Snake/Salt River Basin

Hoback River

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Watershed Description

Six major basins were identified for conservation planning purposes under this State Wildlife Action Plan (SWAP) using hydrographic boundaries and fisheries assemblage and management considerations. The basins each include one to four sub-regions (4-digit hydrologic unit code [HUC] watersheds). This approach allows the nesting of multiple spatial and temporal scales for planning and prioritizing conservation actions.

The Snake/Salt River basin corresponds with the Upper Snake sub-region. It includes two 6-digit HUCs: Snake Headwaters and Upper Snake River (Figure 9), eight sub-basins (8-digit HUCs) and twenty-nine watersheds (10-digit HUCs). These watersheds span an area of about 5,100 square miles in northwestern Wyoming's Lincoln, Teton, Sublette, and Park counties. Land ownership is predominantly public with only 8% privately held. These private lands, however, tend to be vital for aquatic wildlife along the riparian corridors. Public land is primarily managed by the U.S. Forest Service (69%) and National Park Service (Grand Teton National Park, 21%).

There are approximately 4,900 miles of streams on the USGS National Hydrography Dataset in the Snake/Salt River basin. Major drainages in the basin include the Salt, Hoback, Gros Ventre, Buffalo Fork and Snake rivers.

Additional information about the basins drainages, geography, geology, land forms, climate, dams, reservoirs and diversions, hydrology, habitat types, land use and classifications are detailed in the 2010 SWAP.

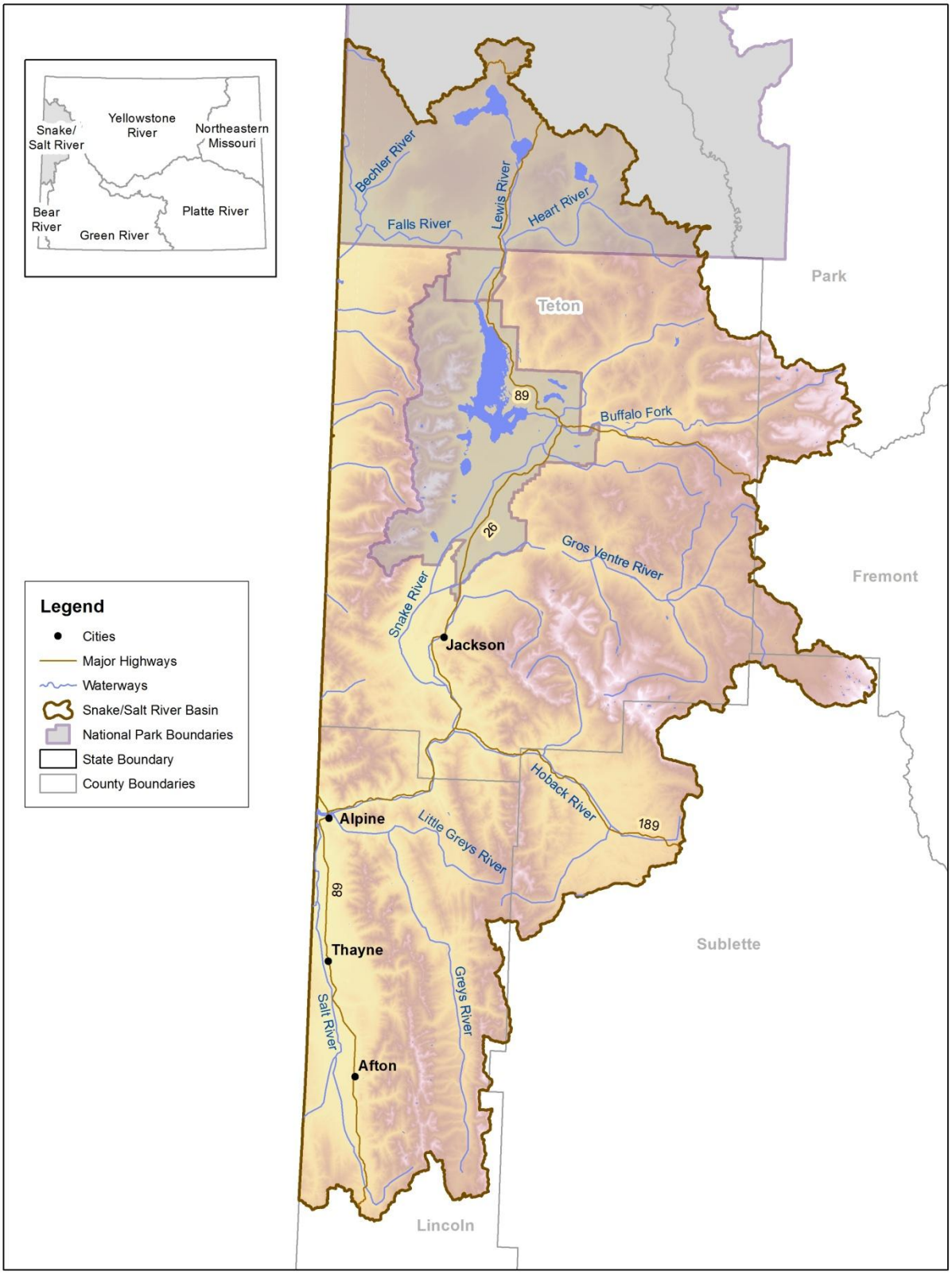

Figure 9. Snake/Salt River Basin.

Aquatic Wildlife

Fish

Twenty-three fish species are found in the basin. Cutthroat trout are represented by Yellowstone Cutthroat Trout *O. clarkii bouvieri* and an unnamed presumed subspecies, the fine-spotted or Snake River Cutthroat Trout *O. clarkii ssp.* Thirteen species or subspecies are native to the basin, and ten are introduced. The WGFD recognizes and manages fine-spotted Snake River Cutthroat Trout separately from other cutthroats. This distinction has been made within the WGFD management program since 1955.

The native gamefish community is composed only of Snake River and Yellowstone Cutthroat Trout and Mountain Whitefish. The nonnative gamefish community consists of seven species of introduced salmonids and chars. The nongame fish community consists of 10 native species and the introduced Fathead Minnow and White Sucker. Additionally, various tropical fish species have been illegally introduced into Kelly Warm Springs.

Simon (1951) surveyed 10 sites in the Snake/Salt River basin and documented the presence of all known native species, as well as Arctic Grayling. The Snake River Cutthroat Trout has been considered a distinct, undefined, fine-spotted variety of cutthroat trout (Behnke 1992).

Table 9. Fishes present in the Snake/Salt River basin. Species of Greatest Conservation Need (SGCN) are followed by an asterisk (*).

Native game	Native nongame	Nonnative game	Nonnative nongame
Mountain Whitefish	Bluehead Sucker*	Bear River Cutthroat Trout	Fathead Minnow
Snake River Cutthroat Trout*	Longnose Dace	Brook Trout	White Sucker
Yellowstone Cutthroat Trout*	Mottled Sculpin	Brown Trout	
	Mountain Sucker	Golden Trout	
	Northern Leatherside Chub*	Grayling	
	Paiute Sculpin	Kokanee Salmon	
	Redside Shiner	Lake Trout	
	Speckled Dace	Rainbow Trout	
	Utah Chub		
	Utah Sucker		

Four fishes, including both subspecies of cutthroat trout, are considered Species of Greatest Conservation Need (SGCN). The two cutthroat subspecies have long been the focus of fisheries management efforts in the basin. Bluehead Sucker and Northern Leatherside Chub are also SGCN.

No known native species have been extirpated from the watershed, but two introduced nongame species have been documented in the past decade. Fathead Minnow was first documented in the Snake River below Jackson Lake Dam in 2002 and in the Lower Salt basin in 2003. White Sucker have also been introduced in the basin although the timing and location is unknown. While White Sucker remain rare, White Sucker x Utah Sucker hybrids were common in samples recently analyzed (Mandeville et al. 2015).

Aquatic Reptiles

No turtles are native to the Snake/Salt River basin and none have been introduced.

Freshwater Mollusks and Crayfishes

Wyoming is still in the discovery phase in terms of its freshwater mussels and gastropods. Although fingernail and pill clams and aquatic gastropods are often encountered during

invertebrate sampling, few published accounts exist (Beetle 1989, Henderson 1924, Hoke 1979, Hovingh 2004). Many native mussels, clams, and gastropods are considered SGCN by the WGFD due to a lack of information regarding status.

A single species of mussel, the Western Pearlshell, is known to inhabit the Snake/Salt River basin. Western Pearlshell are widespread and are not considered a SGCN (Mathias 2014).

Little is known about species present and distributions of gastropods in the basin. One native species, the Jackson Lake Springsnail, has been documented in the watershed. The nonnative New Zealand Mudsnail has been introduced to the basin above Jackson Lake. All of the native gastropods in the basin are considered SGCN.

The only crayfish species that has been documented in the Snake/Salt River basin is the Pilose Crayfish. This is a native species found during both recent surveys (Hubert 1988, Hubert 2010). There is no evidence of the presence of non-indigenous crayfishes in the Snake River drainage.

Table 10. Species of Greatest Conservation Need present in the Snake/Salt River Basin

Fish
Bluehead Sucker
Northern Leatherside Chub
Snake River Cutthroat Trout
Yellowstone Cutthroat Trout

Crustaceans
Pilose Crayfish

Mollusks
Jackson Lake Springsnail

Identification of Conservation Areas

Most of the Snake/Salt basin is of high conservation value for SGCN. Priority areas for conservation activities during the term of this plan are shown in Figure 10.

Aquatic conservation priorities in the watershed include, but are not limited to, the mainstem Snake and Salt River corridors, spring streams tributary to these rivers, the lower reaches of Pacific Creek, and Snake and Salt River tributaries that sustain wild cutthroat populations and Bluehead Suckers.

Additionally the Gros Ventre River drainage is a priority for both cutthroat trout and Northern Leatherside Chub.

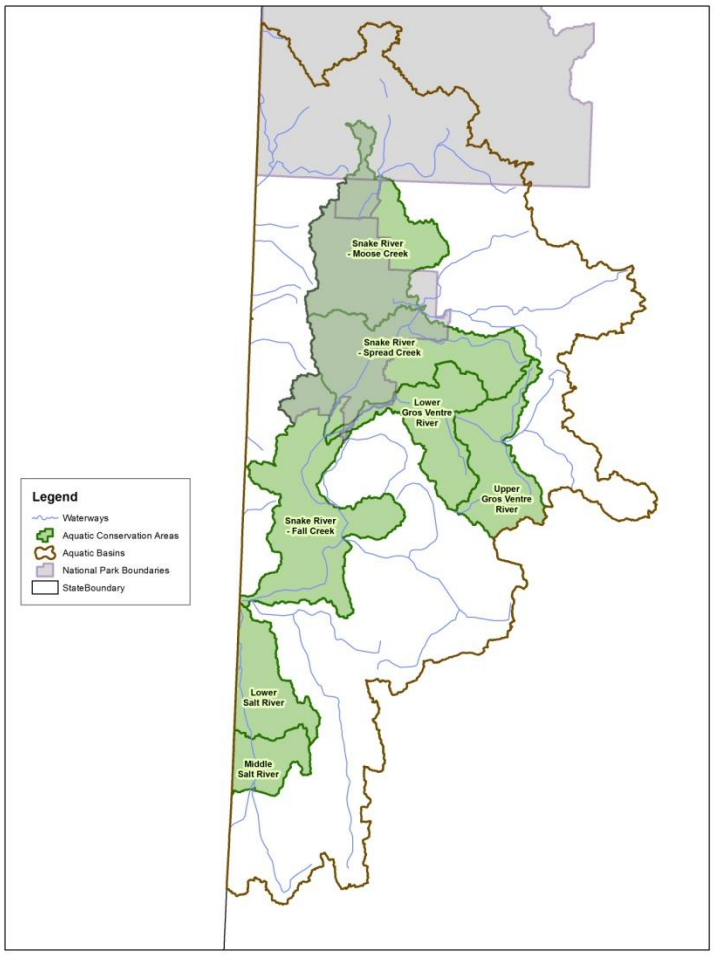

Figure 10. Aquatic Wildlife Conservation Areas in the Snake/Salt River Basin.

Threats

Water development/altered flow regimes – Moderate

Natural flow regimes in stream segments around the state have been altered by human activities, including irrigation diversions and water developments for enhanced water supply, hydropower, and flood control. These altered flow regimes are also a consequence of broad-scale changes in land use and management associated with agriculture, grazing, timber harvest, and housing development (see Wyoming Leading Wildlife Conservation Challenges – Disruption of Historic Disturbance Regimes). The majority of the Snake/Salt River basin is publicly owned. However, the developed areas in the Salt River drainage severely fragment the watershed and limit fish movement, mainly through stream dewatering. Lateral and longitudinal hydrologic connectivity is reduced and fish populations are physically restricted from habitats necessary to complete their life history in many parts of the drainage.

The combined effects of Jackson Lake Dam and the levee system have altered flow regimes, instream habitat, and riparian function. Levees were initially used in the 1950s to protect private property and now constrain the Snake River from Grand Teton National Park to south of Jackson. Jackson Lake Dam has altered flow regimes and blocked fish passage since the early 1900s. Outside the levees, spring creeks and cottonwood regeneration have been negatively affected by lack of flooding.

While water development can threaten native species, some introduced species, including popular sport fisheries, have thrived in the face of water development. The simplification of natural systems by human development tends to favor species with generalized and broad habitat requirements. Stable stream flow releases from dams, with relatively low peak flows and relatively high base flows, perpetuate productive sport fisheries like that found in the Snake River tailwater.

Altered flow regimes have also disconnected the Snake and Salt Rivers and their tributaries from floodplains. During and following extreme precipitation events, floodplains attenuate sediment and flood energy, reduce bank erosion, decrease vertical channel adjustment, and lessen fine sediment inputs into flowing waters. In addition, this lack of connection has reduced key cottonwood galleries' regeneration, lateral structure, and acreage size.

Residential development throughout the Snake River, Flat Creek and Salt River valleys are directly influencing groundwater levels and important spring creeks (Wyoming Water Development Office 2014). These developments often include ponds. Together, groundwater pumping and pond development have the potential to negatively impact water quality(including water temperatures), levels, bank stability and physical habitat quality and quantity in spring streams which serve as spawning and rearing areas for Snake River Cutthroat Trout.

Altered flow regimes from vegetational succession occur in watersheds like the Greys River where fire suppression has resulted in a lack of community and age class diversity. Conducting watershed scale vegetation treatments has become an important tool for enhancing wildlife, both terrestrial and aquatic. For example, aspen treatment projects in the Greys River drainage have the potential to increase water yield and improve spawning and migration of native fish.

Drought and climate change – Moderate
Climate change may increase air and surface water temperatures, alter the magnitude and seasonality of precipitation and runoff, and shift the reproductive phenology and distribution of plants and animals (Seavy et al. 2009) (see Wyoming Leading Wildlife Conservation Challenges – Climate Change).

Changes in precipitation patterns under various climate change scenarios are predicted to produce peak flows earlier in the yearly cycle and to lower base flows (Barnett et al. 2004). Drought lowers water tables, leading to reduced plant growth and reproduction. Riparian vegetation declines lead to lower bank stability, higher siltation and altered stream habitat quality and quantity. Lower water levels increase water temperatures and reduce habitat available to fish and other aquatic wildlife. All these conditions can be detrimental to the health and reproductive success of all aquatic wildlife species.

Invasive species – Moderate
Aquatic invasive species (AIS) present in the basin include the New Zealand Mudsnail. Additional descriptions and definitions of AIS can be found in the WGFD AIS management plan (WGFD 2010).

New Zealand Mudsnails were first discovered in 1996 in the Madison River in Yellowstone National Park. The mudsnail is spread by fish and birds, natural downstream dispersal, upstream through rheotactic behavior, and by humans on fishing gear. The pathway of introduction into Wyoming is unknown, but spread on recreational angling gear is likely given the first location of introduction (WGFD 2010). Currently, in the Salt/Snake River Basin, mudsnail occur in the Snake River upstream of Jackson Lake, and Polecat Creek. Mudsnail populations have decreased in abundance relative to first establishment, a trend observed elsewhere (Vinson et al. 2007).

In addition to species designated as AIS, several introduced game fishes are problematic in the

basin. Nonnative Rainbow Trout present a substantial threat to Yellowstone and Snake River Cutthroat Trout through hybridization, while other introduced trout are predators and/or competitors that have proven successful at eliminating native cutthroat trout populations. While nonnative game fish may need to be controlled for conservation and restoration of natives in some areas, these same fish support popular fisheries that provide important recreational and economic benefits (WGFD 2010).

Other invasive species, such as zebra and quagga mussels and Silver Carp, are present in neighboring states and potentially very harmful to the aquatic wildlife in the basin. Through outreach and education, watercraft inspections, and monitoring, the harmful impacts of these and other invasive species may be prevented. Watercraft are inspected at key locations entering the basin at Alpine and Salt River Pass, and at major waters including Jackson Lake and the Snake River. Ten (10) waters in the basin are monitored annually to detect the presence of invasive species. These efforts to keep existing species in the basin from spreading to new waters, and other harmful species from entering the basin will continue.

Conservation Initiatives

Department plans and policies
The WGFD's Fish Division has developed basin management plans to guide management across the state. These plans provide background and history of aquatic wildlife management as well as management direction. These plans reference the SWAP and the Strategic Habitat Plan, attempting to incorporate management direction relevant to each basin.

Habitat management efforts are guided by the WGFD Strategic Habitat Plan (SHP) that is periodically revised and approved by the Wyoming Game and Fish Commission. The goal of the SHP is to conserve, enhance, and improve priority wildlife habitats while increasing wildlife-based recreation and public awareness of wildlife habitat issues and promotion of collaborative habitat management.

In addition to these guiding documents, the WGFD has a number of tools, policies and protocols to protect and enhance native aquatic wildlife. Additional information on Federal Wild and Scenic designations, state instream flow water rights, environmental commenting, aquatic wildlife stocking and transplant, and disease prevention can be found in the 2010 SWAP.

Interagency plans and agreements
The states of Idaho, Montana, Nevada, Utah, and Wyoming, along with the U.S. Forest Service and Grand Teton and Yellowstone National Parks, signed a Memorandum of Agreement (MOA) to jointly conserve, protect, and restore Yellowstone Cutthroat Trout populations within their historic range (Range-wide YCT Conservation Team 2009). As part of the agreement the interstate working group under the auspices of the 2000 MOA, completes periodic scheduled range-wide status assessments (Endicott et al. 2015).

The states of Idaho, Nevada, Utah, and Wyoming, along with the U.S. Forest Service, Bureau of Land Management, Bureau of Reclamation, National Park Service, Fish and Wildlife Service, Trout Unlimited, and The Nature Conservancy, signed a Conservation Agreement to jointly conserve, protect, and restore Northern Leatherside Chub populations within their historic range (UDWR 2009b). A range-wide conservation team meets annually to further conservation efforts. As part of the agreement the team is charged with producing status assessments for the species at five year intervals.

The states of Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming and U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, U.S. Bureau of Reclamation, Jicarilla Apache Nation, Southern Ute Indian Tribal Council, and U.S. Forest Service are signatories to a range-wide

conservation agreement and strategy for Roundtail Chub, Bluehead Sucker and Flannelmouth Sucker (UDWR 2009a). As part of the agreement an interstate working group meets annually to discuss conservation needs and produces regular status assessments.

The National Fish Habitat Action Plan (NFHAP) was developed by a coalition of fisheries professionals, state and federal agencies, tribes, foundations, conservation and angling groups, businesses and industries, all determined to reverse the declines of America's fish habitats. The WGFD is involved with three NFHAP partnerships, Great Plains Fish Habitat Partnership, the Western Native Trout Initiative, and the Desert Fishes Habitat Partnership. The Western Native Trout Initiative covers the Snake/Salt Basin. Additional information on Fish Habitat Partnerships can be found in the 2010 SWAP.

Ongoing and completed conservation actions

Numerous projects have been completed to benefit SGCN in the Snake/Salt basin since the implementation of the 2010 SWAP (previous accomplishments are documented in the 2010 SWAP). Multiple sources of funding have been used to implement projects. Projects have been completed by department personnel and through contracting and granting with research partners. Accomplishments are listed under headings taken from the Recommended Conservation Actions (bold headings) in the 2010 SWAP. While accomplishments are not duplicated under more than one action they commonly address multiple actions. Although this list is not comprehensive of all actions, most of the significant initiatives are summarized below.

Protect and enhance Snake River tributary streams

WGFD biologists completed several efforts to improve the structure and function of stream segments and watershed features that benefit aquatic SGCN. These efforts are documented in annual Strategic Habitat Plan Accomplishments reports. Flat Creek near Jackson supports substantial Snake River Cutthroat Trout populations and natural channel design restoration work has been completed on 3.5 miles of stream on the National Elk Refuge to benefit all trout life stages (WGFD 2016).

Enhancement work has been conducted by WGFD biologists on Jackson Hole area spring streams on private lands including Fish Creek, Edmiston Spring Creek, Blue Crane Creek, and Spring Creek. This work includes channel narrowing, pool and gravel enhancement, and adding features to reduce fine sediment and benefit Snake River Cutthroat Trout spawning, fry and juvenile habitat (WGFD 2011, WGFD 2014).

WGFD biologists completed channel enhancements on Crow Creek in the Salt River drainage to benefit Snake River Cutthroat Trout (WGFD 2011). Project activities addressed channel form to improve pool diversity and function, gravel cleaning to benefit spawning and incubation, and riparian willow plantings to enhance shade and insect production.

Secure and enhance populations and habitats in SGCN priority areas

No reported projects

Enhance spawning runs of Snake River Cutthroat Trout

WGFD biologists planted eyed-eggs in suitable spawning streams to encourage future spawning runs of Snake River Cutthroat Trout.

Remove fish passage obstacles

WGFD biologists worked with partners and contributed funding to several projects to enhance fish passage and connectivity. These efforts are detailed in annual Strategic Habitat Plan Accomplishments reports (e.g. WGFD 2011).

WGFD biologists worked with partners to modernize irrigation infrastructure and remove a barrier on Spread Creek, tributary to the Snake River. Improved access to over 45 miles of stream for Snake River Cutthroat Trout and Bluehead Sucker was provided (WGFD 2011).

Irrigation diversions from various spring creeks near Jackson were improved to enhance Snake River Cutthroat Trout passage and limit entrainments while also benefitting water users. Example include the Spring Creek headgate (WGFD 2011), the Upper Spring Creek JA Williams passage project (WGFD 2012), and additional Upper Spring Creek passage work completed in 2013 (WGFD 2014).

WGFD funding assistance was provided to Trout Unlimited to remove a historic obstruction on the Gros Ventre River (WGFD 2014). Removing the Kelly (Newbold) Diversion structure improved upstream access to about 42 miles of the Gros Ventre River proper and additional tributary streams for Bluehead Sucker and Snake River Cutthroat Trout.

WGFD biologists worked with Trout Unlimited to improve fish passage at the East Side Diversion on the Salt River by creating a fish ladder.

WGFD biologists worked with Grand Teton National Park to install baffles in a Ditch Creek culvert under US HWY 26/89/191. The baffles will improve passage for all fish, but in particular Bluehead Sucker.

Evaluate the status and distribution of native aquatic wildlife assemblages with emphasis on Snake River Cutthroat Trout, Bluehead Sucker, and Northern Leatherside Chub.

WGFD biologists used state wildlife grant (SWG) funding to complete an inventory of Northern Leatherside Chub and their habitat associations in Wyoming (Schultz and Cavalli 2012). Surveys were conducted in Pacific Creek, Snake River spring creeks, and Buffalo Fork River in the Snake/Salt basin.

WGFD biologists used SWG funding to complete an evaluation of the distribution and movement of Bluehead Sucker in the Snake River drainage (Hines 2013). Bluehead Sucker distributed in summer and congregated in winter.

WGFD biologists conducted surveys to identify Bluehead Sucker spawning locations in the Snake River drainage per recommendations of Hines (2013). Potential spawning locations were located in Blackrock and Spread creeks (WGFD 2014).

WGFD biologists discovered a new locale for Northern Leatherside Chub in the Gros Ventre River drainage in 2014 (WGFD 2015). Additional inventories in the drainage expanded the known range of the species (WGFD 2016).

WGFD biologists conducted a statewide survey of Mountain Whitefish (SGCN in 2010 SWAP) from 2009 to 2013. A primary achievement of the study was the development of a sampling approach for assessing populations (Edwards 2014). The study demonstrated most populations are robust leading to the determination that a non SGCN status rank (NSS5) is appropriate.

Identify and reduce threats to native fish populations from nonnative species

WGFD biologists conducted an inventory of fisheries resources in the Hoback River drainage from 2008-2014(Miller 2015). Native species were more common than nonnatives in 83% of sites sampled.

WGFD biologists identified two lake populations of nonnative species that pose threats to native aquatic wildlife (Mystery Lake and Dime Lake). Plans to chemically rehabilitate these lakes to remove nonnative species are underway.

Implement existing plans and agreements to conserve SGCN

No reported projects

Increase educational efforts about the ecological, economic, and social values of aquatic SGCN

The WGFD created, produced and disseminated a poster detailing the states native fishes.

Explore water management approaches that enhance fish habitat
The WGFD completed studies and filed for instream flow water rights on 10 instream flow segments covering over 48 miles. These include two segments on Cliff Creek (Robertson 2011a), North Fork Fisherman Creek (Robertson 2011b), two segments on the Hoback River (Robertson 2011c, Robertson 2012a), Shoal Creek (Robertson 2011d), the Little Greys River (Robertson 2012b), Granite Creek (Robertson 2012c), Dell Creek (Robertson 2012d), and Willow Creek (Robertson 2012e).

Continue building voucher collections for all aquatic wildlife.
WGFD biologists collected numerous additional fish voucher specimens since the last SWAP (2010). All vouchers specimens are submitted to the Museum of Southwestern Biology, Albuquerque NM.

Complete the comprehensive survey for freshwater mussels
The WGFD conducted a SWG-funded project in 2011 to assess the distribution and abundance of native mussels. Inventory surveys were conducted at numerous sites in the Snake/Salt basin (Mathias 2014). Live Western Pearlshell were common and abundant at many sites.

Follow up on recommendations from the graduate research project on gastropods.
No reported projects

Monitor water resource impacts associated with human developments
No reported projects.

Recommended Conservation Actions

Secure, enhance, or establish SGCN populations
Continue to remove Rainbow Trout and cutthroat–rainbow hybrids from Laker Spring in the Salt River drainage and the Gros Ventre River.

Chemically remove nonnative trout from Dime and Mystery Lakes.

Describe and locate habitats, structures or stream conditions preferred by nonnative trout species.

Inventory, assess, or examine life history requirements of SGCN
Conduct a thorough investigation of the distribution of Northern Leatherside Chub and Bluehead Sucker in the Gros Ventre River drainage.

Juvenile habitat needs of Bluehead Sucker should be investigated in the drainage.

Conduct baseline gastropods surveys in the basin and identify needed actions to maintain or restore populations.

Survey to fill gaps in knowledge about native mussel distribution, particularly in the Hoback, Gros Ventre, Salt and Greys river drainages (Mathias 2014).

Conduct studies to better understand the life history of lesser understood native fishes in the basin.

Provide passage and reduce entrainment at barriers impacting SGCN
Identify barriers to fish passage in the drainage and prioritize structures to improve that have the greatest potential for benefiting aquatic species.

Identify and rank screening priorities to reduce fish loss to diversions.

Improve aquatic habitat for SGCN
Complete projects to maintain, restore or enhance salmonid spawning habitats in spring stream tributaries.

Conduct watershed scale vegetation treatments to benefit native species.

Complete assessment and stream restoration on lower Flat Creek to improve functions and benefit Snake River Cutthroat Trout.

Monitor instream flow segments for compliance with approved instream flow levels. Petition for stream regulation by the Board of Control as needed when water is available and in priority but not reaching the instream flow segment.

Assess sediment supply and stream stability of subdrainages throughout the Salt River watershed to direct future stream restoration efforts.

Employ water management strategies that improve habitat for SGCN

Identify opportunities to work with private water right holders to manage water diversions and uses with the goal of restoring natural flow regimes for fish and encouraging riparian vegetation recruitment. Where opportunities exist, develop cooperative strategies with landowners and other partners to implement strategies that are beneficial to wildlife.

Identify fish and wildlife mitigation for new reservoirs as they are proposed including instream flow regimes and minimum fishery pools. Ensure that mitigation recommendations are included as conditions in applicable state and federal permits.

File for new instream flow water rights on stream segments with native fishes or native fish habitat to secure habitat in suitable areas.

Continue building voucher collections for all aquatic wildlife
Continue to fill voids in voucher inventory for fish per WGFD protocol (Zafft and Bear, 2009).

Build gastropod voucher collection and find permanent repository.

Increase educational efforts about the ecological, economic, and social values of aquatic SGCN
No actions identified.

Monitoring

Routinely monitor SGCN populations
Monitor Snake River Cutthroat Trout spawning activity in important spring creeks tributary to the Snake and Salt Rivers.

Routinely monitor Snake River Cutthroat Trout populations in the mainstem Snake and Salt Rivers and important spawning tributaries. Continue monitoring the response of the wild Snake River Cutthroat Trout population in streams that are no longer stocked.

Establish standardized monitoring protocols and locations for native SGCN
Monitor Northern Leatherside Chub populations in Pacific Creek and Gros Ventre River on biennial schedule.

Conduct pre and post project implementation monitoring on aquatic habitat and passage projects that affect SGCN populations.

Develop a monitoring protocol for Bluehead Sucker in the Snake River drainage.

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