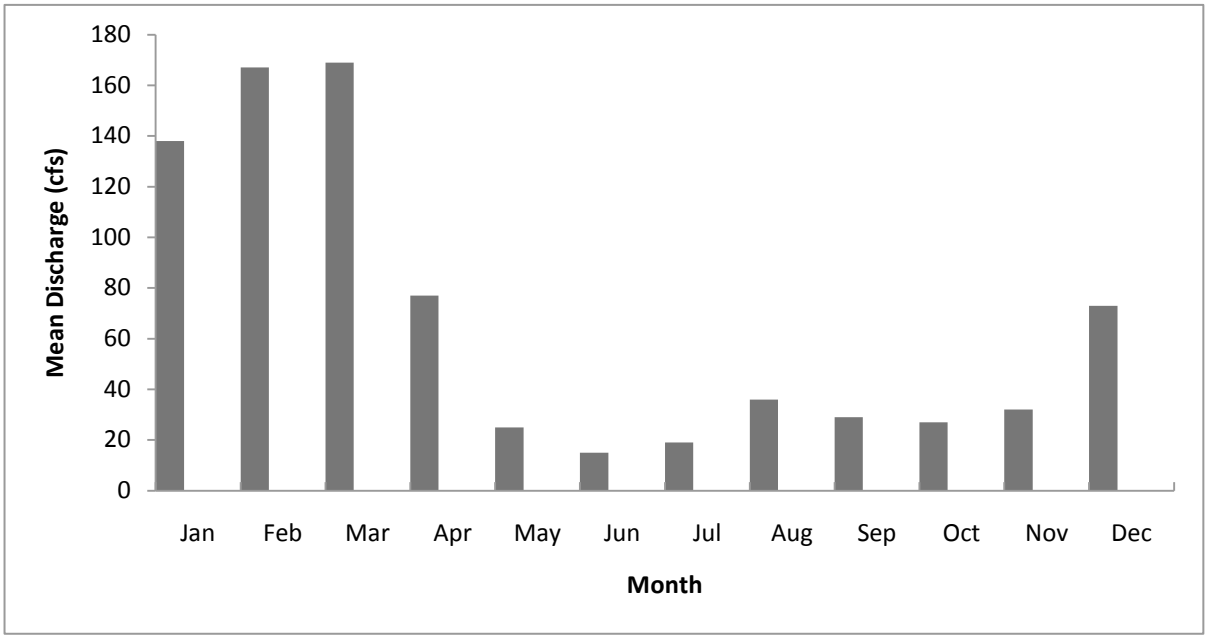

Figure 92. Mean monthly discharge (cfs) for the USGS gage downstream at the Lower East Verde near Childs, AZ for the period from 9-1-61 to 9-30-08.

Table 86. Mean monthly discharge (cfs) for the USGS gage downstream at the Lower East Verde near Childs, AZ for the period from January 2000 to September 2008.

	Year								
Month	2000	2001	2002	2003	2004	2005	2006	2007	2008
Jan	4.8	9.1	5.8	2.7	5.3	414.8		6.6	813.6
Feb	7.0	29.2	5.4	225.3	4.3	759.1		14.8	278.4
Mar	14.9	191.8	4.2	510.2	5.8	131.1		4.5	75.4
Apr	4.8	33.4	2.5	13.5	5.0	37.6		2.8	18.9
May	0.4	7.8	0.5	4.2	0.8	20.2		0.5	9.6
Jun	0.5	5.7	0.0	0.3	0.0	5.1		0.1	2.0
Jul	0.0	25.9	0.0	5.4	4.8	13.4		12.7	14.2
Aug	3.0	27.7	0.0	2.5	2.1	53.3		231.0	3.6
Sep	1.2	11.3	3.4	4.2	43.6	3.2		90.3	5.6
Oct	128.5	13.9	0.4	0.5	16.5		2.4	0.9	
Nov	53.0	5.0	1.0	1.9	96.9		2.9	1.6	

Dec	7.1	7.1	2.0	3.7	200.6		4.1	802.9	

Fish Movement
Stocked fish also have the ability to move freely downstream all the way to the confluence with the Verde River. This is most likely to occur during high winter flows from rain events. A gauging station on the lower East Verde River shows that the highest flows occur during this period (Figure 92) and stream temperatures would be more amenable to trout survival at this time. The East Verde River dries in the lower portions at base flow and temperatures become too warm for trout at this time. Burger and Gill (2009) did not document any trout or channel catfish on a survey that began just upstream of LF Ranch and extended downstream to the Verde River confluence in March 2009.

Channel catfish and rainbow trout would have the ability to move out of Green Valley Lake only during high flow events because the lake typically does not spill except during these periods. If fish were flushed out of Green Valley Lake they would have the ability to move down American Gulch to the East Verde River. Once in the East Verde River they would have the ability to move upstream to the natural waterfall between the Ellison Creek confluence and Waterwheel. Downstream movement would be unrestricted. Once in the Lower Verde River channel catfish would be able to move upstream into the Middle Verde River or downstream to Horseshoe Lake and beyond.

Community Description
LCRB Aquatic GAP data indentifies longfin dace, yellow bullhead, goldfish, desert sucker, Sonoran sucker, red shiner, headwater chub, green sunfish, smallmouth bass, rainbow trout, speckled dace, and Gila trout have been collected from the East Verde River.

Surveys noted the presence of nonnative rainbow trout, green sunfish, yellow bullhead, smallmouth bass, fathead minnow, and red shiner, as well as native Sonora sucker, desert sucker, longfin dace, and roundtail chub, which was likely headwater chub, in the East Verde River (Clark 1997; Burger 2008a; Burger and Gill 2009; Gill 2009c). Green Valley Lake contains rainbow trout (seasonally), channel catfish, flathead catfish, largemouth bass, bluegill, black crappie, and red shiners (Swanson and Hill 2006; Rogers 2009b).

A survey in 1997 (Clark 1997) of an approximately 1 mile stretch of the East Verde River approximately 2 miles below the East Verde River and American Gulch confluence, approximately 25 miles above the confluence with the Verde, found green sunfish, Sonora sucker, roundtail chub, yellow bullhead, smallmouth bass, and fathead minnow. Crayfish were also numerous.

A spot check survey of the East Verde River in late September 2008, upstream and in the vicinity of the Doll Baby Ranch, approximately 18 miles above the confluence with the Verde, found desert sucker, fathead minnow, red shiner, yellow bullhead, and green sunfish, as well as crayfish (Burger 2008a). The East Verde River was dry for at least ¼ mi above the Pine Creek confluence.

A more recent spot check survey of the East Verde River was conducted from LF Ranch to the confluence with the Verde River between March 22 and 24, 2009 (Burger and Gill 2009). The survey used visual observations, dip net surveys, minnow trap surveys, and some hook-and-line sampling. The survey documented the presence of non-native green sunfish, fathead minnow, smallmouth bass, and largemouth bass. Green sunfish were noted to be common in most slack-water habitats. The only native fish species documented in the East Verde River proper was longfin dace. No chub species were collected or observed in the mainstem East Verde River. Additionally, no rainbow trout or channel catfish were observed or collected throughout the survey.

Records from the Native Fish Database show roundtail chub observations in the late 1990s, from above the Webber Creek confluence to downstream near the Pine Creek Confluence.

A number of recent surveys have been conducted on tributaries to the East Verde River (Table 84). These surveys are discussed below beginning in the headwaters of the East Verde River and moving downstream.

A visual survey was conducted in 2008 on lower Pine Creek from the confluence to approximately 2 miles upstream (Burger 2008a). Desert sucker, chub spp. (likely headwater), longfin dace, red shiner, yellow bullhead, and green sunfish were observed. No trout were observed in this stretch nor did the habitat appear suitable for trout. Rainbow trout were collected above Camp Lo Mia on upper Pine Creek in 2007 and the population was noted to be entirely of wild origin (Gill 2007b). This is much better trout habitat than the lower portion. It is higher elevation, with cooler water temperatures and stretches with run, pools, and riffles. The lower portion was mostly comprised of warm pools of water.

A visual survey was also conducted in 2008 on lower Rock Creek (Burger 2008b). That survey noted the presence of native desert sucker and longfin dace. The only nonnative fish species noted in Rock Creek was red shiner (Table 87).

Burger and Gill (2009) surveyed approximately 200 – 300 m of The Gorge, located approximately 6 miles from the Verde River confluence, in March 2009. Multiple age classes of green sunfish and headwater chub were collected from pools in the lower portion of The Gorge. Native longfin dace and a native sucker (likely desert sucker) were also observed.

Narrow-headed gartersnakes are found in the East Verde River (see complex analysis).

Table 87. Summary of the most recent fish surveys in East Verde River Tributaries downstream of highway 87

2008	Jamie Evans Holly Hicks William Lemon	North Sycamore	Visual	Evans 2008. Highline trail trip report.	No fish seen
2008	Bill Burger Natalie Robb	Pine Creek	Visual Dipnet	Burger 2008a. Fish and Herp survey of East Verde, Rock, and Pine Creek.	Desert Sucker Longfin Dace UnID Chub Red Shiner Yellow bullhead Green sunfsh Crayfish
2008	Curt Gill Bill Burger	Pine Creek	Backpack Shocker	Gill 2007. Pine Creek Fish Survey.	Rainbow trout N = 101 (60-205mm)
2008	Bill Burger Natalie Robb	Rock Creek	Visual Dipnet	Burger 2008a. Fish and Herp survey of East Verde, Rock and Pine Creek.	Desert Sucker Longfin Dace Red Shiner Crayfish
2009	Bill Burger Curt Gill	The Gorge	Minnow Trap Hook-and-Line Dipnet	Burger and Gill 2009.	Green sunfish UnID chub desert sucker

Consultation Species or Critical Habitat

Potential impacts to headwater chub, Gila trout, northern Mexican and narrow-headed gartersnakes are discussed below. Potential downstream impacts to northern Mexican and narrow-headed gartersnakes, headwater and roundtail chub, spikedace and critical habitat, razorback sucker and critical habitat, loach minnow, desert pupfish, Gila topminnow and Colorado pikeminnow are discussed in the Lower Verde River analysis. Chiricahua and northern leopard frogs were discussed previously in the site analysis.

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 and narrow-headed 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.

Chiricahua Leopard Frog
See Local and Broad Scale analyses under each stocking location.

Northern Leopard Frog
See Local and Broad Scale analyses under each stocking location.

Northern Mexican Gartersnake
Stocking complex analysis: The East Verde River stocking complex is considered unoccupied by northern Mexican gartersnakes. There are no records of the species within the East Verde River complex (HDMS). The closest locality to the complex is at Tonto Creek (HDMS; Holycross et al. 2006), which drains to the Salt River and is about 10.6 air mi from Green Valley Lake and 15.5 air mi from the East Verde stocking reach. The intervening landscape is rugged and generally unsuitable for northern Mexican gartersnakes and dispersal from those sites to the East Verde River complex is highly unlikely. There is a questionable historical (1933) record for a northern Mexican gartersnake from Hart Canyon, a tributary of Willow Creek (approx. 18.6 air mi from the East Verde stocking reach and about 25 air mi from Green Valley Lake), for which Holycross et al. (2006) provide this analysis: "Wright and Wright (1957) discuss a *T. eques* from Hart Canyon....and provide both a physical description and photographs (p. 802). Unfortunately, it is difficult to tell from the photographs or description whether or not this specimen is a *T. eques*, so the specimen is not mapped…Whether [this record is valid] is a question that needs to be resolved, if possible." Regardless of the credibility of this record, it is unlikely that northern Mexican gartersnakes would disperse across the Mogollon Rim to the East Verde River complex from this site. Also, Green Valley Lake does not provide suitable habitat for the species.

Previous fish surveys in the East Verde River have documented smallmouth bass, green sunfish, crayfish, and bullfrogs (Clark 1997, Burger 2008a, Burger and Gill 2009), making the system less suitable habitat for northern Mexican gartersnakes. Without historical records from the stocking complex and the lack of suitable habitat, there is no likelihood of exposure to fish stocked within the East Verde River complex.

Downstream analysis: Downstream of the East Verde River complex, there are two unvouchered sightings of northern Mexican gartersnakes, and the status of the northern Mexican gartersnakes along that part of the Verde River is unknown. A northern Mexican gartersnake was observed in 1986 at Houston Creek just below the confluence of the East Verde and Verde rivers (approx. 33.5 river mi downstream of the East Verde stocking reach) (Rosen and Schwalbe 1988). There is an additional record from Horse Creek from 1986, a tributary to the Verde River approx. 22 river miles downstream of the East Verde confluence (Rosen and Schwalbe 1988). If fish stocked in the East Verde River complex dispersed into the East Verde and Verde Rivers, there is likelihood that northern Mexican gartersnakes could be exposed to rainbow trout and channel catfish.

Narrow-Headed Gartersnake

Stocking complex analysis: The current status of narrow-headed gartersnakes in the East Verde River is unknown. The East Verde River supported a population of narrow-headed gartersnakes possibly as late as 1992 (Holycross et al. 2006). There are multiple observations of narrow-headed gartersnakes (1981-1986) from 0-3 river miles downstream of the East Verde River stocking reach (HDMS; Rosen and Schwalbe 1988). There is an unsubstantiated observation of an individual from Pine Creek, which flows into the East Verde, but there is no date associated with this record (Holycross et al. 2006). The species was not found during surveys in the East Verde in 2004 and 2005; however the physical habitat appeared suitable despite the presence of crayfish and non-native fish (Holycross et al. 2006). The abundance of non-native and predatory fishes, especially spiny-rayed sunfishes and catfishes may negatively affect their foraging and movement potential and may preclude their persistence in this area. It is possible narrow-headed gartersnakes still exist in the East Verde in low numbers, or that the species could disperse into the East Verde River from populations on the Verde River upstream. Therefore, there is likelihood narrow-headed gartersnakes could be exposed to stocked rainbow trout or channel catfish in the East Verde River.

Downstream analysis: Narrow-headed gartersnakes likely persist in low densities in the Verde River (Holycross et al. 2006). There is a 2005 record of a narrow-headed gartersnake from Ikes Backbone in the Verde River, approx. 34 river mi downstream of the East Verde River complex (HDMS; Holycross et al. 2006). If stocked sportfish disperse from the complex into the East Verde and Verde Rivers, there is likelihood of exposure to narrow-headed gartersnakes.

Headwater Chub

Headwater chub have been documented to historically occupy the East Verde Drainage (Minckley 1973). Records from the Native Fish Database show roundtail chub observations in the late 1990s, from above the Webber Creek confluence to downstream near the Pine Creek Confluence. In 1997 headwater chub were documented in East Verde River downstream of American Gulch (AGFD unpublished). During the first status assessment of headwater chub,

chub were documented near the confluence of Webber Creek in both Webber Creek and the East Verde River (Voeltz 2002). This population was identified as an Unstable and Threatened population, due to the low numbers detected and the presence of green sunfish along with other identified threats. In 2007 and 2008, AGFD documented headwater chub in two tributaries of the East Verde River. These tributaries were Pine Creek and the Gorge. More recently, the reach proposed for stocking rainbow trout is occupied by headwater chub. According to recent discussions with angler groups that frequently fish within the stocking area of the East Verde, headwater chub are abundant and often caught with a hook and line (C. Cantrell pers. comm.).

Recent fires in the drainage area may have impacted the population occupying the stocking area. No recent surveys have been implemented to document the abundance of headwater chub pre and post these fires.

Potential Impacts

Potential impacts to chub from rainbow trout are primarily insectivorous, but may consume small fish, eggs and larvae. However, the main impact would likely be competition for food and space before the trout perished in the summer.

Potential impacts to chub from channel catfish would likely be competition for food and space but more likely from the predation on headwater chub and their eggs and larvae.

Channel catfish leaving the Green Valley Lakes would have to be transported or swim over 5 miles r in one season to access the East Verde River, where headwater chub are located. Channel catfish could survive the summer if water existed in the intervening reaches. To date, no records have been documented of channel catfish in American Gulch or the East Verde River.

The area proposed for stocking is occupied by several other competing and predatory non-native species that occur independent of stocking actions (smallmouth bass, green sunfish, crayfish, bullfrogs, etc.), which would be expected to outcompete and predate on trout. In addition, rainbow trout would not be expected to persist in the East Verde, except above the Mail Creek confluence (Gill 2009c) because of summer temperatures.

Gila Trout

Gila trout have been stocked previously into Dude Creek, a tributary to the East Verde River but are not being considered for future stockings. The last stocking occurred in Dude Creek in 2000 and recent surveys suggest that these fish no longer exist in the stream (Meka 2006). No surveys from the East Verde River have documented Gila Trout within the stocking action area.

Potential Impacts

Behnke (2002) reports the maximum known age of Gila trout to be six years. The last stocking of Gila trout into Dude Creek occurred in 2000, suggesting that these fish have all died. The only

way that stocked rainbow trout could have an effect on previously stocked Gila trout is if the Gila trout stocked successfully reproduced, which is not expected because they have not been found in surveys (Meka 2006).

LOWER VERDE RIVER SUB-WATERSHED ANALYSIS

The Lower Verde River is not proposed for sport fish stocking. The proposed stocking that may impact this area are in the Upper Verde watershed and the Middle Verde River Complex. The proposed stockings on the East Verde River are at a minimum approximately 33 miles upstream of the confluence with the lower Verde. The Lower Verde River has historically been a self-sustaining warm-water fishery with recent regulatory changes allowing unlimited harvest of non-native fishes (AGFD 2009a).

Water Distribution / Connectivity

Water distribution and connectivity, fish movement, and aquatic community descriptions were discussed for the upper and middle Verde River, upper and lower East Verde River, and Green Valley Lake, and will not be repeated here. Impacts to sensitive species in the Lower Verde River sub-watershed attributable to stocking actions in the East Verde River Complex are discussed below. Potential impacts from fishes stocked further upstream in the Middle Verde complex and coming through the Upper Verde River from other upstream complexes are also comprehensively included.

For the purposes of this consultation, the Lower Verde River begins at Childs and continues downstream to Horseshoe Lake, a distance of 36 miles. There are number of intermittent perennial tributaries to the Lower Verde River: Fossil Creek, East Verde River, Red Creek, Wet Bottom Creek, and Tangle Creek.

Fossil Creek is a perennial warm-water stream that flows for 14 miles and empties into the Verde River from the east. Fossil Creek flows into the Lower Verde River 3.8 miles downstream of Childs. The stream was recently renovated and upstream of a constructed barrier the stream is composed of entirely native fish.

The East Verde River empties into the Verde River 3.3 miles downstream from Fossil Creek. There are a number of interrupted perennial tributaries to the East Verde River from the headwaters to the confluence with the Verde River, including; Mail Creek, Dude Creek, Chase Creek, North Sycamore Creek, Ellison Creek, Webber Creek, Pine Creek, and The Gorge.

Red Creek empties into the Lower Verde River 16.2 miles downstream of the East Verde River. From there it is 0.8 miles to Wet Bottom Creek. Tangle Creek converges with the Lower Verde River 8 miles downstream from Wet Bottom Creek. Sycamore Creek enters from the east just under 0.6 miles farther downstream. From Sycamore Creek it is 8.3 miles to Horseshoe Dam.

Typically, the Lower Verde River experiences high flow in the winter and much reduced flows in the summer. Mean monthly flows at the USGS gauge at Tangle Creek range from 120 cfs in June to 1,470 cfs in February (Figure 93).

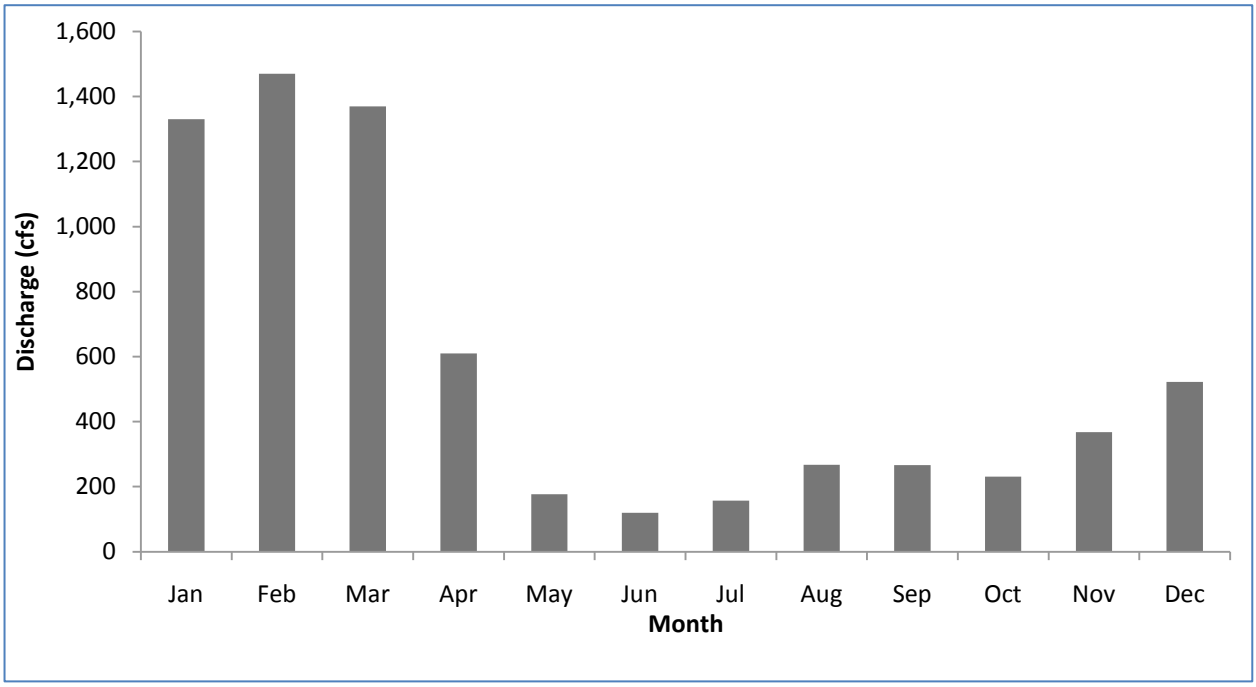

Figure 93. Mean monthly discharge (cfs) for the USGS gage on the Lower Verde River below Tangle Creek for the period from 10-1-85 to 9-30-08.

Fish Movement

Movement of stocked fish out of the proposed stocking locations upstream of Childs and in the East Verde River was previously discussed. Once in the mainstem Verde River below Beasley Flats, fish can move throughout the river system. Most of the tributaries to the Verde River are intermittent at their confluences, minimizing the chance for upstream movement into them. It is possible that fish could move upstream into tributaries during periods of high flow or after run-off events.

Once in the Verde River it would be possible for trout to move upstream to the next partial barrier (Verde Falls located between Beasley Flats and Childs) or downstream to Horseshoe Lake, but only during cooler seasons or when water temperatures allow. Survival of stocked rainbow trout in the Verde River would be limited to less than a year and they could not establish populations because temperatures become too warm for trout survival by summer.

In addition, even when water temperatures would be suitable for the different types of fish proposed for stocking, as indicated above most of the tributaries streams are ephemeral near the confluence with the Verde River making fish movement into those streams only opportunistic during a high flow event.

Community Description
The aquatic assemblage for the East Verde River, its tributaries, and Green Valley Lake were discussed in the previous sections. The aquatic community for the Lower Verde River and its tributaries is discussed below.

LCRB Aquatic GAP data identified 19 species of fish have been collected in the lower Verde River from 1974 to 2003. These are longfin dace, yellow bullhead, desert sucker, Sonoran sucker, common carp, red shiner, threadfin shad, mosquitofish, roundtail chub, channel catfish, green sunfish, redear sunfish, sunfish hybrid, largemouth bass, smallmouth bass, Colorado pikeminnow, flathead catfish, white crappie, and razorback sucker.

The Lower Verde River has been stocked in the past with smallmouth bass and more recently with Colorado pikeminnow and razorback sucker (Table 7). The Department has stocked both the upper and lower Verde River with Colorado pikeminnow and razorback sucker. On the lower Verde River, stockings occur at Beasley Flats and at Childs. From 1981 to 1991 stockings were conducted with fry and fingerling sized fish (Hendrickson 1993). Since 1991, reintroduction efforts in the Verde River have focused on stocking large razorback suckers and Colorado pikeminnow. The minimum size currently being stocked for both species is ten inches.

Table 7. Stocking History for the Lower Verde River

Species	First Year	Last Year	Number of Stockings	Num. Stocked
Smallmouth Bass	1960	1960	1	74
Colorado Pikeminnow	1993	2006	20	14,940
Razorback sucker	1993	2005	30	26,373
Total			51	41,387

From 1994-1998 AGFD placed coded wire tags on each pikeminnow and razorback suckers stocked to assess survival and movement; of the 24,915 razorback suckers stocked in the past 14 years, only one has been recaptured. Hyatt (2004) summarized the capture of razorback sucker (Table) and Colorado Pikeminnow (Table) for surveys conducted between 1990 and 2003. In May 2002, one razorback sucker with a pit tag was captured near Childs. The fish was tagged in 1999 and released in the same pool. A pit tagged Colorado pikeminnow has never been recaptured. Additional research is needed to determine if these fishes can successfully spawn and

recruit offspring into the adult population. There is no evidence of successful reproduction of Colorado pikeminnow or razorback sucker in the Verde River (Hyatt 2004; Jahrke and Clark 1999).

Narrow-headed and northern Mexican gartersnakes are found in the Lower Verde River Watershed (see watershed analysis).

Table 8. Captures of Razorback Suckers by AGFD electrofishing, seines, and trammel nets (Hyatt 2004).

Species	**Year**	**Total # Captured**
Razorback Sucker	1990	46
Razorback Sucker	1991	3
Razorback Sucker	1992	2
Razorback Sucker	1993	34
Razorback Sucker	1994	104
Razorback Sucker	1996	3
Razorback Sucker	1997	28
Razorback Sucker	1998	20
Razorback Sucker	1999	17
Razorback Sucker	2000	12
Razorback Sucker	2001	2
Razorback Sucker	2002	9
Razorback Sucker	2003	3

Table 9. Captures of Colorado Pikeminnow by AGFD electrofishing, seines, and trammel nets (Hyatt 2004).

Species	**Year**	**Total # Captured**
Colorado Pikeminnow	1992	3
Colorado Pikeminnow	1996	26*
Colorado Pikeminnow	1997	24
Colorado Pikeminnow	1998	30
Colorado Pikeminnow	1999	3
Colorado Pikeminnow	2003	1

*23 captured in Horseshoe Reservoir

Surveys were conducted annually on the Lower Verde River by AGFD fisheries personnel between 2001 and 2007. These surveys were conducted from Childs to Sheeps Bridge. Twelve species, including four native species, were documented in these surveys and Gill (2007c)

provided a summary of the surveys conducted between 2002 and 2007 (Table 10). Mosquito fish, yellow bullhead, goldfish, and bluegill have also been documented in portions of the Lower Verde River and/or in Horseshoe Reservoir (Burger 2001; Robinson 2007).

Surveys have also been conducted in the past on many of the tributaries to the mainstem Lower Verde River (Table 11). Burger (2009) documented the aquatic species composition for the lower portions of Squaw Creek and Sycamore Creek; they contained only native species. The only non-native species collected in Red Creek was green sunfish. Wet Bottom Creek contained a mix of natives and non-natives.

Table 10. Summarized comparison of Verde River fisheries survey electrofishing data from 2002 to 2007, excluding carp and red shiner (Gill 2007c).

	Relative Abundance (%)					
Year→ Species↓	**2002 (N)**	**2003 (N)**	**2004 (N)**	**2005 (N)**	**2006 (N)**	**2007 (N)**
CACL	4.9	6.7	5.7	1.1	6.6	18.3
	(19)	(18)	(5)	(10)	(10)	(33)
CAIN	8.6	12.2	21.6	1.4	12.5	32.2
	(33)	(33)	(19)	(12)	(19)	(58)
ICPU	4.4	3.0	0	1.1	2.6	3.3
	(17)	(8)	(0)	(9)	(4)	(6)
LECY	3.9	8.1	2.2	0.1	2.6	2.2
	(15)	(22)	(2)	(1)	(4)	(4)
LEMA	2.3	0.4	2.2	0	0.0	0.6
	(9)	(1)	(2)	(0)	(0)	(1)
MIDO	18.2	20.7	25.0	4.5	52.6	11.7
	(70)	(56)	(22)	(38)	(80)	(21)
MISA	15.9	24.4	17.0	0.6	6.6	3.3
	(61)	(66)	(15)	(5)	(10)	(6)
PYOL	39.3	23.0	21.6	1.3	15.1	28.3
	(151)	(62)	(19)	(11)	(23)	(51)
PTLU	0	0.4	0	0	0.0	0.0
	(0)	(1)	(0)	(0)	(0)	(0)
XYTE	2.3	1.1	4.5	0.2	1.3	0.0
	(9)	(3)	(4)	(2)	(2)	(0)
Overall	(384)	(270)	(88)	(79)	(152)	(180)

Table 11. Summary of the most recent fish surveys on the Lower Verde River Tributaries. Tributaries are listed in the order that they flow into the East Verde River, starting in the headwaters.

Year	Collector(s)	Stream	Survey Type	Source	Species
2008	Jesse Bahm and Codey Carter	Fossil Creek	Visual Dipnet	Carter 2008. Fossil Creek Gila Topminnow Survey	longfin dace, speckled dace, dessert sucker, Gila topminnow, desert pupfish, razorback sucker, roundtail chub
2009	Bill Burger, Curt Gill, and Jon Hanna	Red creek	Visual dipnet	Burger 2009. Verde River and Tributaries, Childs to Horseshoe Dam	longfin dace, dessert sucker, green sunfish
2009	Bill Burger, Curt Gill and Jon Hanna	Wet Bottom Creek	Visual dipnet	Burger 2009. Verde River and Tributaries, Childs to Horseshoe Dam	unid Chub, longfin dace, dessert sucker, green sunfish, smallmouth bass, red shiner
1979	Clarkson, Young	Tangle Creek		Clarkson and Young 1979	longfin dace
2009	Bill Burger, Curt Gill and Jon Hanna	Sycamore Creek	Visual dipnet	Burger 2009. Verde River and Tributaries, Childs to Horseshoe Dam	longfin dace, possible dessert sucker

Consultation Species or Critical Habitat

Potential impacts to northern Mexican and narrow-headed gartersnakes, headwater and roundtail chub, spikedace and critical habitat, razorback sucker and critical habitat, loach minnow, desert pupfish, Gila topminnow and Colorado pikeminnow are discussed below. Chiricahua and northern leopard frogs were discussed previously in the site analysis.

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 and narrow-headed 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.

Northern Mexican Gartersnake

Watershed analysis: Northern Mexican gartersnakes occupy the Lower Verde River, which lies within the current and historical range of the species, although likely in low numbers (Holycross et al. 2006, HDMS 2009). There are two unvouchered, though reliable, northern Mexican gartersnake observations in the Lower Verde. In 1986, a northern Mexican gartersnake was observed at the confluence of the East Verde and Verde Rivers and another at Horse Creek, north of Horseshoe Reservoir (Rosen and Schwalbe 1988, HDMS 2009). Given the likely presence of the species downstream of the Middle Verde River buffered stocking complex, there is likelihood of exposure to northern Mexican gartersnakes if stocked sport fish disperse from the Upper, Middle or East Verde River stocking sites.

Downstream analysis: There are no records of northern Mexican gartersnakes from the Verde River downstream of the Lower Verde watershed, thus no exposure is anticipated. Although there are historical records of northern Mexican gartersnakes from the Salt River downstream of the confluence with the Verde, northern Mexican gartersnakes are considered extirpated (USFWS 2008a).

Narrow-Headed Gartersnake

Watershed analysis: Narrow-headed gartersnakes occupy the Lower Verde River, which lies within the current and historical range of the species, although likely in low numbers. There is a 1987 gartersnake record from the Verde River at The Falls, approx. 18 river mi upstream of the confluence of Fossil Creek (HDMS 2009). Another was observed in 2005 along the Verde River approx. 1 river mile downstream from the confluence of Fossil Creek (Holycross et al. 2006, HDMS 2009). Therefore, there is likelihood that narrow-headed gartersnakes in the Lower Verde River will be exposed if stocked sport fish disperse from the Middle, Upper, or East Verde River stocking sites.

Downstream analyses: There are no records of narrow-headed gartersnakes below the Lower Verde watershed, thus no downstream exposure is expected (HDMS 2009).

Colorado Pikeminnow

Colorado pikeminnow were extirpated from central Arizona before about 1950. Prior to their disappearance, they were only known from the Verde River at an archaeological site in the Verde Valley and from one record in 1963 near Camp Verde (Sonfishes data). Since the early 1980's,

reintroductions of pikeminnow have occurred throughout the Verde River from the headwaters down to Childs. Colorado pikeminnow in the Verde River and Salt River are designated experimental non-essential under the Endangered Species Act (10j). The species only occurs in Arizona as a result of stocking action by the Arizona Game and Fish Department. No attempts at reproduction have been documented (lack of collection of ripe fish or spawning evidence) and no young have been detected within the Verde River. The USFWS has drafted recovery guidelines for Colorado pikeminnow throughout their range (USFWS 2008). No recovery potential or requirement is provided in those guidelines for a population of pikeminnow in Arizona.

Potential Impacts
Potential impacts could result from the movement of fish out of the stocked reaches. Movement over a minimum of 20 miles from the East Verde Drainage would need to occur in one season for trout or catfish to access the Verde River where Colorado pikeminnow are located.

Channel catfish would survive over the summer if water existed in the intervening reaches. Channel catfish are already well-established in the Verde River. Any trout migrating out of the East Verde River will die in the lower reaches during the summer. Biological response to an exposure between the two species could be competition for food or space if either is limited for Colorado pikeminnow, or predation by rainbow trout and channel catfish on young of year Colorado pikeminnow if they successfully reproduce (which has not been documented) or predation on trout and catfish by pikeminnow (beneficial response). No data exists to indicate that Colorado pikeminnow will migrate into the tributaries from the Verde River.

Desert Pupfish
Desert pupfish were stocked and have established a successful population within Lime Creek, a tributary of the Verde River that flows into Horseshoe Reservoir. In addition Desert pupfish are planned for stockings into Fossil Creek. It is unknown whether they will persist or if movement out of Fossil Creek will occur, but the potential does exist.

Potential Impacts
If pupfish were to wash downstream of both tributary and rainbow trout were able to successfully migrate downstream from the stocking area they could meet in the Verde River. While it is possible that individuals could be washed to downstream areas during flood events, existing literature indicates this will be rare. For example, Minckley and Meffe (1987) determined that, while non-natives are unable to resist flooding events and are washed downstream, native desert fishes show little if any response to flooding events. If individual fish were to be washed downstream it would be anticipated that it would be in low numbers and would likely be preyed upon by the numerous predatory fishes in the Verde River further reducing the opportunity for potential interactions with desert pupfish.

Gila Topminnow

Gila topminnow were stocked in and successfully populating Lime Creek. In addition, topminnows were recently stocked into Fossil Creek as a recovery action. Their persistence has not yet been determined, and movement out of Fossil Creek has also not been documented, but is possible.

Potential Impacts
If topminnows were to wash downstream and rainbow trout were able to successfully migrate downstream from the stocking area they could meet in the Verde River. While it is possible that individuals could be washed to downstream areas during flood events, existing literature indicates this will be rare. For example, Minckley and Meffe (1987) determined that, while non-natives are unable to resist flooding events and are washed downstream, native desert fishes show little if any response to flooding events. If individual fish were to be washed downstream it would be anticipated that it would be in low numbers and would be likely preyed upon by the numerous predatory fishes in the Verde River further reducing the opportunity for potential interactions with Gila topminnow.

Loach Minnow
Loach minnow are determined to be extirpated from the Verde River mainstem. No documented occurrences have been found since 1967. Loach minnow were recently stocked into Fossil Creek as a recovery action. Their persistence has not yet been determined, and potential for movement out of Fossil Creek has also not been documented.

Potential Impacts
If loach minnow were to wash downstream and rainbow trout were able to successfully migrate downstream from the stocking area they could meet in the Verde River. While it is possible that individuals could be washed to downstream areas during flood events, existing literature indicates this would be rare. For example, Minckley and Meffe (1987) determined that, while non-natives are unable to resist flooding events and are washed downstream, native desert fishes show little if any response to flooding events. If individual fish were to be washed downstream it would be anticipated that it would be in low numbers and would be likely preyed upon by the numerous predatory fishes in the Verde River further reducing the opportunity for potential interactions with loach minnow.

Razorback Sucker with Critical Habitat
Razorback suckers have been stocked throughout the Verde River since about 1981. Beginning in 1993, they have only been stocked at or below Beasley Flats. Reproduction has never been documented in the Verde River, but reproductively mature males have been encountered. Reproductive females have not been encountered, nor have larval or young razorbacks, although it should be noted that larval razorback sucker surveys have yet to be conducted.

Critical habitat for the razorback sucker on the Verde River was designated in 1995 and extends from the western boundary of the Prescott National Forest west of Perkinsville to Horseshoe Dam. The Verde River critical habitat unit was described in the biological support document for the designation as contributing to delisting of the species, therefore important for recovery (Maddux et al. 1993). The Middle Verde River reach was described as being altered by diversions, sand and gravel operations, and agricultural and residential development adjacent to the channel that may have affected channel morphology, especially in restricting the river from meandering. Backwaters and riparian areas are degraded. The Middle Verde River also was noted to support a diverse non-native fish community.

At the time of designation, the Verde River supported several constituent elements of critical habitat as described below:

> Water: The Verde River base flow is affected by the diversions that at times, can take all the flow from the river and leave it dry in spots (Kubacki 1998). Inflows from perennial tributaries and irrigation return flows provide some relief, especially in the Verde River beginning at Beasley Flats. There is sufficient flow through this reach to support fish populations.
>
> Physical habitat: The Verde River contained mainstem and backwater habitats, with shallow waters available at the lower ends of perennial tributaries.
>
> Biological environment: At the time of designation, non-native fish species were common in the Verde River with native fishes such as Sonora and desert sucker, roundtail chub, and longfin dace also present. Most of these native species are still present (Gill 2007c); however, the lack of consistent surveys in the reach is unable to document population trends for either native or non-native species.

Additional selection criteria besides the primary constituent elements were developed to assist in selecting critical habitat areas for the razorback sucker:

> Presence of spawning population: There was no spawning population in the Verde River at the time of designation. The Verde River may have supported a spawning population of razorback suckers later than did the Gila or Salt Rivers, as the last razorback sucker from the Verde River was documented in 1954, several years after the species was gone from the other central Arizona rivers.
>
> Nursery habitat: Nursery habitat is available in all reaches of the Verde River.

Historic or present distribution: The reintroduction of razorback sucker into the Verde River began in the 1980s, and the river was considered occupied at the time of designation of critical habitat.

Maintenance of range wide distribution: Potentially the last of the central Arizona rivers to support razorback suckers, the Verde River shares some physical characteristics with the Gila River in terms of elevational changes and the mixture of canyon and open alluvial floodplain areas. The Gila River is also free-flowing in that critical habitat reach, upstream of San Carlos Reservoir. The Gila River supported a large and dominant non-native fish community at the time of designation, similar to the Verde River.

Special management: Maintenance of a natural flow regime that would encourage native fish and discourage non-native fish was also identified as an important management need.

Potential Impacts

Razorback sucker

Potential impacts to the razorback sucker in the lower Verde River may result from the stocking of rainbow trout into the mainstem Verde River, Oak Creek, Wet Beaver Creek, West Clear Creek, East Verde River or from stocking rainbow trout and channel catfish into Green Valley Lake. Effects from stockings in tributaries could occur if the stocked fish moved down into the mainstem or if razorback suckers move into the stocking reaches of Oak Creek, Wet Beaver Creek, West Clear Creek or East Verde River, particularly during the razorback sucker spawning period.

Rainbow trout are documented to prey on razorback sucker larvae in the wild (Mueller 1993) and in a laboratory setting (Carpenter and Mueller 2008). While rainbow trout are not considered particularly piscivorous, they do prey on small fish (Bonar et al. 2004, Propst et al. 1998) and once stocked, may feed on natural foods (Propst et al. 1998). Bonar et al. (2004) also noted that stocked rainbow trout were primarily feeding on insects.

Catchable sized rainbow trout are proposed for stocking in the mainstem from November to March and in the tributaries from March to May and October to November. All fisheries are intended for high intensity use with repeated stockings during the period to maintain sufficient fish for anglers. Kubacki (1998) estimated a return to the creel of stocked trout of 50% in 1997 and 61% in 1998. He also notes that the 78% return from 1996 was done under a different census and should not be compared with the later results. Later creel results from 2000 indicated a return of 40%.

Rainbow trout are stocked before, during and after the probable spawning period for razorback suckers in the Verde River. Robinson (2007) caught seven tuberculate, ripe males in one gill net set in Horseshoe Reservoir in April 2005 where the water had a surface temperature of 19°C. The cluster of males is indicative of staging behavior during the spawning period. No ripe females have been found. No surveys for larval razorback suckers have been initiated, so it is unknown if spawning occurs. Persistence of rainbow trout in the river until May is documented and temperatures in the area currently known to be occupied by razorback suckers (Beasley Flat to Horseshoe Reservoir) remain suitable for rainbow trout until at least April (Robinson 2007).

The distribution of rainbow trout below West Clear Creek to Horseshoe Reservoir is unclear. Bonar et al. (2004) had a survey site at West Clear Creek and the Verde River, and likely that is the source of the rainbow trout they captured in their Reach III, although the specific record is not included in their report. The series of surveys in the Childs to Sheep Bridge and in Horseshoe Reservoir have not documented rainbow trout in that area (Table), even with some surveys done at the times of the year that rainbow trout could be expected to be in the system.

Table 12. Surveys in the Lower Verde River (Childs to Horseshoe Reservoir) that did not document rainbow trout in occupied razorback sucker habitat.

Date of Survey	Location	Source
1995	Childs to Sheep Bridge	Jahrke and Clark 1999
1996	Childs to Sheep Bridge	Jahrke and Clark 1999
1997	Childs to Sheep Bridge	Jahrke and Clark 1999
1998	Childs to Sheep Bridge	Jahrke and Clark 1999
1999	Childs to Sheep Bridge	Jahrke and Clark 1999
10/2001	Childs to Sheep Bridge	Weedman 2001
5/2002	Childs to Sheep Bridge	Weedman 2002
5/2003	Childs to Sheep Bridge	Weedman 2003
6/2004	Childs to Sheep Bridge	Weedman 2004a
2/2004	Horseshoe Reservoir	Weedman 2004b
10/2005	Childs to Sheep Bridge	Robinson 2007
3 and 10/2006	Childs to Sheep Bridge	Robinson 2007
4 and 10/2005	Horseshoe Reservoir	Robinson 2007
3 and 10/2006	Horseshoe Reservoir	Robinson 2007
5/2007	Childs to Sheep Bridge	Gill 2007c

For the Lower Verde, there are no records in the dataset (LCRB Aquatic GAP database) examined for stocked rainbow trout in the current razorback sucker stocking area. The Lower

Verde River is also occupied by many centrarchids, ictalurids and cyprinids (esp. carp and red shiner, known predators on razorback eggs and larvae).

Biological interactions between razorback sucker and trout have not been well studied. However, trout are known to be piscivorous at larger sizes and at younger sizes there may be dietary overlap with razorback suckers. Potential impacts may involve predation and competition in the area stocked with razorback suckers, but only if the trout move out of the East Verde River or other upstream tributaries. Potential interactions increase if the razorback suckers successfully reproduce and recruit (which has not been documented to date) because of the presence of young of year fish.

The draft Razorback Sucker Recovery Goals 2008 revision provides extensive discussion of the effects of non-native fishes on razorback sucker and attempts to control specific species in the upper basin (USFWS 2008). Many nonnative species are identified as concerns for razorback suckers in that document, including carp, channel catfish, flathead catfish, smallmouth bass, largemouth bass, bluegill, green sunfish, red shiner, sand shiner, fathead minnow, walleye and northern pike. Rainbow trout is not included in the list of species of concern.

Control efforts in the Upper Basin are targeted at pike, smallmouth bass and channel catfish specifically, within habitats also occupied by species of trout, where trout are not targeted for removal. It does not appear that trout are a recognized concern for razorback sucker. The Fish and Wildlife Service continues to stock rainbow trout into critical habitat and with a reproducing population of razorback sucker in Lake Mohave and below Davis Dam in the Colorado River.

Channel catfish stocked in Green Valley Lake have the potential to move downstream to the Lower Verde River and interact with razorback suckers in the main channel. Channel catfish could also survive over the summer in the intervening reaches between Green Valley Lake and the Verde River, if pools or water are present. Occurrence of channel catfish in this intervening habitat has not been documented, although recent surveys are limited (Burger and Gill 2009). Channel catfish are already well-established in the Verde River.

Critical habitat

The primary constituent elements of razorback sucker critical habitat include one for the biological environment. This element includes food supply, predation and competition components of the habitat. When critical habitat was established the Service recognized that non-native fish species were common in the Verde River. The Lower Verde River hosts at least 19 species according to the LCRB Aquatic GAP Data 1974 to 2003. These are longfin dace, yellow bullhead, desert sucker, Sonoran sucker, common carp, red shiner, threadfin shad, mosquitofish, roundtail chub, channel catfish, green sunfish, redear sunfish, sunfish hybrids, largemouth bass, smallmouth bass, Colorado pikeminnow, flathead catfish, white crappie, and razorback sucker.

Any stocked rainbow trout or catfish that joined this assemblage would contribute an incremental effect to this constituent element. However, the rainbow trout would not persist in critical habitat through the summer because of the high water temperatures.

Spikedace

Spikedace were recently stocked into Fossil Creek as a recovery action. Their persistence has not yet been determined, and potential for movement out of Fossil Creek has also not been documented. They are also assumed to be present in the upper Verde River above the Peck's Lake diversion dam, where critical habitat is designated, and is addressed in the Middle Verde River Complex discussion.

Potential Impacts

If spikedace were to wash downstream and rainbow trout were able to successfully migrate downstream from the stocking area they could meet in the Verde River. While it is possible that individuals could be washed to downstream areas during flood events, existing literature indicates this will be rare. For example, Minckley and Meffe (1987) determined that, while non-natives are unable to resist flooding events and are washed downstream, native desert fishes show distinctive behavioral responses that make them less susceptible to floods. If individual fish were to be washed downstream it would be anticipated that it would be in low numbers and would be likely preyed upon by the numerous predatory fishes in the Verde River that would further reduce the opportunity for potential interactions with spikedace.

Headwater Chub and Roundtail chub

Headwater chub and roundtail chub genetics and morphology are extremely complicated with similarities that make it difficult to distinguish the two apart. The two species were historically identified as separate sub-species, *Gila robusta robusta and G.r. grahmi*, and now based on those identifications; biologists determine the chub species based upon geography. During high flows many of the populations of these two species occupying the Verde River Drainage have the ability to move and coexist within the same habitat. Due to this inability to separately identify individuals to species, we will discuss them together.

Headwater chub have been documented to historically occupy the East Verde Drainage, Wet Bottom Creek, Deadman Creek, and Fossil Creek within the lower Verde River Drainage (Minckley 1973). Headwater chub were identified to be the species of chub occupying these streams in 1976 (Rinne 1976).

Within the East Verde Drainage, the upper mainstem East Verde, Webber Creek, Pine Creek, and the Gorge have all documented the presence of chub. In 1997, AGFD documented headwater chub near the confluence of American Gulch in the East Verde River. During the first status assessment of headwater chub, chub were documented near the confluence of Webber creek in

both Webber Creek and the East Verde River (Voeltz 2002). This population was identified as an Unstable and Threatened population, due to the low numbers detected and the presence of green sunfish along with other identified threats. In 2007 and 2008, chub were documented in Pine Creek and the Gorge. According to recent discussions with angler groups that frequently fish within the stocking area of the East Verde, headwater chub are abundant and often caught with a hook and line (C. Cantrell pers. comm.). Recent fires in the drainage area may have impacted the population occupying the stocking area. No recent surveys have been implemented to document the abundance of headwater chub pre and post these fires.

Headwater chub were also documented in the status assessment as occupying both Deadman Creek and Wet bottom Creek. Their statuses were stable, threatened and unknown respectively. More recently the presence of chub was confirmed again in Wet bottom Creek (Burger 2009). Roundtail chub have been documented to historically occupy the Verde River mainstream, fossil creek, and have recently been stocked into Roundtree Canyon; a tributary to Red Creek.

As stated above, Fossil Creek contains both headwater and roundtail chub. Fossil Creek was recently renovated to remove non-native fish from the creek in 2005. Since that time the chub populations in Fossil Creek have exploded. Currently the chub is thought to be the most abundant fish within Fossil Creek.

Roundtail chub were considered unstable and threatened in 2002 during the first status assessment for the species. In 2005, the Department has embarked on an aggressive propagation program for roundtail chub within the Verde River Drainage. The objective of this propagation program is to stock the roundtail into the Verde River and its tributaries that currently do not contain a chub species. To date, over 4,000 chub have been stocked into the drainage. Specifically, approximately 2000 were stocked into the lower Verde River, just below Childs power plant, 1000 into Roundtree Canyon and 2000 into ponds in the drainage.

Potential Impacts

Potential impacts to chub could result from the predation and competitive exclusion food and space by stocked rainbow trout or channel catfish. Please refer to the species interactions appendix.