

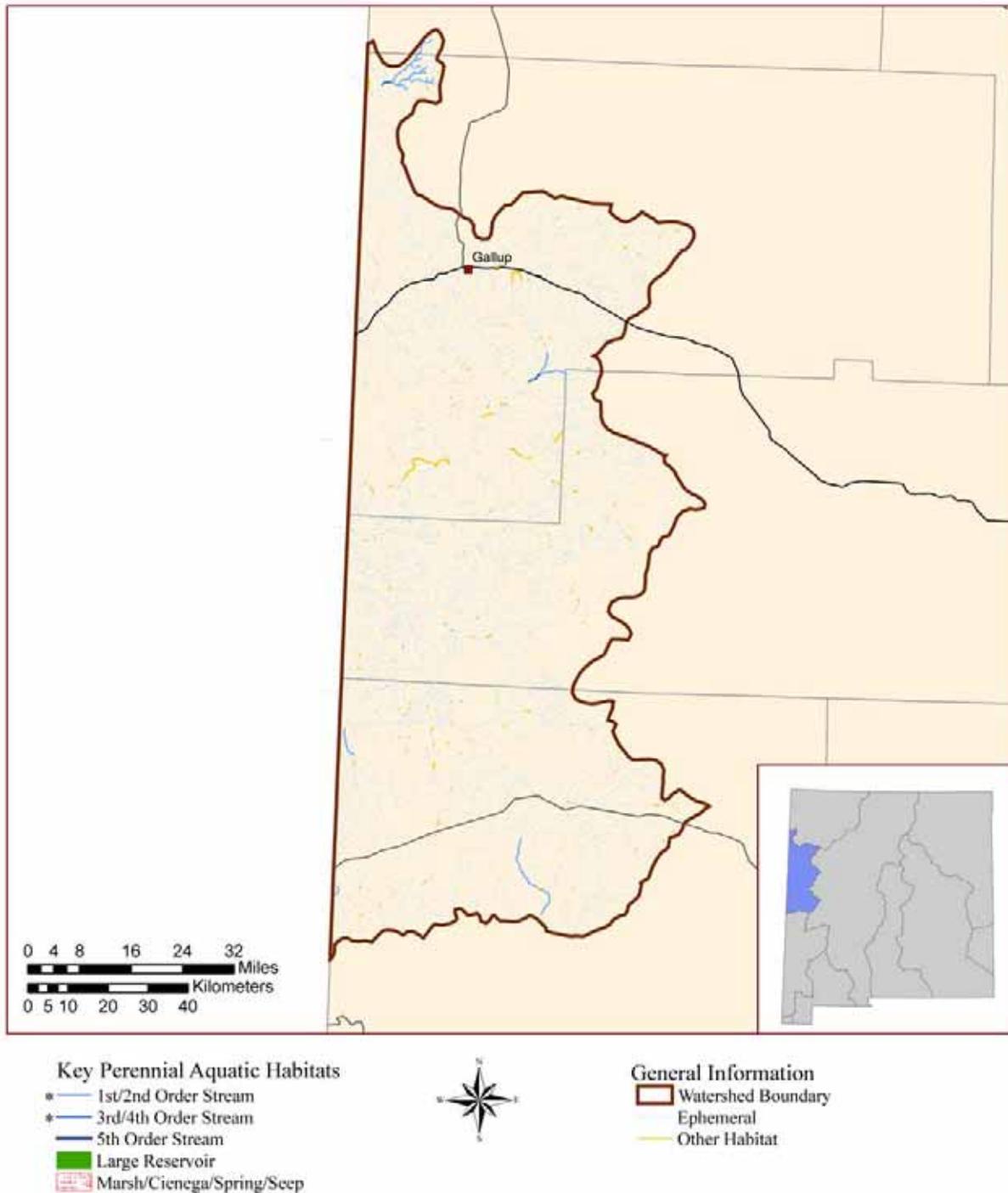
## ZUNI WATERSHED

The Zuni River drains about 840,155 ac (340,000 ha) as it flows from its headwaters in west-central New Mexico to the Little Colorado River in Arizona. Key aquatic perennial habitats in the Zuni Watershed include 1<sup>st</sup> and 2<sup>nd</sup> order streams and 3<sup>rd</sup> and 4<sup>th</sup> order streams (Fig. 5-16). Continuous surface flow generally occurs in the Zuni River only during heavy spring run-off. Many stream reaches are dry except near perennial springs. Headwaters of the Zuni Watershed include 1<sup>st</sup> and 2<sup>nd</sup> order streams such as Rio Nutria and Tampico Draw. Lower areas of the watershed include the main stem of the Zuni River, a 3<sup>rd</sup> and 4<sup>th</sup> order system, and associated impoundments, such as Black Rock Reservoir.

In New Mexico, the Zuni Watershed includes parts of San Juan, McKinley, Valencia, and Catron Counties and the municipalities of Gallup, Zuni, Quemado, and Ramah. Population in this area of the state grew from 8% (Cibola) to 46% (Valencia) between 1990 and 2000, with an average of 23%. Land in the upper watershed is primarily owned privately and by the US Forest Service. The lower areas of the watershed are under the jurisdiction of the sovereign Zuni Pueblo.

Post-European settlement changes to the landscape and subsequent effects on the Zuni Watershed are well documented (see *Zuni River Watershed Plan*; Natural Resources Conservation Service 1998). The watershed was severely degraded by extensive logging and overgrazing in the late 1800s and early-to-mid 1900s. Effects of subsequent vegetative cover loss included increased surface erosion, gulying, headcutting, wide discharge fluctuations, and loss of water in the system. Impacts were so severe that the Zuni Pueblo brought litigation against the United States government in the early 1970s. The settlement called the “Zuni Watershed Act of 1990” (Public Law 102-388), seeks to restore tribal lands damaged because of upstream misuse of resources. In addition, the “Zuni Land Conservation Act of 1990” (Public Law 101-486) provided funds for the Zuni Pueblo to take corrective measures within the Zuni Indian Reservation in response to damage of lands as a result of federal improprieties.

After being subjected to early twentieth century land use practices, the Zuni River was dammed for flood control, irrigation storage, and recreational fishing. In addition, water withdrawals for irrigation and human consumption reduced surface discharge in the system. Limited water quality monitoring at the Zuni River above Black Rock Reservoir (US Geological Survey 1996) indicates water is fairly hard, with a mean total dissolved solids concentration of 38.5 oz/gal (537 mg/l), but with heavy metals well below allowable standards. Overall water quality is unknown. The *Zuni River Watershed Plan* (Natural Resources Conservation Service 1998) was completed in 1998. It details current conditions of the watershed; makes recommendations for protection and rehabilitation of the area; establishes management guidelines for maintaining and improving resources; establishes a system for monitoring conditions; and provides proposals for voluntary cooperative programs among partner agencies. Specific tasks for implementing this plan include establishing a regular monitoring program to examine effects of management on hydrology and erosion, agriculture and cropland, rangeland, forestry, wildlife, archeology, cultural values, and social and economic values in the Zuni Watershed.



The source of data is the National Hydrography Dataset. For information regarding methods, results, and data accuracy, refer to <<http://nhd.usgs.gov>>.

Figure 5-16. Key perennial aquatic habitats in the Zuni Watershed in New Mexico. Key habitats are designated with an asterisk (\*).

Several non-native species reside in the watershed. Eight non-native fish species have been reported from the Zuni River drainage (Hanson 1980, Propst and Hobbes 1996), but only green sunfish (*Lepomis cyanellus*), fathead minnow (*Pimephales promelas*), and plains killifish, (*Fundulus zebrinus*), are comparatively common and widespread. Several species have been introduced as sport fish, including northern pike (*Esox lucius*), rainbow trout (*Oncorhynchus mykiss*), and channel catfish (*Ictalurus punctatus*). Crayfish (*Orconectes virilis*) have also been introduced into the basin and are spreading.

**Species of Greatest Conservation Need**

Only 14 Species of Greatest Conservation Need (SGCN), excluding arthropods other than crustaceans, occurred in the Zuni Watershed (Table 5-18). Eight species (57%) were classified as vulnerable, imperiled, or critically imperiled in New Mexico, and secure nationally. Three species (21%) are vulnerable, imperiled, or critically imperiled in New Mexico and nationally, and three species are secure both nationally and in the state. Conservation status codes (abundance estimates) for each SGCN are provided in Appendix H. Zuni bluehead sucker

Table 5-18. Species of Greatest Conservation Need in the Zuni Watershed in New Mexico.

Common Name or Scientific Name <sup>1</sup>	Perennial	
	1 <sup>st</sup> and 2 <sup>nd</sup> Order Stream	3 <sup>rd</sup> and 4 <sup>th</sup> Order Stream
<b><i>Fish</i></b>		
Roundtail Chub		E <sup>2</sup>
Zuni Bluehead Sucker	X	X
<b><i>Birds</i><sup>3</sup></b>		
Eared Grebe		X
Northern Pintail		X
Osprey		X
Bald Eagle		X
Peregrine Falcon		X
Southwestern Willow Flycatcher		X
Bank Swallow		X
Yellow Warbler	X	X
<b><i>Mammals</i><sup>3</sup></b>		
American Beaver	X	X
<b><i>Amphibians</i><sup>3</sup></b>		
Western Chorus Frog	X	X
Northern Leopard Frog	X	X
<b><i>Crustaceans</i><sup>3</sup></b>		
<i>Hyalella</i> spp.	X	X

<sup>1</sup> Scientific names are provided where common names for the species does not exist.

<sup>2</sup> Species is considered extirpated from habitat type.

<sup>3</sup> Additional conservation concerns for these taxa are addressed in the Statewide Distributed Riparian Habitats, Statewide Distributed Ephemeral Habitats and Perennial Tanks and/or Ecoregion and terrestrial habitat sections.

(*Catostomus discobolus yarrowi*) was listed as endangered in New Mexico in 1975 because habitat modification and predation by non-native fishes jeopardized its ability to persist and reproduce within the state (Propst 1999). As directed by the Wildlife Conservation Act amendments of 1995, New Mexico Department of Game and Fish (NMDGF), along with an advisory committee with representatives from federal, state, local, and tribal agencies, conservation organizations, and private landowners, completed a recovery plan for the species (NMDGF 2005b). The *Zuni Bluehead Sucker Recovery Plan* provides detailed information on the biology, threats to populations and habitats, and strategies for recovering the species. The roundtail chub (*Gila robusta*) was collected from the Zuni River (Baird and Girard 1853), but the species has not been collected there in more than 100 years. Lack of continuous flow, habitat degradation, and the introduction of non-native fishes may have led to the extirpation of roundtail chub from the Zuni River in New Mexico. Conservation concerns for birds, mammals, amphibians, and reptiles are primarily addressed in the statewide distributed riparian habitats section and/or the discussion of terrestrial habitats in each ecoregion. Additional concerns for molluscs and crustaceans are addressed in the statewide distributed ephemeral habitats and perennial tanks section.

### **Perennial 1<sup>st</sup> and 2<sup>nd</sup> Order Streams and Perennial 3<sup>rd</sup> and 4<sup>th</sup> Order Streams**

Perennial 1<sup>st</sup> and 2<sup>nd</sup> order streams and perennial 3<sup>rd</sup> and 4<sup>th</sup> order streams in the Zuni Watershed have similar problems, information gaps, research, survey, and monitoring needs, desired future outcomes, and conservation actions. Thus, we present information on these two key habitat types collectively.

#### **Habitat Condition**

Perennial 1<sup>st</sup> and 2<sup>nd</sup> order stream habitats in the Zuni River system include the Rio Nutria, Tampico Draw, and Agua Remora. These tributaries are varied and flow through mountain meadows and narrow canyons where habitats are mainly bedrock-bottomed pools in canyon-bound reaches, and runs and cobbled riffles in meadows. Many of the 1<sup>st</sup> and 2<sup>nd</sup> order streams are spring fed and only permanently wet near the spring source. The main stem of the Zuni River (perennial 3<sup>rd</sup> and 4<sup>th</sup> order stream habitat) is intermittent, slow and meandering, and interrupted by several reservoirs (Propst and Hobbes 1996). Habitats are deep runs and pools over sand and silt substrates. Gradient decreases as the river flows through fluvial floodplain. Surface flow is generally continuous only during heavy spring run-off and near perennial springs. Small reservoirs such as Ramah, Black Rock, and McGaffey, once intended for water storage and recreational fishing opportunities, are often shallow and silty or completely dry, and impede the natural flow of water and species dispersal. Past grazing and logging excesses have caused surface erosion, gullyng, headcutting, wide discharge fluctuations, and loss of water.

Damming for flood control, irrigation storage, and recreational fishing have inundated and fragmented Zuni bluehead sucker habitats and reduced the species to about 9 mi (15 km) or 10% of its historical range (see *Zuni Bluehead Sucker Recovery Plan* (NMDGF 2005b) for a summary). Populations of non-native aquatic vertebrates and invertebrates have become established in reservoirs and perennial 1<sup>st</sup> - 4<sup>th</sup> order streams of the Zuni Watershed.

## **Problems Affecting Habitats or Species**

### *Modification of Natural Processes*

The combination of drought, groundwater depletion, water withdrawal, and impoundments has resulted in the absence of perennial water necessary to sustain the functionality stream ecosystems of the Zuni Watershed. It is anticipated that increased urban/residential development and associated infrastructure (roads, utility corridors) may exacerbate this condition. Ash flows associated with wildfires have the potential to diminish or eliminate SGCN from portions of affected streams.

### *Invasive Species*

Introduced largemouth bass (*Micropterus salmoides*), green sunfish, and crayfish occupy Zuni Watershed reservoirs and streams where they compete with and prey upon native species. They are responsible for the state-endangered status of the Zuni bluehead sucker.

## **Information Gaps**

Numerous information gaps concerning perennial streams constrain our ability to make informed conservation decisions in the Zuni Watershed. They include:

- There is little information available on invertebrates of the Zuni Watershed.
- Little is known about water quality in the Zuni Watershed and its affects upon associated SGCN.
- The specific effects of fluctuating flows on the life history of all SGCN are unknown.
- The life history of most of the SGCN and their use of this habitat type are unknown.
- The extent to which non-native species may alter perennial stream habitats and limit populations of SGCN is unknown.
- The intensity, scale, and extent of different human-caused habitat degradation factors, and their effects on populations of SGCN are unknown.

## **Research, Survey, and Monitoring Needs**

Ownership and management of perennial streams and the surrounding landscape in the Zuni Watershed are divided between private, federal, and tribal interests. These land managers have conservation efforts underway and plans to research, monitor, and rehabilitate areas of the watershed and conserve or restore associated wildlife. New Mexico Department of Game and Fish is actively involved in implementation of the *Zuni Bluehead Sucker Recovery Plan*, including establishment of an annual monitoring program and funding of genetic and morphometric research on the species. The Natural Resources Conservation Service (NRCS) has survey and monitoring programs in place and the New Mexico Environment Department

(NMED) recently completed a watershed survey of the Zuni River, including physiochemical water quality monitoring, invertebrate and fish surveys, and limited habitat assessments.

The Cibola National Forest, Mount Taylor Ranger District, manages much of the upper watershed where most of the perennial 1<sup>st</sup> and 2<sup>nd</sup> order stream habitat is located and has a variety of research and monitoring programs ongoing including monitoring of grazing conditions to ensure compliance with habitat requirements for Mexican spotted owl (*Strix occidentalis*). The Zuni Department of Natural Resources has ongoing and planned monitoring, survey, and research projects.

Additional research or survey initiatives needed to inform conservation decisions are outlined below. In conducting research it is important that tribal sovereignty is recognized. Tribes, agencies and institutions must collaborate to gather information needed to protect and conserve resources of mutual interest.

- Conduct thorough surveys of current and potential Zuni Bluehead sucker habitat to locate extant populations per the *Zuni Bluehead Sucker Recovery Plan*.
- Research is needed to develop a hydrological model and monitoring protocol for the Zuni Watershed per the *Zuni Bluehead Sucker Recovery Plan*.
- Field studies are recommended that focus on habitat use patterns of all SGCN that are perennial stream obligates.
- Research, surveys, and monitoring programs are needed for invertebrate SGCN. Little is currently known about the extent of their distribution, biology, or stability and microhabitats.
- Research is needed to characterize population dynamics and species interactions in these key habitats.

### **Desired Future Outcomes**

Mutually held and complementary expectations have been expressed in the collaboratively developed *Zuni Bluehead Sucker Recovery Plan* and the *Zuni River Watershed Plan* (Natural Resource Conservation Service 1998, NMDGF 2005b). The plans have indicated the following desired future outcomes for perennial streams:

- Perennial 1<sup>st</sup> - 4<sup>th</sup> order stream habitats in the Zuni Watershed persist in the condition, connectivity, and quantity necessary to sustain viable and resilient populations of resident SGCN, facilitate uninterrupted movement patterns of native aquatic and terrestrial SGCN, and host a variety of land management uses with reduced resource use conflicts.
- Secure, self-sustaining sub-populations of Zuni bluehead sucker are distributed throughout their historic range in the Zuni Watershed.

- Land and resource management initiatives are coordinated among jurisdictional entities in the Zuni Watershed and are resulting in complementary and effective conservation actions.
- Healthy watershed conditions have been restored and natural stream recovery is progressing.
- Native riparian plant communities of the Zuni Watershed are restored and maintained.
- Non-native species that adversely affect SGCN have been removed from key stream habitats.

### **Prioritized Conservation Actions**

Conservation actions necessary to secure the perennial headwater habitat and species of the Zuni River are largely outlined in the *Zuni River Watershed Plan* and *Zuni Bluehead Sucker Recovery Plan* (Natural Resource Conservation Service 1998, NMDGF 2005b). The implementation of these plans is foremost for conservation of the habitat and species of the Zuni Watershed. Monitoring of species and habitat will be employed to evaluate the effectiveness of the conservation actions described below. Those found to be ineffective will be modified in accordance with the principles of adaptive management. Conservation actions, in order of priority, which assist in achieving desired future outcomes, are outlined below.

1. Establish better communication, coordination, and collaboration between state, federal, private, and tribes to jointly protect and conserve Zuni Watershed habitats and wildlife of mutual interest.
2. Increase habitat protection through government, NGO, and landowner cooperation and partnerships.
3. Implement a Zuni Bluehead Sucker Conservation Agreement with interested parties to formalize partnerships and coordinate implementation of the *Zuni Bluehead Sucker Recovery Plan* (NMDGF 2005b) across jurisdictional boundaries.
4. Work with state and federal land managers and research institutions to investigate the current status of the Zuni bluehead sucker and identify factors limiting its populations.
5. Work with land managers and affected interests to remove non-native aquatic species from key watershed habitats and to restore SGCN and other native species to the Zuni Watershed.
6. Organize a management oversight group to collaboratively implement the *Zuni River Watershed Plan* (Natural Resource Conservation Service 1998).

7. Work with federal and state agencies, Zuni Pueblo, private landowners, research institutions, and universities to design and implement projects that will provide information about SGCN and perennial 1<sup>st</sup> - 4<sup>th</sup> order stream habitats outlined in the Information Gaps and/or Research, Survey, and Monitoring Needs sections. Studies on watershed modeling and hydrologic rehabilitation are especially desirable.
8. Collaborate with federal and state agencies, the Zuni Pueblo, NGOs, and affected publics to create an awareness and understanding of watershed functions, services, and values afforded by perennial 1<sup>st</sup> - 4<sup>th</sup> order stream habitats.
9. Construct a hydrological model and monitoring protocol to rehabilitate the Zuni Watershed per the *Zuni Bluehead Sucker Recovery Plan*.