STRATEGIC HABITAT CONSERVATION
VERDE RIVER WATERSHED FOCUS AREA PLAN, ARIZONA

Our Vision is a Verde River watershed with flowing water in its river and streams, biologically diverse habitats, and land uses that encompass a variety of social, environmental, and cultural needs and values.

Our Mission is to work in partnership with Fish and Wildlife Service (FWS) programs, other public agencies, non-governmental organizations, and private landowners to implement ecological restoration and conservation activities that will improve the diversity, status, trend, and distribution of native aquatic and terrestrial species and the habitats that they depend upon in the Verde River watershed.

Purpose and Context: The primary purpose of the Verde River Watershed Focus Area Strategic Plan (Verde River Watershed Plan) is to coordinate and cooperate with other agencies, organizations, and stakeholders to identify, implement, and facilitate policies, programs, projects, and management practices that support productive and diverse populations of native species. Ensuring continual and sufficient base flows in the Verde River and its tributaries that will maintain healthy watershed and aquatic conditions is a vital part of this effort. This plan is not intended to replace other ongoing efforts and plans that involve the Verde River or its watershed, but to augment those efforts and to serve as a guide for the FWS Arizona Ecological Services Office (AESO) to work with our partners to focus on activities that promote the long-term goals of this watershed plan.

Existing Plans: A number of other plans, strategies, and efforts are already underway and complement this strategy. These include:

- Salt River Project Horseshoe and Bartlett Reservoirs Habitat Conservation Plan
- Focus Areas for the FWS Arizona Partners for Fish and Wildlife program
- Coconino, Prescott, and Tonto National Forests Land and Resource Management Plans
- Arizona Game and Fish Department (AGFD) Comprehensive Wildlife Conservation Strategy
- Coconino and Tonto National Forests Verde River Wild and Scenic River Comprehensive River Management Plan
- Arizona State Parks Greenway Management Strategy
- The Nature Conservancy (TNC) Conservation Action Plan for the Verde River
- Interagency Fossil Creek Native Fish Repatriation Plan
- FWS and AGFD Stillman Lake Renovation and Native Fish Sanctuary Plans
- Individual species candidate conservation agreements, conservation assessments and strategies, and recovery plans

This effort builds on the information in these plans and strategies and focuses AESO activities on those actions that will provide the greatest benefit for rare and imperiled native species and migratory birds in the Verde River watershed. The results from implementing the Verde River Watershed Plan will also be compared with the results of other plans as part of the evaluation process and to find common places to share efforts with our partners.

Scope: The Verde River Watershed Plan applies to FWS authorities and responsibilities for Federal trust resources along the Verde River, its tributaries, and within its major subwatersheds. The primary focus of the plan is on the aquatic and riparian habitats associated with the river and its tributaries, and activities both within and outside the watershed that affect these habitats.

Partners: AESO, in conjunction with our Arizona Fish and Wildlife Conservation Office (AZFWCO) and our regional Division of Migratory Birds, will work with state and Federal agencies, tribes, county and city governments, private landowners, non-governmental organizations, utilities and other companies, interest groups, and interested individuals to implement the management actions in this plan. Our current and potential partners include, but are not limited to, AGFD, U.S. Forest Service, U.S. Bureau of Reclamation (BOR), U.S. Geological Survey (USGS), National Park Service (NPS), Natural Resources Conservation Service (NRCS), Arizona State Parks, Arizona Department of Water Resources (ADWR), Arizona Department of Environmental Quality (ADEQ), Yavapai-Apache Nation, Yavapai-Prescott Tribe, Salt River-Pima-Maricopa Indian Community, Fort McDowell-Yavapai Nation, Yavapai and Maricopa counties, city and municipal governments, Northern Arizona University, Verde River Basin Partnership, Natural Resource Conservation Districts (NRCD), Upper Verde River Adaptive Management Program, private landowners, TNC and other organizations (e.g., Prescott Creeks Association, Audubon Society - Maricopa and Northern Arizona Chapters, Sierra Club, Center for Biological Diversity, Desert Fish Habitat Partnership, Arizona Riparian Council), and private companies such as Salt River Project, Arizona Public Service, and Freeport-McMoRan.

Overview

The Verde River watershed is located in north-central Arizona and includes portions of Yavapai, Coconino, and Maricopa counties. The watershed encompasses 4.2 million acres (6,626 square miles). Major cities and towns include Prescott, Cottonwood, and Sedona.

The Verde River is 140 miles long and is primarily perennial. There are two major dams on the Verde River, Horseshoe and Bartlett dams. Major tributaries to the Verde River include Sycamore Creek, Oak Creek, Wet Beaver Creek, West Clear Creek, Fossil Creek, and East Verde River. Landownership is dominated by National Forest (64 percent) with about 23 percent private. The remaining landownership is comprised of Bureau of Land Management, National Park Service, military, AGFD, state trust, county, and tribal lands (Yavapai-Apache Nation, Yavapai-Prescott Tribe, Salt River-Pima-Maricopa Indian Community, and Fort McDowell-Yavapai Nation) (Figure 1).

Species and Habitats

The Verde River provides habitat for a diversity of aquatic and riparian-dependent species. The riparian and aquatic community is constantly changing. Some of the changes are natural and others are human-caused. Human activities in the watershed include agricultural uses; development for industrial, municipal, and domestic uses; mining; sport hunting and fishing; and other recreational activities. Some of these uses have altered habitats through introduction of non-native aquatic and vegetative species, withdrawal of ground water, diversion or alteration of

surface water flows, operation of reservoirs, removal of vegetation, hardening of surfaces, restoration efforts, and other actions.

At least 13 native fish species historically occurred in the Verde River watershed; 12 species persist today. There are 30 known non-native fishes in the river and tributaries, as well as non-native, invasive bullfrogs (*Rana catesbeiana*) and crayfish (Table 1) (Haney et al. 2008). Five federally-listed or sensitive aquatic and riparian herpetofauna species remain extant in the watershed: the northern Mexican gartersnake (*Thamnophis eques megalops*), narrow-headed gartersnake, Chiricahua leopard frog (*Lithobates {=Rana} chiricahuensis*), lowland leopard frog (*Lithobates {=Rana} yavapaiensis*), and northern leopard frog (*Lithobathes {=Rana} pipiens*). The Verde River and its tributaries support a diversity of wildlife species, with a high density of breeding birds per acre and records of over 200 resident and neo-tropical migratory bird species. Federally-listed and candidate species such as the southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Coccyzus americanus*) depend on its woody riparian forests. The Verde River watershed supports large numbers of bald eagles (*Haliaeetus leucocephalus*), river otters (*Lutra canadensis*), and beavers (*Castor canadensis*). The Page springsnail (*Pyrgulopsis morrisoni*), a candidate species, occurs only at springs along Oak Creek. Forests, grasslands, and deserts in the watershed provide habitat for the threatened Mexican spotted owl (*Strix occidentalis lucida*), migratory birds, pronghorn (*Antilocapra americana*), and other wildlife.

Water Uses

As Arizona's population has increased and water sources have been developed, many surface waters in the state have been reduced due to ground water pumping; diverted for industrial, municipal, or agricultural uses; or affected by drier climate conditions. The Verde River is a major source of water for the Verde Valley communities and metropolitan Phoenix. Water supply and water quality considerations were the fundamental congressional purpose for the creation of the Tonto National Forest (see http://www.fs.fed.us/r3/tonto/about/history.shtml). Salt River Project's senior water rights to the Verde River have helped to keep water flowing in the river, which serves as a conduit for delivering water to downstream users. However, groundwater in the Big and Little Chino watersheds is being developed to support growth in the tri-cities of Prescott, Prescott Valley, and Chino Valley. These aquifers are the primary source of ground water discharge for the springs that provide base flow for the first 22 miles of the river (Granite Creek to Perkinsville) (Wirt and Hjalmarson 2000, Wirt 2005, Blasch et al. 2006). Continued development within groundwater basins downstream may also affect base flow in the middle and lower Verde River over time.

Special Management Designations

There are opportunities to partner with a variety of entities on management of uses such as livestock grazing, recreation, housing and community development, and agriculture in a manner that will maintain and enhance riparian and aquatic habitat values. Forty-one miles of the Verde River downstream from Camp Verde have been designated as a Wild and Scenic River, providing special management of roads, recreation access, and livestock grazing to protect the outstandingly remarkable values for which the segments were designated (U.S. Forest Service

2004). Fossil Creek, a tributary to the Verde River, has also been designated as a Wild and Scenic River, and other tributaries are considered candidates for Wild and Scenic River status. AGFD manages the Upper Verde River Wildlife Area to maintain native fish diversity and for riparian habitat, environmental education, and compatible wildlife-oriented recreation (AGFD 2009). Management of wildlife and fish habitat is also in place in some other areas for specific resources or uses (e.g., critical habitat segments, tribal lands, bald eagle breeding areas).

Current Trends and Management Challenges

Because the Verde River watershed supports such a diverse suite of species, including migratory birds and a number of federally-listed and rare or declining species, AESO has placed special management attention on this area in order to work with our partners to address some of the threats facing species and habitats in this area. We recognize that without changes in management or efforts to offset the effects of water withdrawals, surface water diversions, and non-native plant and animal species, some native species populations will likely continue to decline. Regional climate change models for the southwestern U.S. predict warmer and drier conditions, greater variability in winter precipitation, and an increasing probability of drought (Karl et al. 2009). Extended drought, from the combined effects of natural climate variability and human-induced climate change, could further stress the water resources of this region. We face a variety of challenges in developing and implementing management actions that will effectively conserve listed and rare species and their habitats, and move these species closer to recovery.

Non-native fish, bullfrogs, and crayfish compete with or prey on native aquatic and riparian species, contributing to declines and loss of native species, particularly when combined with other stressors such as altered hydrology. However, sport fishing is a popular activity in many parts of the watershed, and management of non-native fish populations must be considered in any fisheries management program in the watershed. Anthropogenic influences to upland and riparian vegetative communities can threaten the continuity and diversity of avian habitat, while water development alters or reduces both aquatic and riparian habitat. However, human uses and development of water and land are essential to the communities and the economy of the region, as well as the state.

Without aggressive management of non-native aquatic and vegetative species in some areas of the watershed, we expect that some native species dependent upon the river and its aquatic and riparian habitats will continue to decline or disappear, possibly leading to the federal listing of additional species. Effective control of non-native plant species may be necessary to maintain healthy and diverse riparian vegetation communities. Preventing the spread of non-native aquatic invasive species is vital to preserving recovery of native species. For example, without management to keep it from spreading upstream from the Salt River, the introduced Rio Grande leopard frog (*Lithobathes {=Rana} berlandieri*) is likely to invade the Verde River and its tributaries, where it will compete with, prey upon, and potentially eliminate native lowland leopard frog populations.

Introduction of non-native fish for anglers has had dramatic impacts on native species. Efforts to restore or improve native fish species diversity by removing or reducing non-native fishes and

stocking native species will be controversial and will require close coordination with other agencies, as well as significant public outreach and education about the status and trends of native fish and the importance of their continuing legacy. We also understand that genetic diversity of some native fishes that have been extirpated from the Verde River has been lost. Native fish from other lineages may be needed for stocking efforts. However, restoration and management of tributary and river reaches for native fish, in combination with other non-native fisheries and watershed management actions, will be necessary to restore self-sustaining populations of native species to the watershed.

Continued development of groundwater in basins that supply the Verde River is likely to reduce base flows of surface water over time, leading to population declines or loss of species dependent on sustained river flows and diverse native riparian habitat. Continued use of surface water for irrigation purposes and use of irrigation ditches for new development will continue to deplete surface flows and reduce water quality. Human population growth will result in increased recreational use in the Verde River and its perennial tributaries, impacting the condition of aquatic and riparian habitats and the surrounding watershed. These uses, combined with the effects of climate change, are likely to alter aquatic and riparian habitats along the Verde River and its tributaries.

The Verde River mainstem contains designated critical habitat for and is important to potential recovery of the listed razorback sucker (*Xyrauchen texanus*) and spikedace (*Meda fulgida*). It is also important for non-listed but imperiled species such as roundtail chub (*Gila robusta*) and Sonora sucker (*Catostomus insignis*) and desert sucker (*Catostomus clarki*). Tributaries in the watershed support declining species such as northern Mexican and narrow-headed gartersnakes. The mainstem and its tributaries offer the potential for returning a full suite of historically present native species to the watershed. We need to better engage local communities in planning to offset the effects of regional groundwater pumping and surface water uses on aquatic and riparian habitats in the watershed. We also need to continue to actively engage land managers to address appropriate uses and levels of use in sensitive areas.

Decision Support Tools

In addition to the existing plans that guide certain activities and encompass portions of the Verde River watershed, we will use information from the following tools to develop priorities among the actions and areas listed below under Strategic Goals.

AGFD Statewide Fisheries Management Team Report

In May 2008, AGFD produced the Statewide Fisheries Management Team Report. This report provides AGFD a framework and decision-making guidance for watershed-based, fisheries management emphasis decisions that balance the agency's dual mandates for sport fish opportunities and native fish conservation. The team based their recommendations in part on the *Integrated Fisheries Management Plan for the Little Colorado River Watershed* (Young et al. 2001) and used other resources to develop a decision tool to determine management emphasis for aquatic resources for state waters.

The tool defines existing and desired management emphasis categories, and allows for more specific prescriptions under those categories as appropriate. Current and potential sport fish opportunities and native fish conservation are considered in the analysis. AGFD recommendations of management emphasis designations must consider the Arizona Game and Fish Commission direction to ensure that no net loss to angler/sport fish opportunities occurs. When reductions to sport fishing opportunities will occur in one management unit due to a management emphasis decision, the tool requires compensation of lost Angler Use Days in another management unit. Final AGFD decision making authority rests at the Director's level or Commission when deemed appropriate.

USGS Groundwater Model

The USGS has developed a numerical groundwater flow model simulating the groundwater system of the upper and middle Verde River watersheds, Coconino Plateau, and Mogollon Highlands, in cooperation with ADWR under their Rural Watershed Initiative Program and Coconino and Yavapai Counties. The Coconino Plateau Water Advisory Council and Yavapai County Water Advisory Council have identified three development scenarios for the first model runs. The numerical model will enable examination of these various development scenarios and potential effects on surface water resources under each scenario. We will use the results of these model runs to identify priority areas for watershed and water resources management, and for more specific models and investigations.

FWS Climate Change Strategic Plan and 5-year Action Plan

The FWS has developed a draft strategic plan for responding to accelerating climate change in the 21st century and an action plan for implementing the goals and objectives of the strategic plan over the next 5 years (2009-2013). These actions include planning and delivering landscape conservation to support climate change adaptations of important fish, wildlife, and plant populations; identifying climate-vulnerable species and their habitat to take "pre-emptive" actions for conservation; protecting unfragmented habitat and promoting habitat connectivity through linkages and corridors; working with partners to ensure that water resources of adequate quality and quantity are available to support biological objectives for fish and wildlife; managing genetic resources within species; reducing susceptibility to diseases, pathogens, pests, and contaminants; and reducing non-climate related stressors. As we continue to develop our expertise in fish and wildlife adaptation, we will use existing and newly synthesized information to adjust our priorities as needed and design additional actions or strategies to sustain fish and wildlife habitat within the watershed.

STRATEGIC GOALS

Goal A: Restore the full suite of self-sustaining native fish, amphibian, and aquatic reptile populations that were historically present in the Verde River and its tributaries.

Rationale: AESO is committed to the recovery and conservation of both listed and non-listed native species dependent on the Verde River and its aquatic and riparian habitats. Our goal is to work with AZFWCO and other partners to recover listed species to levels where protection under

the Endangered Species Act is no longer necessary, and to conserve vulnerable species before they become listed as threatened or endangered. The following actions are consistent with species recovery plans and incorporate recovery needs for listed species and conservation needs for non-listed species-at-risk.

Action 1: Work with AGFD and AZFWCO to implement the Statewide Fisheries Management Team Report and develop management emphasis areas within the Verde River watershed. Consider the recommendations that come from this process to develop specific species and habitat management objectives for aquatic and riparian habitats in the Verde River. For the purposes of native aquatic species conservation, we refer to six reaches of the Verde River, including tributaries: Upper Verde River (headwaters to Clarkdale gage); Verde River – Verde Valley Reach (Clarkdale gage to Beasley Flats); Verde River – Wild and Scenic Reach (Beasley Flats to the head of Horseshoe Reservoir); Verde River – Reservoirs (head of Horseshoe Reservoir through Bartlett Reservoir); Verde River – Bartlett Dam to Salt River (below Bartlett Dam to the Salt River confluence); and the Verde River Tributaries (including Oak Creek, Wet Beaver Creek, West Clear Creek, Fossil Creek, East Verde River, Deadman Creek, and Sycamore Creek) (Figure 2).

Our management recommendations are:

a. Upper Verde River
Promote management in this reach for native fish and herpetofauna (e.g., narrow-headed gartersnakes, lowland leopard frogs, northern leopard frogs, etc.) in an environment free of or with very low numbers of non-natives that allows for self-sustaining populations of native species. This reach is critical to recovery of spikedace and loach minnow (*Tiaroga cobitis*) and to conservation of roundtail chub, Sonora and desert sucker, longfin dace (*Agosia chrysogaster*), and speckled dace (*Rhinichthys osculus*). Designated critical habitat for spikedace is in the upper portion of this reach and for razorback sucker in the lower portion. Work with partners toward the construction of barrier(s) and chemical renovation where appropriate within this reach.

b. Verde River – Verde Valley Reach
The Verde River is very accessible through the Verde Valley and provides many opportunities for recreation, including fishing. Native species management in this reach is complicated by recreational use and land status and must be balanced with sport fish management. Promote management in this reach for native fish and herpetofauna, particularly the lowland leopard frog and gartersnakes. This reach contains all stocking locations for Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker, and designated critical habitat for razorback sucker and southwestern willow flycatcher. Maintenance and renovation of suitable aquatic habitats (e.g., riverine, wetland, and spring) for native species and conservation and restoration of riparian woodland habitat are management opportunities in this reach.

c. Verde River – Wild and Scenic Reach
A large proportion of the fish population in this reach consists of non-native species. The current native fish assemblage includes razorback sucker, Colorado pikeminnow, Sonora

and desert sucker, speckled and longfin dace, and roundtail chub. There is also designated critical habitat for razorback sucker and southwestern willow flycatcher through this reach. Motorized access is relatively limited, and the area provides many opportunities for river-related recreation and fishing. In balance with sport fish management, promote management of native species through development and maintenance of aquatic and riparian habitat. Protect outstandingly remarkable values in accordance with the Verde Wild and Scenic River Comprehensive River Management Plan.

d. Verde River – Reservoirs
Native fish numbers are low to non-existent in this reach, and conservation opportunities are limited because of the presence of the dams and associated reservoirs. To the extent practical, maintain and improve sport fishing opportunities for native and non-native species and/or support opportunities to enhance or protect riparian and adjacent upland habitat to preserve or improve water quality, quantity, and aquatic habitat. Work with Salt River Project to identify opportunities to benefit native fishes (e.g., razorback suckers, roundtail chub) in reservoirs.

e. Verde River – Bartlett Dam to Salt River
We will work with tribes, AGFD, and Salt River Project to ensure the long-term viability of the existing native fish community below Bartlett Dam. This population of native fishes is important for conservation genetics and for future propagation and reestablishment purposes elsewhere in this system. Maintaining Sonora and desert suckers and roundtail chub in this reach is important for bald eagle populations as well.

f. Verde River Tributaries
Some tributaries, such as Fossil Creek, West Clear Creek, and West Fork Oak Creek, are or could be restored and managed as refugia for native aquatic species and may provide native sport fishing opportunities. Several tributaries include occupied and designated critical habitat for Gila chub (*Gila intermedia*), and plans are underway to restore Gila trout (*Oncorhynchus gilae*) to West Fork Oak Creek. Upper Oak Creek (specifically around the confluence with West Fork Oak Creek) is one of very few remaining strongholds for narrow-headed gartersnakes in the U.S, a species that has shown signs of decline in long-term studies. A series of springs near AGFD hatcheries in this area provides the only habitat for the candidate Page springsnail. The Fossil Creek watershed supports a metapopulation of Chiricahua leopard frogs (currently restricted to stock tanks) and Fossil Creek itself supports an important population of lowland leopard frogs. In addition, tributaries and wetland habitats on the Tonto National Forest also support Chiricahua and lowland leopard frogs, and the Prescott National Forest contains lowland leopard frog habitat. Forest restoration and upland management are also important for improving watershed health along these drainages.

g. System-wide
Continue to partner with public land and wildlife management agencies and private entities to mitigate threats posed by other invasive non-native species such as bullfrogs, crayfish, and exotic mussels. Cooperate with partners to ensure that aquatic mammal

management is conducive to native fish, amphibian, and aquatic reptile goals and objectives. Maintain fish diversity and abundance, as appropriate by reach, to benefit breeding bald eagles (in support of the Bald Eagle Conservation Strategy and Assessment) and other fish-eating species. Protect and enhance riparian habitat and designated critical habitat for breeding southwestern willow flycatchers, and riparian habitat for other migratory birds along appropriate stretches in all reaches. Work to conduct forest restoration throughout the watershed to reduce the risk of high-severity wildfire and adverse impacts.

Action 2: Implement the Stillman Lake Renovation and Native Fish Sanctuary Plans.

Action 3: In partnership with the AGFD, Coconino National Forest, Northern Arizona Flycasters, BOR, and others, complete planning for and implement renovation of West Fork Oak Creek.

Action 4: Install frog fencing or other upland barrier materials to stop movement of Rio Grande leopard frogs above Bartlett Dam.

Action 5: Working with our partner agencies, determine the most suitable location for one or more mainstem Verde River barriers, complete construction as identified in the 2001 revised CAP biological opinion, and renovate the Verde River above the barrier(s).

Action 6: In conjunction with Action 5, plan native aquatic species restoration projects such that benefits from the restoration are achieved for native reptiles and amphibians as well as for native fish species to restore the entire natural component of the ecosystem. Also, when planning such restoration actions, analyze potential negative effects on other uses of the watershed, particularly grazing, logging, recreation, and maintenance of sport fisheries downstream of restoration areas.

Action 7: Continue to assess the status of spikedace in the Verde River. Determine a suitable source population and augment or reestablish spikedace in the Verde River in conjunction with Action 5.

Action 8: In conjunction with native fish restoration projects, restore and enhance populations of northern Mexican gartersnakes, narrow-headed gartersnakes, northern leopard frogs, and other species in appropriate habitats in the Verde River upstream from Clarkdale and in tributaries.

Action 9: Continue to support existing public and private partnerships that focus on captive propagation and reintroductions of narrow-headed and northern Mexican gartersnakes, Chiricahua and northern leopard frogs, and native fish.

Action 10: Investigate opportunities to create strategically located source populations via the creation of breeding ponds to enhance lowland leopard frog metapopulations within the system. Mitigate the risks of non-native invasions of these ponds through the use of drift fencing or other means to curb invasion potential.

Action 11: Identify and support research on potential control methods for crayfish, bullfrogs, and other aquatic nuisance species that currently lack effective means for control. Work to develop protocols that reduce the risk of new aquatic nuisance species being introduced to the watershed.

Goal B: Maintain or improve riparian and wetland habitat conditions for bald eagles, southwestern willow flycatchers, yellow-billed cuckoos, and other migratory birds.

Rationale: In addition to federally-listed species, FWS has trust responsibility for migratory birds. Through the Sonoran Joint Venture, Partners in Flight, Partners for Fish and Wildlife, and Endangered Species recovery programs, FWS is committed to conserving the diversity and unique avian communities that occur in the Southwest, and the habitats upon which migratory birds depend. Riparian woodland habitats in the Southwest are declining because of water diversions and withdrawals, land development and other surface-disturbing or altering land uses, invasive plant and animal species, and other threats. Protection of existing areas and restoration of riparian habitats are important actions to maintain populations of these species.

Action 1: Cooperate in Federal, non-Federal, tribal, and private projects that increase and improve native riparian habitat quality, distribution, and abundance.

Action 2: Protect known special status species breeding areas from impacts that degrade, modify, or reduce habitat (i.e. wildfire, habitat destruction/clearing, disturbance, etc.).

Action 3: Promote and manage physical elements and processes (i.e. natural hydrologic regime, overbank flooding, groundwater levels, etc.) in order to reduce threats and improve conditions that maintain, restore, enhance, recycle, germinate, and grow riparian wildlife habitat.

Action 4: Work with NPS to restore and enhance native wetland plant communities to create quality wildlife habitat in Tavasci Marsh.

Action 5: Work with land managers to maintain and improve the abundance, distribution, and persistence of large trees and snags for bald eagle nesting, foraging, loafing, and roosting.

Action 6: Provide education and outreach on measures to improve the distribution, abundance, and quality of riparian habitat.

Action 7: Cooperate in projects that prevent, identify, and/or reduce the occurrence of invasive organisms that impact wildlife and its habitat.

Goal C: Promote land development and land management practices that will reduce loss of base flow in the river, maintain healthy watershed conditions, and maintain adequate water quality for riparian and aquatic species.

Rationale: Development and use of groundwater and surface water resources is a significant impact to fish and wildlife species in this region. Better management of irrigation, industrial, and municipal uses of water to improve water quality and continuity of flows in the Verde River

would benefit aquatic and riparian habitats downstream. Encourage development that promotes conservation and a low per capita water use to reduce the stress on groundwater aquifers and consequent impacts to springs and stream and river flows. Water quality also depends in part on watershed conditions, so actions that maintain or improve functional watersheds also benefit riparian and aquatic habitats.

Action 1: Work with county and city governments in the Verde Valley and Tri-cities area to encourage planning that will mitigate flow losses from groundwater development.

Action 2: Work with the Verde River Basin Partnership, USGS, ADWR, and other appropriate entities to develop an assessment and analysis of long-term water-supply management options in the Verde Basin.

Action 3: Work with USGS, ADWR, Salt River Project, and others to monitor baseflow at stream gages, changes in water depths at wells, and rainfall patterns to track changes due to water use and/or climate change. Work with these entities, the Forest Service, and other appropriate parties to establish stream gages in all perennial tributaries to the Verde River.

Action 4: Participate in the Central Yavapai Highlands appraisal study to develop alternatives for water management and delivery in the Verde Basin.

Action 5: Measure and monitor water quality conditions to assess impacts from development and other uses in the watershed.

Action 6: Work with the Forest Service to ensure that Land and Resource Management Plans and revised Forest Plans promote healthy and functional watershed conditions.

Action 7: Through regional watershed and other groups, work with state and county representatives to identify legislative and regulatory tools that give better control of water supply and water decisions to local authorities, and that recognize the connection of surface water and ground water under state law.

Action 8: Work with Yavapai, Coconino, and Maricopa Counties, AGFD, Forest Service, tribes, and other partners during development of comprehensive county plans to address future development and growth in the Verde River watershed. These efforts should include programmatic guidance, developed with county planning and zoning departments, for housing and other construction, open space, and wildlife movement corridors.

Action 9: Work with NRCS, local NRCDs, and others to develop programmatic guidance for best management practices for agricultural activities that will reduce water use and impacts on aquatic and riparian species. Work with the Environmental Protection Agency and ADEQ to identify and resolve water quality issues associated with agricultural practices.

Action 10: Engage ditch associations in the Verde Valley in discussions to minimize adverse effects from maintenance activities and channeling. These could include developing diversion

and ditch structures that would minimize overall impacts to the river and require less maintenance, and measuring water use more accurately.

Action 11: Work with Yavapai County Land Trust, TNC, AGFD, and others to identify and facilitate purchase of conservation easements on private lands and the purchase of development rights from willing sellers.

Goal D: Develop guidelines and promote land management activities that will maintain and enhance watershed conditions.

Rationale: Maintenance of healthy watershed conditions improves water quality in streams by slowing runoff, filtering sediments, reducing soil erosion, promoting aquifer recharge, and increasing baseflow; and maintains forest and desert habitats for nesting and foraging birds, as well as habitat for other wildlife species and endemic plants.

Action 1: Work with the Forest Service in monitoring changes in watershed conditions and riparian habitat over time to ensure that habitat conditions continue to meet native species needs.

Action 2: Continue to work with our Federal and private partners to reduce fuels and improve watershed function throughout forested habitats of the Verde watershed. Forest restoration actions should also protect and improve habitat for the threatened Mexican spotted owl.

Action 3: With the Partners for Fish and Wildlife Program, identify habitat management and restoration projects within the Verde River Partners Program Focus Area that will benefit Federal trust resources.

Action 4: Continue to work with the Forest Service (Coconino, Kaibab, Prescott, and Tonto National Forests) on fuels reduction and fire management activities in the watershed, and implement the emergency fish and herpetofauna salvage plan when appropriate.

Action 5: Work with the Forest Service (Coconino, Kaibab, Prescott, and Tonto National Forests) on recreation management that minimizes impacts to nesting birds, water quality, riparian habitat, and watersheds.

Action 6: Work with the State of Arizona; Cooperative Weed Management Areas; and with Coconino, Kaibab, Prescott, and Tonto National Forests on invasive plant species management by participating in technical or advisory committees developed for this problem and assisting with implementation of actions.

Action 7: Coordinate with local watershed groups (e.g., Verde Watershed Association, Hyde Mountain Vista group) on watershed and stream restoration activities, including control of tamarisk and participation in the Master Watershed and Adopt-a-Stream programs.

Action 8: Inform and educate the general public about Verde watershed values and risks by developing an outreach plan and participating in community outreach events and activities.

Goal E: Develop or revise recovery goals, objectives, and conservation measures for listed, candidate, and rare species in the watershed.

Rationale: Developing recovery plans and keeping plans current is key to focusing our actions effectively towards species recovery.

Action 1: Annually submit a list of priority species for recovery plan development or revision to the Regional Office for approval and funding.

Action 2: Prioritize and complete status reviews of listed, candidate, and sensitive species in the Verde River watershed.

EVALUATION

Ongoing:	Post a list of FWS current and planned activities that are occurring in the Verde River watershed to the AESO website.
Annually:	Identify actions initiated, completed, or ongoing under each goal and action item.
Every 5 years:	Evaluate accomplishments under the plan and revise actions/priorities as appropriate.

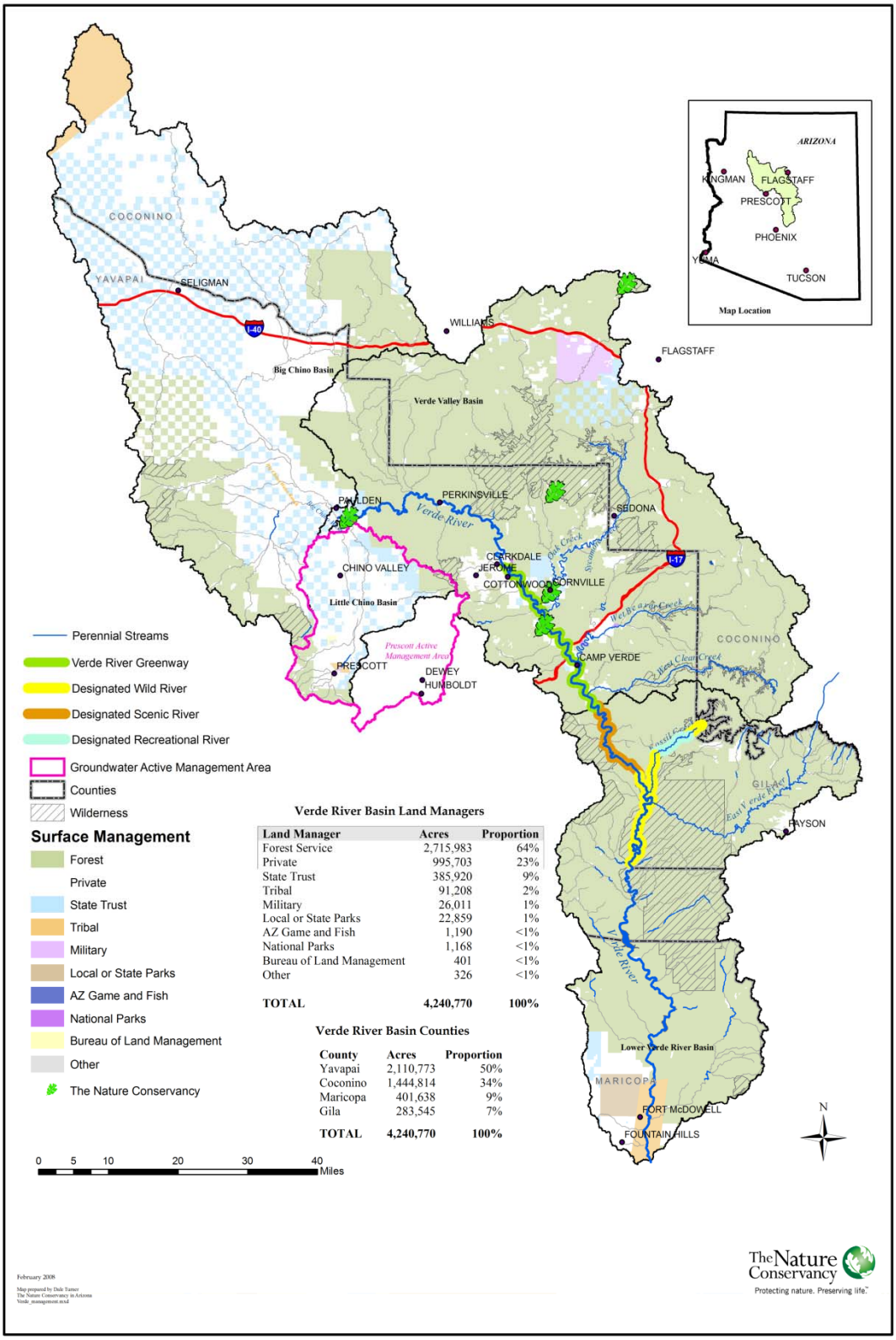

Figure 1. Verde River watershed with land ownership. (Map courtesy of Dale Turner, TNC)

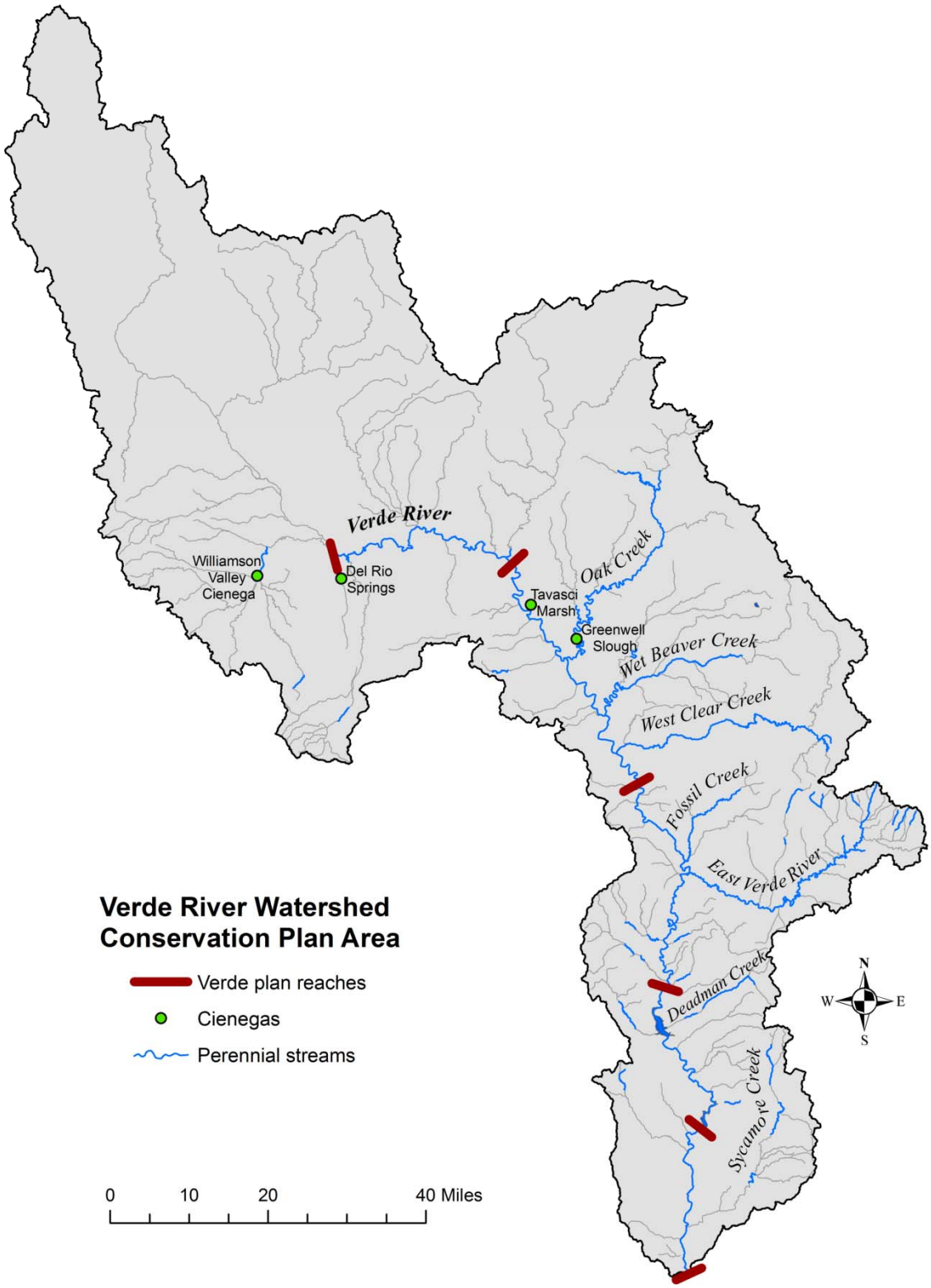

Figure 2. Verde River Watershed boundary with river reaches. (Map courtesy of Dale Turner, TNC)

Table 1. Fish species in the Verde River watershed (from Haney et al. 2008).

Common Name	Scientific Name	Native (NA) or Non-native (NN)	Federal Status
Desert sucker	*Catostomus clarki*	Na	
Sonora Sucker	*Catostomus insignis*	Na	
Razorback Sucker	*Xyrauchen texanus*	Na	E
Longfin Dace	*Agosia chrysogaster*	Na	
Gila Chub	*Gila intermedia*	Na	
Headwater Chub	*Gila nigra*	Na	
Roundtail Chub	*Gila robusta*	Na	C
Spikedace	*Meda fulgida*	Na	T
Colorado Pikeminnow	*Ptychocheilus lucius*	Na	E
Speckled Dace	*Rhinichthys osculus*	Na	
Loach Minnow	*Tiaroga cobitis*	Na	T
Gila Topminnow	*Poeciliopsis o. occidentalis*	Na	E
Gila Trout	*Oncorhynchus gilae*	Na	T (Extirpated)
Rock Bass	*Ambloplites rupestris*	NN	
Green Sunfish	*Lepomis cyanellus*	NN	
Bluegill	*Lepomis macrochirus*	NN	
Smallmouth Bass	*Micropterus d. dolomieui*	NN	
Spotted Bass	*Micropterus punctulatus*	NN	
Largemouth Bass	*Micropterus salmoides*	NN	
Striped Bass	*Morone saxitalis*	NN	
White Crappie	*Pomoxis annularis*	NN	
Black Crappie	*Pomoxis nigromaculatus*	NN	
Tilapia	*Tilapia* sp.	NN	
Threadfin Shad	*Dorosoma petenense*	NN	
Goldfish	*Carassius auratus*	NN	
Common Carp	*Cyprinus carpio*	NN	
Golden Shiner	*Notemigonus crysoleucus*	NN	
Red Shiner	*Notropis lutrensis*	NN	
Fathead Minnow	*Pimephales promelas*	NN	
Northern Pike	*Esox lucius*	NN	
Black Bullhead	*Ictalurus melas*	NN	
Yellow Bullhead	*Ictalurus natalis*	NN	
Channel Catfish	*Ictalurus punctatus*	NN	
Flathead Catfish	*Pilodictis olivaris*	NN	
Yellow Bass	*Morone mississippiensis*	NN	
Yellow Perch	*Perca flavescens*	NN	
Walleye	*Stizostedion vitreum*	NN	
Mosquitofish	*Gambusia a. affinis*	NN	
Sailfin Molly	*Poecilia latipinna*	NN	
Shortfin Molly	*Poecilia mexicana*	NN	
Rainbow Trout	*Oncorhynchus mykiss*	NN	
Brown Trout	*Salmo trutta*	NN	
Brook Trout	*Salvelinus fontinalis*	NN	

REFERENCES

Arizona Game and Fish Department. 2006. Upper Verde River Wildlife Area. Accessed July 8, 2009 at http://www.azgfd.gov/outdoor_recreation/wildlife_area_upper.shtml

Blasch, K.W., J.P. Hoffmann, L.F. Graser, J.R. Bryson, and A.L. Flint. 2006. Hydrogeology of the upper and middle Verde River watersheds, central Arizona: U.S. Geological Survey Scientific Investigations Report 2005–5198,101 p., 3 plates.

Haney, J.A., D.S. Turner, A.E. Springer, J.C. Stromberg, L.E. Stevens, P.A. Pearthree, and V. Supplee. 2008. Ecological implications of Verde River flows. A report by the Arizona Water Institute, The Nature Conservancy, and the Verde River Basin Partnership. viii + 114 pp.

Karl, T.R., J. M. Melillo, and T.C. Peterson (eds.). 2009. Global climate change impacts in the United States. Cambridge University Press. Available at www.globalchange.gov/usimpacts

U.S. Forest Service. 2004. Verde River Wild and Scenic River Comprehensive River Management Plan. USDA Forest Service Southwestern Region, 72 pp., 3 plates.

Wirt, L. 2005. Sources of base flow in the Upper Verde River, *In* Wirt, L., E. Dewitt, and V.E. Langenheim, eds. Geologic framework of aquifer units and ground water flow paths, Verde River headwaters, north-central Arizona. U.S. Geological Survey Open-File Report 2004-1411, pp. F1-34.

Wirt, L., and H.W. Hjalmarson. 2000. Sources of springs supplying base flow to the Verde River headwaters, Yavapai County, Arizona. U.S. Geological Survey Open-File Report 99-0378, 50 pp.