2015 - 2016 Highlights

Upper Colorado River Endangered Fish Recovery Program

San Juan River Basin Recovery Implementation Program

Upper Colorado River Endangered Fish Recovery Program

and

San Juan River Basin Recovery Implementation Program

Implementing Innovative Solutions to Manage Water and Hydropower Resources While Recovering Endangered Species

Highlights 2015-2016

The Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program use science-based, cost-effective measures to recover endangered fish. The recovery programs stock endangered fish, restore habitats, provide river flows, and reduce nonnative fish populations. Water for endangered fish is provided within state and federal laws and tribal rights while water and hydropower resources are managed to meet the needs of people in growing western communities. This dual mission has created a unique, powerful set of partnerships to support the economy, protect the environment, and preserve the heritage of the Colorado River basin.

Actions taken by the recovery programs provide Endangered Species Act compliance for approximately 2,500 water projects providing water for irrigation, cities, industry, recreation and tribal uses. No lawsuits have been filed on ESA compliance provided by the programs.

Predation and competition by nonnative fish species is now considered the primary threat to endangered fish recovery and is the most challenging to manage. The recovery programs are on a path to reduce the nonnative fish threat. In the past three years, the programs have spent more than $2.5 million per year managing nonnative fish species. Control efforts focus on removing nonnative fishes from 760 miles of rivers, disrupting reproduction, and preventing reservoir escapement. State agencies are removing bag limits, issuing "must kill" regulations for some species if caught by anglers, holding nonnative fishing tournaments at reservoirs, participating in river removal efforts, informing the public and anglers about the nonnative fish problem, and eliminating problematic, illegally stocked nonnative fish populations, replacing them with compatible sport fisheries at some reservoirs.

We have made great progress, but still have more work to do. The recovery programs continue to implement recovery actions and are working with the U.S. Fish and Wildlife Service to produce Species Status Assessments for 3 of the 4 endangered fish. These assessments will assist in revision of the recovery plans and inform the Service on the status of the species and the potential to downlist the species from 'endangered' to 'threatened." Downlisting would recognize the improved status of the species and be a significant step toward recovery and delisting.

Highlights *is produced annually to summarize the recovery programs' progress toward recovery of the endangered fishes.*
This document is not a publication of the U.S. Department of the Interior or its agencies.
All uncredited photographs are courtesy of the recovery programs.

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Reaching Out to Local Communities

The recovery programs inform the public about endangered fish recovery actions through news and social media, public meetings, interpretive exhibits, water festivals and other events, newsletters, fact sheets, and web sites.

Photo by U.S. Fish and Wildlife Service

A child compares a fish trading card with an aquarium fish during an Endangered Species Day outreach event at the Denver Aquarium.

Photo by Utah Division of Wildlife Resources

Robert Schelly, Utah Division of Wildlife Resources biologist, teaches a 4th grade class about the endangered fishes of the Colorado River basin.

Photo by U.S. Fish and Wildlife Service

Brielle Troxel, 3, gets to touch a fish during the annual Children's Water Festival held in western Colorado.

Partners' Long-Term Commitment, Collaboration, and Effective Participation Drive Recovery Programs' Success

The Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program partners include states, federal agencies, water development interests, power customers, American Indian tribes, and environmental organizations. The programs operate in compliance with the Endangered Species Act, state water and wildlife laws, interstate water compacts, tribal law and the trust responsibilities of the United States to American Indian tribes. Supporting the diverse interests of all these partners, the recovery programs have made long-term commitments to work collaboratively to recover the endangered fish species while water development and hydropower generation continue.

Upper Colorado River Endangered Fish Recovery Program

State of Colorado
State of Utah
State of Wyoming
Bureau of Reclamation
Colorado River Energy Distributors Association
Colorado Water Congress
National Park Service
The Nature Conservancy
U.S. Fish and Wildlife Service
Utah Water Users Association
Western Area Power Administration
Western Resource Advocates
Wyoming Water Association

The Upper Colorado River Endangered Fish Recovery Program is recovering humpback chub, bonytail, Colorado pikeminnow, and razorback sucker in the Colorado River and its tributaries in Colorado, Utah, and Wyoming. The Recovery Program was initiated in 1988 with the signing of a cooperative agreement by the Governors of Colorado, Utah, and Wyoming; the Secretary of the Interior; and the Administrator of Western Area Power Administration. The cooperative agreement is active through September 30, 2023.

San Juan River Basin Recovery Implementation Program

State of Colorado
State of New Mexico
Jicarilla Apache Nation
Navajo Nation
Southern Ute Indian Tribe
Ute Mountain Ute Tribe
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
The Nature Conservancy
U.S. Fish and Wildlife Service
Water Development Interests

The San Juan River Basin Recovery Implementation Program is recovering Colorado pikeminnow and razorback sucker in the San Juan River and its tributaries in Colorado, New Mexico, and Utah. The Recovery Program was established in 1992 with the signing of a cooperative agreement by the Governors of Colorado and New Mexico; the Secretary of the Interior; the Southern Ute Indian Tribe, the Ute Mountain Ute Tribe, and the Jicarilla Apache Nation. The cooperative agreement is active through September 30, 2023.

State, Tribal, and Federal Leaders Endorse Recovery Program Accomplishments

State, tribal, and federal leaders have supported the recovery programs for their cost-effective and collaborative on-the-ground achievements. They recognize the challenges of meeting the water development and management needs of western communities, while working toward conservation of endangered fish species. The recovery programs are models of successful endangered species recovery efforts.

State Leaders Value Endangered Fish Recovery Programs' Accomplishments:

"The endangered fish recovery programs are models of collaborative, grassroots efforts that leverage cooperation from numerous stakeholders to ensure these remarkable ancient fish continue to swim in the Colorado River System. The programs support millions of people who depend on the river's water to grow food, generate electricity, and serve the needs of cities and towns."

John W. Hickenlooper, Governor, State of Colorado

"The State of New Mexico has a vested interest in the successful outcome of these programs. New Mexico is highly reliant upon continued use of the waters of the San Juan River system for continued economic growth in the state … for power generation, for agricultural purposes, and for municipal and industrial uses …"

Susana Martinez, Governor, State of New Mexico

"The success of the Upper Colorado River and San Juan River Endangered Species Recovery Programs is vital for Utah's continued use and development of Utah's Colorado River apportionment as part of our state's continued progress in providing for the needs of the citizens of Utah."

Gary R. Herbert, Governor, State of Utah

"Wyoming has been an active participant in the Recovery Program, ensuring the recovery of four endangered fish species while allowing for the development of the Compact appropriations. It is imperative that the Recovery Program remains viable and continues to provide reasonable and practical alternatives to assure ESA compliance."

Matthew H. Mead, Governor, State of Wyoming

Tribal Leaders Stress Recovery Programs' Contributions:

"Jicarilla Apache Nation has been a participant in the San Juan River Basin Recovery Implementation Program since its inception in 1992 … The continuation of the Program is of the utmost importance to the Nation and the economic viability of the region."

Levi Pesata, President, Jicarilla Apache Nation

"The Navajo Nation is an active participant in, and strong supporter of, the San Juan River Basin Recovery Implementation Program … These two successful, ongoing cooperative partnership programs involve the States of Colorado, New Mexico, Utah and Wyoming, Indian tribes, federal agencies and water, power, and environmental interests …"

Ben Shelly, President, The Navajo Nation

The Department of the Interior Recognizes the Recovery Programs' Benefits:

"The Colorado River recovery programs have become a national model for collaborative species recovery efforts. Here in one of the nation's fastest growing areas, we continue to work successfully with a broad array of partners to secure the future of the river's endangered native fishes, while meeting the water needs of communities across the river's watershed. As the impacts of a changing climate and human populations continue to grow, these partnerships will become increasingly vital to sustaining our natural heritage in the Colorado River basin."

Sally Jewell, Secretary of the Interior, 2014

"The strength of the Colorado River recovery programs flows from the commitment and engagement of its partners. Management actions are developed and implemented with the equal participation of each partner, ensuring that those actions contribute effectively to recovery of the river's native fish species and allow for development of critical water projects. The U.S. Fish and Wildlife Service and the Department of the Interior play a key role in supporting these partnerships, and we are committed to strengthening and expanding our support for their vital work."

Dan Ashe, Director of the U.S. Fish and Wildlife Service, 2014

"The Upper Colorado and San Juan recovery programs continue to provide ESA compliance for a great many Federal and non-Federal water projects while working towards the ultimate objective to recover the listed fish species. Despite persistent drought and the challenges of dealing with invasive nonnative fish, these programs continue to make progress through the collaborative efforts of our partners."

Estevan López, Commissioner of Reclamation, 2016

"The Upper Colorado River recovery programs are an excellent example of the power of collaboration among state, federal and local partners. With these programs we are able to meet the needs of many including agriculture, the environment, tribes, recreation and of course, the millions of people who live in the watershed."

Jennifer Gimbel, Principal Deputy Assistant Secretary for Water and Science, 2015

"The Upper Colorado River and San Juan River recovery programs serve as a model for how a broad spectrum of stakeholders can work toward a common goal of endangered species recovery, while respecting other important interests such as state and federal water rights and hydropower generation."

Michael L. Connor, Deputy Secretary of the Interior, 2015

Endangered Species Act Compliance Streamlined for Water and Hydropower Projects

The Upper Colorado River and San Juan River Basin recovery programs respond to the challenge of water management by working with local, state, federal, and tribal agencies to meet the needs of people and endangered fish. The programs' goal is to achieve full recovery (delisting) of the endangered fishes, not just to avoid jeopardy (offset impacts of water project depletions) under the Endangered Species Act (ESA). The recovery programs provide ESA compliance for water development and management activities for federal, tribal, and non-federal water users. This includes Bureau of Reclamation-operated dams and projects across the Upper Colorado River Basin. Responsibilities to offset water project depletion impacts do not fall on individual projects or their proponents.

The recovery programs currently provide ESA compliance for 2,449 water projects depleting more than 3.7 million acre-feet per year. No lawsuits have been filed on ESA compliance for any of these water projects.

Upper Colorado River Endangered Fish Recovery Program
Summary of Endangered Species Act Section 7 Consultations
1/1988 through 12/31/2015

		Historical Depletions	New Depletions	Total
State	Number of Projects	Acre-Feet/Yr	Acre-Feet/Yr	Acre-Feet/Yr
Colorado	1216	1,915,682	207,192	2,122,873
Utah	242	517,670	97,317	614,987
Wyoming	405	83,498	35,724	119,223
CO/UT/WY	238[1]	(Regional)	(Regional)	
Total	**2,101**	**2,516,850**	**340,233**	**2,857,083**

[1]Small depletion projects (<100 acre-feet per year) consulted on between July 3, 1994, and October 1, 1997, when the Recovery Program did not track the number of these projects by state. Depletion totals associated with these 238 projects are captured by state under new depletions.

San Juan River Basin Recovery Implementation Program
Summary of Endangered Species Act Section 7 Consultations
1/1992 through 12/31/2015

State	Number of Consultations	Depletions Acre-Feet/Yr
New Mexico	23	653,758
Colorado	310	217,930
Utah	15	9,311
Total	**348**	**880,999**

The Programs Rely on Recovery Goals to Guide Recovery Actions and Measure Success

The overall goal for recovery of the four endangered fishes is to achieve naturally self-sustaining populations and protect the habitat on which those populations depend. Specific, basin-wide recovery goals for humpback chub, bonytail, Colorado pikeminnow, and razorback sucker were approved by the U.S. Fish and Wildlife Service (USFWS) on August 1, 2002, and are currently in revision to incorporate new information. The Upper Colorado and San Juan recovery programs implement actions to achieve the recovery goals in the Upper Colorado River Basin.

The recovery goals describe conditions necessary for downlisting and delisting each of the fish species by:

1) Identifying site-specific management actions* necessary to minimize or remove threats;

2) Establishing objective, measurable criteria that consider demographic and genetic needs for naturally self-sustaining, viable populations *(see Box 1)*;

3) Providing estimates of the time to achieve recovery.

Box 1. DEMOGRAPHIC CRITERIA FOR RECOVERY

DOWNLISTING	DELISTING
Colorado pikeminnow	
Over a 5-year monitoring period: •Maintain the Upper Basin metapopulation •Maintain populations in the Green River and Upper Colorado River sub-basins ("no net loss") •Green River sub-basin population >2,600 adults •Upper Colorado River sub-basin population >700 adults •Establish 1,000 age-5+ subadults in the San Juan River sub-basin	**For 7 years beyond downlisting:** •Maintain the Upper Basin metapopulation •Maintain populations in the Green River and Upper Colorado River sub-basins ("no net loss") •Green River sub-basin population >2,600 adults •Upper Colorado River sub-basin population >1,000 adults OR Upper Colorado River sub-basin population >700 adults and San Juan River sub-basin population >800 adults
Bonytail	
Over a 5-year monitoring period: •Maintain reestablished populations in the Green River and Upper Colorado River sub-basins, each >4,400 adults •Maintain established genetic refuge of adults in Lower Basin •Maintain two reestablished populations in the Lower Basin, each >4,400 adults	**For 3 years beyond downlisting:** •Maintain populations in the Green River and Upper Colorado River sub-basins, each >4,400 adults •Maintain genetic refuge of adults in Lower Basin •Maintain two populations in the Lower Basin, each >4,400 adults
Razorback sucker	
Over a 5-year monitoring period: •Maintain reestablished populations in Green River sub-basin and EITHER in Upper Colorado River sub-basin or San Juan River sub-basin, each >5,800 adults •Maintain established genetic refuge of adults in Lake Mohave •Maintain two reestablished populations in Lower Basin, each >5,800 adults	**For 3 years beyond downlisting:** •Maintain established populations in Green River sub-basin and EITHER in Upper Colorado River sub-basin or San Juan River sub-basin, each >5,800 adults •Maintain genetic refuge of adults in Lake Mohave •Maintain two populations in Lower Basin, each >5,800 adults
Humpback chub	
Over a 5-year monitoring period: •Maintain the six populations ("no net loss") •One core population in Upper Basin > 2,100 adults •One core population in Lower Basin > 2,100 adults	**For 3 years beyond downlisting:** •Maintain the six populations ("no net loss") •Two core populations in Upper Basin > 2,100 adults •One core population in Lower Basin > 2,100 adults

*__Habitat Management:__ Identify and provide adequate instream flows; **Habitat Development:** Restore and maintain habitat; **Nonnative Fish and Sportfishing:** Reduce the threat of certain nonnative fish species while maintaining sportfishing opportunities; **Endangered Fish Propagation and Stocking:** Produce genetically diverse fish in hatcheries and stock them in the river systems; and, **Research, Monitoring, and Data Management:** Provide data on life-history requirements of the endangered fishes, and monitor progress toward recovery.

Recovery Progress Report

The overall goal of the recovery programs is to remove the four Colorado River fish from Endangered Species Act (ESA) protection (delist) by 2023. For Colorado pikeminnow, recovery can occur solely in the Upper Basin; concurrent efforts in the Lower Basin will be required to recover the other three species. A summary of population status, major recovery accomplishments to date, and remaining objectives to meet the goal is provided below.

Species	Population Status & Goals	Major Accomplishments	Remaining Objectives
Colorado pikeminnow	The population of adult Colorado pikeminnow in the Colorado River sub-basin averages 612 individuals (1992 – 2014). The current USFWS criteria for downlisting this population is >700. Although the preliminary adult population estimate for 2014 (N=377) is the lowest on record, a record high number of young-of-year (YOY) pikeminnow were collected in the fall of 2015. The population in the Green River sub-basin averaged 2,504 individuals (2001 – 2013). The current USFWS' criteria for downlisting this population is >2,600. Pikeminnow stocking in the San Juan River has resulted in a growing population (see page 19).	Flows are managed in all Upper Basin rivers to benefit all life stages; fish passage provided at all major migration barriers; species is self-sustaining (not stocked) in Green and Colorado rivers and a successful stocking program occurs in the San Juan River; management of nonnative fish (e.g. northern pike, smallmouth bass, and walleye) has been underway for 10+ years.	Refine dam releases to provide flows that increase survival of YOY. Refine the nonnative fish management strategy to further reduce numbers of nonnative predators. The recovery programs are working with the USFWS to produce a Species Status Assessment by the end of 2016, which will assist in revision of the recovery plan and inform the Service on the status of the species and potential reclassification (downlisting the species from 'endangered' to 'threatened').
Humpback chub	The Upper Basin "core" population, which consists of adult humpback chub in Black Rocks and Westwater Canyons averaged 3,124 individuals from 1998 - 2012 (see page 21). The USFWS' criteria for downlisting a core population is >2,100. This estimated core adult population size dropped below 2,100 in 2007 and has remained relatively stable since. The Lower Basin core population (Grand Canyon) greatly exceeds current demographic criteria.	Flows are managed to benefit most populations; nonnative fish management actions benefit humpback populations most in the Green River sub-basin where nonnatives occupy the same river reaches.	Improve survival of young humpback chub. In 2015, the USFWS convened a recovery team to revise the recovery plan. The team has begun by developing a Species Status Assessment to inform the Service on the status of the species and potential reclassification (downlisting the species from 'endangered' to 'threatened').
Razorback sucker	The Upper Colorado and San Juan Programs have been stocking hatchery reared razorback sucker since 2004. Stocked fish are surviving, spawning, and wild-produced juveniles have been captured since 2013. Spring capture of adults in the Colorado River increased from 419 in 2013 to 1,151 in 2015. Preliminary population estimates are close to the USFWS downlist criteria of 5,800 adults. Similar increases are occurring in the Green and San Juan rivers. A small, but self-sustaining population occurs in Lake Mead in the Lower Basin.	Both programs have developed successful stocking strategies. Timing of spring Flaming Gorge Dam releases has been adjusted to connect floodplains when larval razorback sucker are present which has improved their survival. Nonnative predator control programs benefit all life stages.	Both programs are on track to recovery and are working with the USFWS to produce a Species Status Assessment in early 2017, which will inform the Service on the status of the species and potential reclassification (downlisting the species from 'endangered' to 'threatened').
Bonytail	The Upper Colorado program has been stocking hatchery-reared bonytail since 2004 to rebuild populations in the wild. Bonytail are still too scarce to warrant population estimates.	Genetically diverse stocks of this species have been developed and stocked in the Green and Colorado rivers. Monitoring programs have encountered this species in the wild, but in small numbers.	Modify the stocking program and protocols to establish viable populations in the wild, continue to develop a better understanding of the life history needs of the species.

Fish Illustrations © Joseph R. Tomelleri

State, Federal, and Tribal Facilities Help Reestablish Endangered Fish Populations

Genetically-diverse, hatchery-produced fish are stocked to reestablish naturally self-sustaining populations of razorback sucker and bonytail in the Upper Colorado River system and razorback sucker and Colorado pikeminnow in the San Juan River. Stocked fish will contribute* to meeting the demographic criteria of the recovery goals. The recovery programs monitor survival and reproduction of stocked fish to evaluate and improve stocking strategies. In most cases, the facilities are exceeding their annual production targets *(see pages 19 and 20)*.

Facility, Location (Target Number)	River, # Stocked and Average Size in 2015		
	Green	Colorado	San Juan[1]
Bonytail: average size 10 inches			
J.W. Mumma Native Aquatic Species Restoration Facility, Alamosa, CO (5,000)	**2,713; 12.6"**	**2,780; 12.6"**	
Wahweap State Fish Hatchery, Big Water, UT (10,000)	**8,918; 9.5"**	**4,509; 9.5"**	
Ouray National Fish Hatchery – Randlett Unit, Vernal, UT (10,000)	**10,131; 10.5"**		
Ouray National Fish Hatchery – Grand Valley Unit, Grand Junction, CO (10,000)		**11,594; 10.8"**	
Razorback sucker: average size 14 inches			
Ouray National Fish Hatchery – Randlett Unit, Vernal, UT (6,000)	**5,892; 14.7"**		
Ouray National Fish Hatchery – Grand Valley Unit, Grand Junction, CO (6,000)		**3,165; 16.8"**	
Ouray National Fish Hatchery-Horsethief Canyon Native Fish Facility, Fruita, CO (2,000-3,000)			**2,160**
Navajo Agricultural Products Industry (NAPI) Ponds, Farmington, NM (6,000-8,000)			**1,803**
Colorado pikeminnow: fingerlings, 50-55 mm total length			
Southwest Native Aquatic Resources and Recovery Center, Dexter, NM (400,000)			**402,087**

[1]The San Juan Program's target size for razorback sucker is ≥12" total length.

- Three razorback sucker stocked near the Hogback diversion on the San Juan River were recaptured two to four years later in the Colorado River between Moab and the Utah-Colorado state line. They moved between 404 to 477 miles, including through 138 miles of Lake Powell that hosts nonnative predatory fish such as striped bass and walleye. This is the first documented movement of endangered fish between the San Juan River and the Colorado River.

- Construction of 22 grow-out ponds was completed in 2012 at the Horsethief Canyon Native Fish Facility near Fruita, Colorado, to increase production of razorback sucker for the Upper Colorado and San Juan programs. The ponds are a cost-effective and efficient way to raise genetically-sound, endangered fish needed to achieve annual stocking goals.

Photo by Zane Olsen, Utah Division of Wildlife Resources

Wahweap is located by Big Water in Kane County, Utah near Lake Powell. The hatchery sits on 265 acres and currently raises bonytail.

Photo by Mike Porras, Colorado Parks and Wildlife

The Ouray National Fish Hatchery - Grand Valley Unit, Grand Junction, CO is used to raise several endangered species: bonytail, humpback chub and razorback sucker.

*All four species of endangered fish are long-lived (up to 40 years). The U.S. Fish and Wildlife Service will include hatchery-produced fish in population estimates after those populations have been determined to be "self-sustaining."

Cooperative Water Management Provides Flows for Endangered Fishes

Green River: provides spring and baseflows, Flaming Gorge, ROD Feb. 2006

White River: Future Water Management Plan, PBO TBD

Duchesne River: provides spring and baseflows, BO July 1998

15-Mile Reach–Colorado River: Flows managed with reservoir pools and an irrigation efficiency project (Grand Valley Water Management, GVWM) *(see table, top right and graph lower right)*, PBO Dec. 1999

Price River: minimum flows, Position Paper May 2012

Coordinated Water Releases (1997-2015) Benefit Endangered Fishes in the Colorado River

Reservoirs	Acre-Feet		
Granby	74,655	Green Mtn	704,959
Palisade Bypass	164,608	Ruedi	370,084
Williams Fork	103,965	Willow Creek	9,918
Windy Gap	4,624	Wolford Mtn	155,240

Total Ac-Ft: 1,588,147

Yampa River: Elkhead Reservoir to manage baseflows, *(see graph lower left)* PBO Jan. 2005

Gunnison & Colorado Rivers: Aspinall Unit assist to meet fish flows, ROD May 2012

San Juan River: Lake Nighthorse, completed in 2011. The 1991 BO for Animas-La Plata established the San Juan Recovery Program.

Navajo Reservoir, releases meet spring and baseflow targets, ROD July 2006

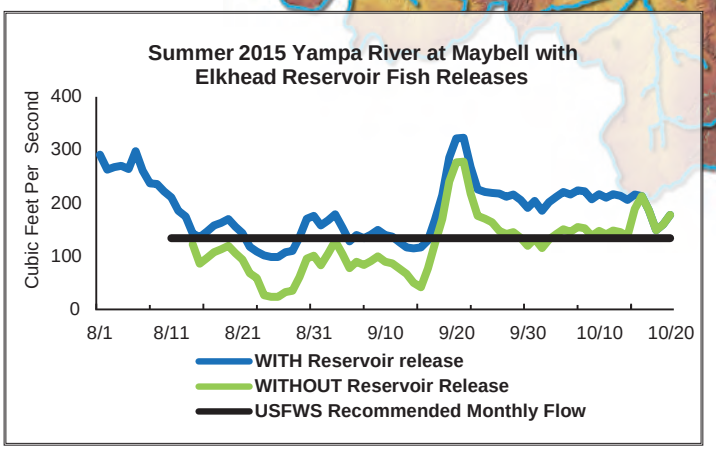
Reservoirs

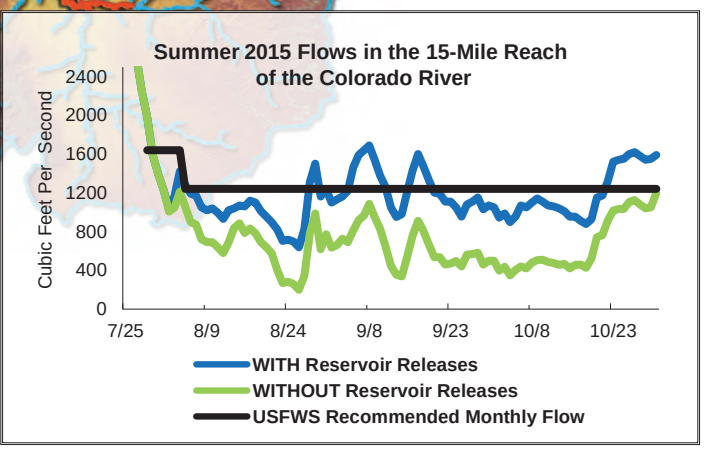
Critical Habitat

BO = Biological Opinion

PBO = Programmatic Biological Opinion

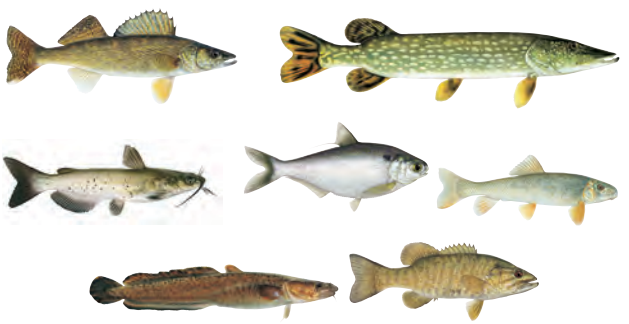
ROD = Record of Decision





Nonnative Predators Delay Recovery in the Upper Colorado River

Predation or competition by nonnative fish species is considered the primary threat to endangered fish recovery and is now the most challenging to manage. One hundred years ago only 13 native fish species swam in the Upper Colorado River and its tributaries – today they have been joined by more than 50 nonnative species. The graphic below depicts the spread of a few of the most predaceous and invasive species through the life of the Upper Colorado Program.

River	Presence of Invasive Species	
	1988	Today
Colorado		
Gunnison		
Green		
White		
Yampa		

Rusty crayfish photo courtesy of the United States Geological Survey
Virile Crayfish photo courtesy D. Gordon E. Robertson
Fish Illustrations © Joseph R. Tomelleri

Legend

Burbot	Channel catfish	Gizzard Shad	Northern pike	Rusty crayfish	Smallmouth bass	Striped bass	Virile crayfish	Walleye	White sucker

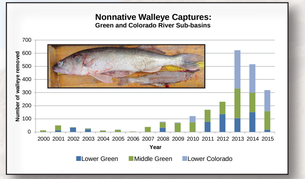
1 In 2014, biologists began gill netting connected backwaters in the upper Yampa River, to remove northern pike before they could spawn (see inset).

2 In 2016, Upper Colorado Program partners will install a 9mm mesh net (shown in red) in the Elkhead Reservoir spillway channel to prevent nonnative northern pike and smallmouth bass escaping to the Yampa River.

3 Multi-agency crews coordinate smallmouth bass removal efforts in the Yampa, White, Green and Colorado rivers timed specifically to target spawning adults.

Photo by Mark Webster, UDWR

4 Utah Division of Wildlife chemically treated Red Fleet Reservoir in 2015 to remove an illegally introduced population of walleye that was escaping to the Green River.



5 Distribution and abundance of nonnative walleye has increased dramatically in the past 8 years throughout the Upper Colorado River basin. **Inset photo** – the remains of an endangered Colorado pikeminnow removed from the stomach of a walleye.

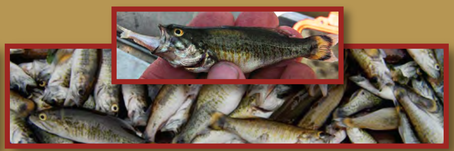
6 San Juan River researchers report declines in both juvenile and adult nonnative channel catfish in river reaches where the greatest amount of removal occurs.

WHY ARE CERTAIN NONNATIVE FISH A PROBLEM?

PREDATION AND COMPETITION

HIGH REPRODUCTION POTENTIAL

High Reproduction Leading to Competition



Predators in Shared Habitats

The Upper Colorado River Program has focused the majority of its nonnative control efforts on northern pike, smallmouth bass, and walleye. The San Juan Program manages nonnative channel catfish and common carp. Since the early 2000s Upper Colorado Program removal activities have expanded from six miles in the Yampa River to over 600 miles in four rivers. Some river reaches are sampled more than a dozen times annually. Similar sampling intensity is expended in 180 miles of the San Juan River.

Photo by M. Fischer, USFWS

Closeup of a northern pike.

Photo by USFWS

Bobby Duran, USFWS, holds a channel catfish, captured while electrofishing on the San Juan River.

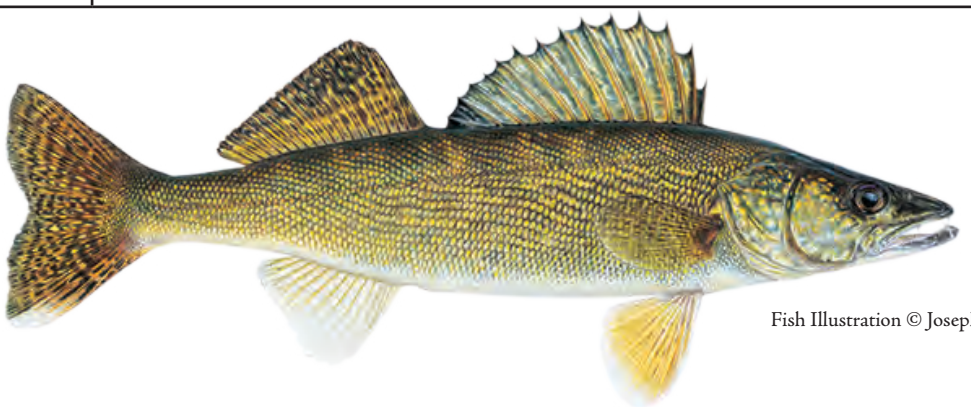
Photo by UDWR

Mitch Stanton, UDWR with a walleye on the middle Green River.

Photo by A. Schmoeger, USFWS

An endangered bonytail was regurgitated by a smallmouth bass captured in the Green River, Utah.

River	Species	History and Current Status
Colorado	Smallmouth bass	•Increases in abundance first observed in 2003; removal began in 2004. •Weak year class produced in 2014 and 2015 because higher flows and cooler temperatures delayed spawning and reduced growth.
	Northern pike	•Northern pike densities in the river remain low.
	Walleye	•Catches of walleye in the lower river increased in 2010; specific fall and spring removal efforts started in 2014. •Two juvenile Colorado pikeminnow found in the stomachs of walleye in 2014.
Green	Smallmouth bass	•Increases in abundance first observed in 2003; removal began in 2004. •Strong year classes produced in 2012 and 2013 because low flows and warmer temperatures provided earlier spawning and enhanced growth.
	Northern pike	•Since removal began in 2001, abundance has been greatly reduced.
	Walleye	•Catches of walleye increased in the middle and lower Green Rivers beginning in 2010; specific fall and spring removal efforts started in 2014. •A walleye spawning bar was discovered in Dinosaur National Monument in 2015; will be targeted in 2016.
Yampa	Smallmouth bass	•Escapement from Elkhead Reservoir in the 1990's identified as source of basinwide infestation. •Removal actions ramped up through the 2000's and now focus on disrupting in-river reproduction. •A net to prevent escapement from Elkhead Reservoir will be installed in 2016.
	Northern pike	•Removal actions focus on disrupting in-river reproduction and preventing reservoir escapement. •Large numbers of pike were removed before they could spawn in 2014 and 2015; young pike now outnumber large adults.
White River	Smallmouth bass	•This location is the most recent expansion of this species. Removal began in 2012. •The relatively intact native fish community in this river must be protected from smallmouth bass.
San Juan	Channel catfish	•Intensive removal began in 2000. In the reaches with the longest period of nonnative removal effort, juvenile and adult channel catfish have significantly declined.
	Common carp	•Removal since 2001 has reduced the number of carp in the river. •Colorado pikeminnow and razorback sucker now outnumber common carp.



Fish Illustration © Joseph R. Tomelleri

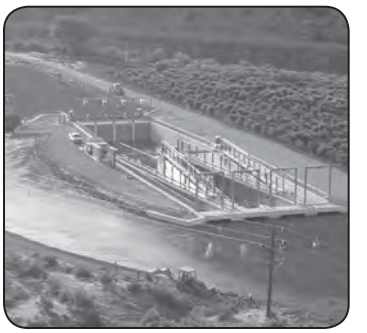
Capital Projects Restore Endangered Fish Habitat

The recovery programs work cooperatively with American Indian tribes, water and power customers, and local landowners to improve endangered fish habitat. Habitat restoration and maintenance includes reconnecting fragmented river reaches through construction and operation of fish passages at irrigation diversion dams; preventing fish from entering and becoming trapped in irrigation diversion canals through construction and operation of fish screens; and acquisition, restoration, and management of floodplain habitat to serve primarily as fish nursery areas.

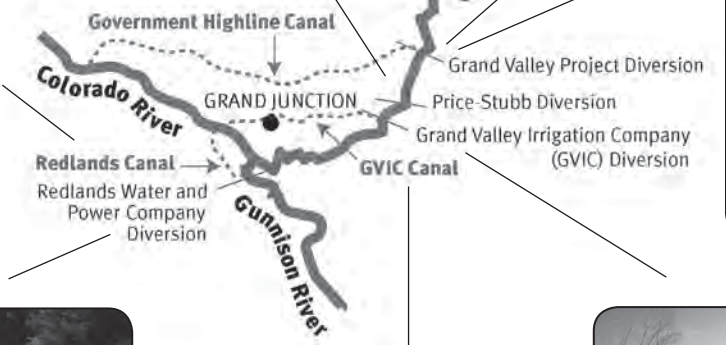
Price-Stubb Fish Passage, 2008

Grand Valley Project Fish Passage, 2004

Redlands Fish Screen, 2005



Grand Valley Project Fish Screen, 2007



Redlands Fish Passage, 1996

GVIC Fish Screen, 2002

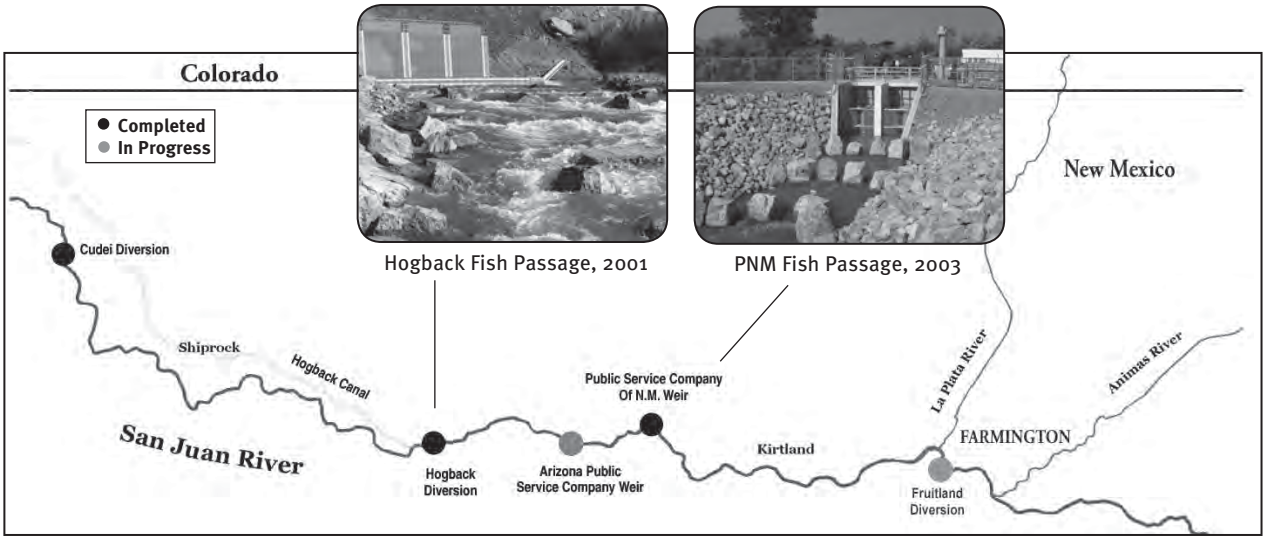
GVIC Fish Passage, 1998

The majority of the Upper Colorado Program's construction projects needed to recover the endangered fishes are complete *(dates shown above)*. Located in western Colorado, these fish passages and screens contribute to unimpeded access to approximately 340 miles of designated critical habitat in the Colorado and Gunnison rivers. The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), along with state and local partners, began rehabilitating the Tusher Wash Diversion Dam on the Green River in eastern Utah in the winter of 2015. The Upper Colorado Program is working with local water users to design a barrier to prevent endangered fishes from entering and becoming trapped in the Green River Company Canal on the western side of the Tusher Diversion.

Photo by K. McAbee, U.S. Fish and Wildlife Service

Johnson Bottom still holding water in September 2015

Green River: Johnson Bottom Wetland Enhancement Project To provide additional habitat for young razorback sucker under the Larval Trigger Study Plan (page 20), the U.S. Fish and Wildlife Service (USFWS) completed a wetland enhancement project at Johnson Bottom on the Ouray Refuge in spring 2015. Sampling in summer 2015 documented 115 juvenile razorback sucker. Additional suitable nursery habitat was provided for razorback sucker. This project was funded by USFWS under the Cooperative Recovery Initiative program, which emphasizes recovery of endangered species on National Wildlife Refuge properties.



As part the upcoming rehabilitation of Fruitland Diversion, the renovated structure will include upstream and downstream fish passage and a fish weir to prevent fish entrainment. The need for additional fish passages and weirs at other diversion structures along the San Juan and Animas rivers is being evaluated.

Photo by U.S. Fish and Wildlife Service

Hogback Fish Weir – In 2013, a weir wall was installed at the Hogback Diversion Dam on the San Juan River near Shiprock, NM to prevent endangered fish from getting trapped in the irrigation canal. Preliminary tests show that the weir successfully diverted 88.8% of stocked Colorado pikeminnow and razorback sucker back to the river. A full test of the weir during the entire irrigation season will be conducted using various ages and species of fish to further determine the effectiveness of the fish weir at keeping fish out of the canal.

Photo by the Nature Conservancy

Habitat Restoration –The Nature Conservancy, with assistance from the San Juan Program, restored several backwaters and side channels. This work, completed in 2011 and 2014, will help recover endangered species by increasing channel complexity and improving habitat conditions. The San Juan Program is monitoring the restored sites for fish use, persistence, functionality, and reestablishment of nonnative vegetation.

Status of Endangered Fishes

The recovery programs monitor reproduction, growth, survival, and abundance of endangered fishes in the wild. Results are used to track progress toward achieving recovery goals and to assess the effectiveness of management actions.

The core of the U.S. Fish and Wildlife Service's recovery goals for each species is achieving a sufficient number and size of self-sustaining populations that will persist. To achieve this, wild or re-introduced adults must survive and reproduce. Recruitment of young fish into the adult population must then maintain the minimum population level (demographic criteria) identified in the recovery goals *(see page 6)*.

COLORADO PIKEMINNOW *(Ptychocheilus lucius)*

Photo by Colorado Parks and Wildlife

Danielle Tremblay, CPW, holds a Colorado pikeminnow collected on the Colorado River near Grand Junction, CO.

Upper Colorado Program

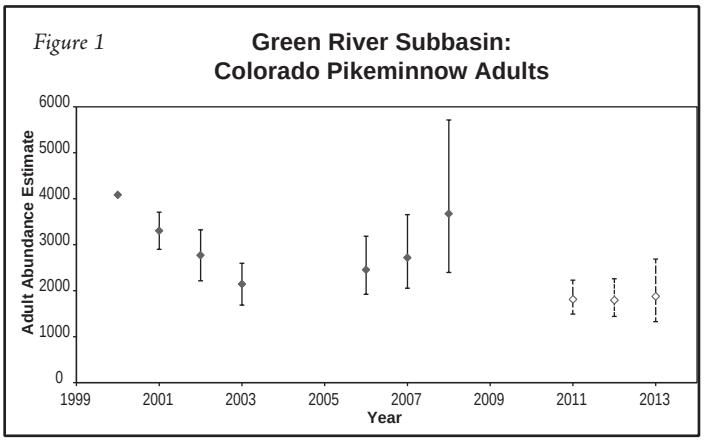
◆ Wild Colorado pikeminnow populations occur in the Green and Colorado river sub-basins of the Upper Colorado River.

✦ The population in the Green River is the largest *(Figure 1; estimates for 2011-2013 are preliminary)*. The Service's current downlisting criteria for this sub-basin is 2,600 adults, but they are re-evaluating recent survival estimates to determine if revision of that criteria is necessary.

✦ The adult population in the Colorado River sub-basin is smaller than the Green River population *(Figure 2; estimates for 2013 and 2014 are preliminary)*.

✦ In 2015, 1331 young-of-year (YOY) were collected from Colorado River backwaters. This was the highest catch in this reach of river in 30 years. Encouraging numbers were seen in the middle and lower Green rivers as well, yielding 202 YOY and 461 YOY, respectfully.

Figure 1



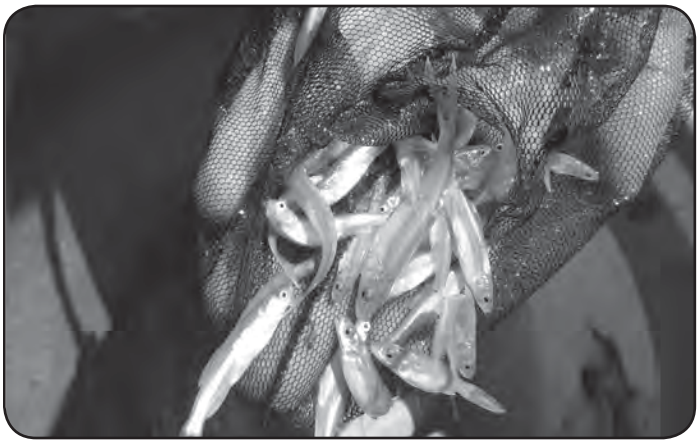
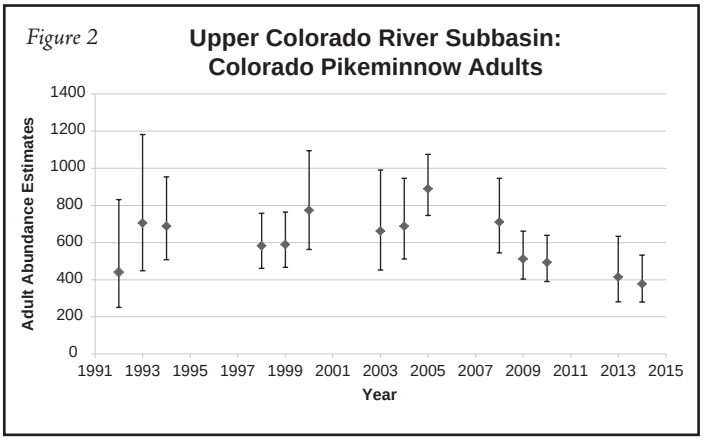


Photo by Melissa Trammell, National Park Service

Young-of-year pikeminnow collected from a seine haul in the middle Green River.

Figure 2



San Juan Program

◆ Colorado pikeminnow are being reestablished in the San Juan River.

• Over the last six years, 2,644,903 age-0 Colorado pikeminnow have been stocked into the San Juan River.

• Annual monitoring efforts document that stocked fish are persisting in the San Juan River *(Figure 3)*.

• A record high number (n=312) of wild-produced Colorado pikeminnow larvae were captured in 2014! Only 58 larvae had been captured in the previous 20 years of sampling.

• The San Juan Program is restoring secondary channels along the river to increase the amount of low velocity nursery habitats for young pikeminnow. Nonnative vegetation along the shoreline must be removed if these restored habitats are to function naturally and persist into the future.

Figure 3

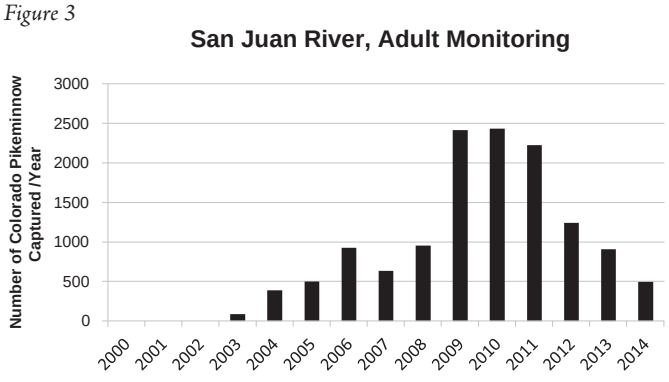


Photo by U.S. Fish and Wildlife Service

More than 30,000 bonytail are stocked each year in the Green and Colorado rivers.

Photo by Michael Akland, U.S. Fish and Wildlife Service

Healthy young Colorado pikeminnow.

BONYTAIL *(Gila elegans)*

Upper Colorado Program

◆ Stocking continues to reestablish populations in the Upper Colorado River Basin. When the Upper Colorado Program was established, bonytail had essentially disappeared and little was known of its habitat requirements. Key to bonytail recovery is research and monitoring of stocked fish to determine life history needs.

• Survival of stocked bonytail is low. Biologists are testing different stocking times and growing hatchery fish larger.

• A total of 106 individual bonytail (151 – 358 mm TL) was collected during Colorado pikeminnow abundance estimate sampling on the Colorado River in 2015. Thirteen, or 12%, have been in the wild for more than a year.

Upper Colorado Program's Performance to Meet Annual Bonytail Stocking Goals (%)

	Green River	Colorado/Gunnison River
2011	201%	180%
2012	52%[1]	102%
2013[2]	30%[2]	108%
2014	127%	138%
2015	145%	122%

Shaded cells indicate years when the stocking goal was not met (i.e., <100%).

[1] This 2012 group of fish were <10 inches total length and were transferred to Ouray National Fish Hatchery – Randlett Unit, to grow over winter and were stocked in 2013.

[2] In 2013 some bonytail were held in a hatchery longer to achieve the 10-inch size.

◆ When the recovery programs were established, numbers of wild razorback sucker had diminished to a few hundred adults in the Green River system and were considered lost from the Upper Colorado and San Juan rivers. Hatchery-produced fish are being stocked to reestablish the species in the wild. Preferred habitat is being restored via flow and floodplain management, and nonnative predator control.

✦ The recovery programs are revising stocking strategies to incorporate recent stocked fish survival information. New data indicates that fall is the best time to stock and that fish should be at least 12 inches in length.

Programs' Performance to Meet Annual Razorback Sucker Stocking Goals (%)

	Green River	Colorado/Gunnison Rivers	San Juan River
2011	109%	121%	165%
2012	108%	106%	118%
2013	53%[1]	101%	135%
2014	110%	109%	54%[3]
2015	98%	53%[2]	35%[3]

Shaded cells indicate years when stocking goal was not met (i.e., <100%).

[1] The Upper Basin stocking strategy is being changed to shift some production from razorback sucker to bonytail.

[2] Parasitic outbreak limited production.

[3] Annual stocking target of 11,400 was not met in 2014 and 2015 but the long-term target of 91,200 from 2009-2015 was exceeded.

Figure 4

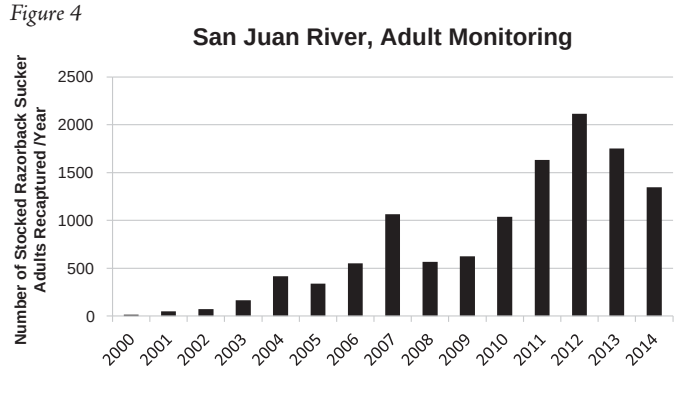
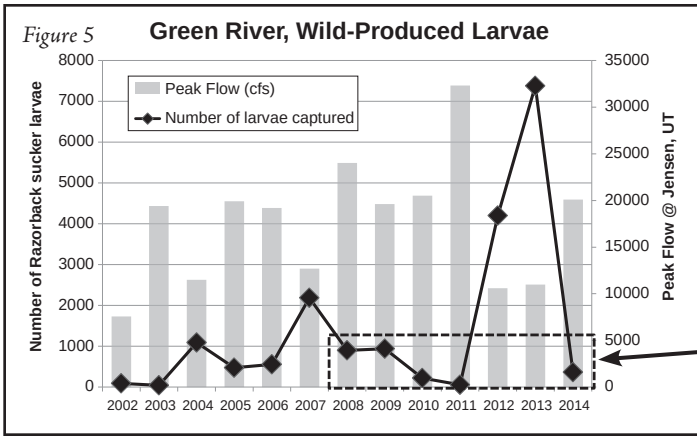


Figure 5



✦ Fish stocked in the Green, Colorado, and San Juan rivers *(Figure 4)* are recaptured in reproductive condition and often in spawning groups. Captures of wild-produced larvae in the Green *(Figure 5)*, Gunnison, Colorado, and San Juan rivers document that the stocked fish are spawning.

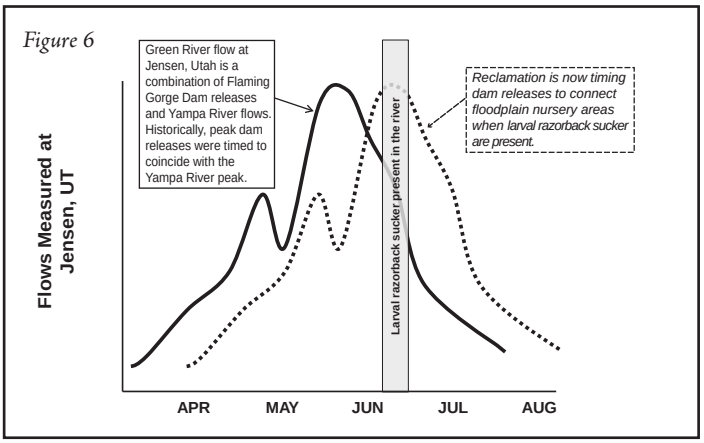
✦ In 2015, antennas placed on a known spawning bar in the middle Green River in Dinosaur National Monument in northeast Utah detected 584 razorback sucker. The majority of these were stocked in 2010 and 2011, but a few were stocked as long ago as 2004. Submersible antennas used near the Green and Yampa River confluence detected 10 razorback sucker, more than captured in the Yampa River in the past 20 years.

✦ Wild-produced juveniles were captured for the first time in the Green and Colorado rivers in 2013 and in the San Juan River in 2014.

✦ The Upper Colorado Program and the Bureau of Reclamation continue to adjust the timing of spring releases from Flaming Gorge Dam to connect floodplain habitats – important nursery habitat for larval razorback sucker *(Figure 6)*. In September, Utah researchers released 87 young of the year razorback sucker from Stewart Lake – some had grown more than 6 inches over the summer.

✦ Hundreds of razorback sucker are using transitional habitats at the inflows of both the Colorado and San Juan rivers into Lake Powell.

Figure 6



Larval sampling efficiency declines during wetter years because of large amounts of available habitat.

Photo by M. McKinstry, Reclamation

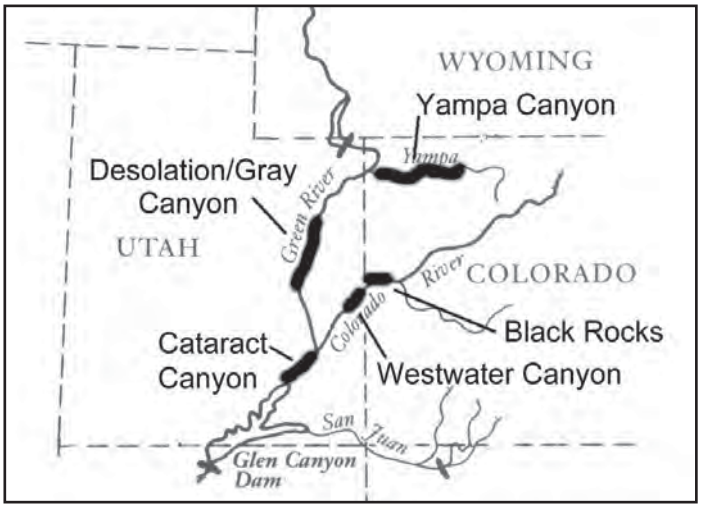
Biologists deploy a submersible PIT tag antenna at the waterfall that separates the San Juan River from Lake Powell. Wild razorback sucker populations have been found in Lake Powell.

Photo by U.S. Fish and Wildlife Service

Close up of a razorback sucker captured in the San Juan River.

HUMPBACK CHUB (*Gila cypha*)

◆ Five wild populations inhabit canyon-bound sections of the Colorado, Green, and Yampa rivers. Downward trends in some populations (particularly Yampa Canyon) have been attributed to increased abundance of nonnative fish and habitat changes associated with extended periods of drought.



Locations of the five humpback chub populations in the Upper Basin.

✦ In 2014, biologists resumed humpback chub population estimation in Desolation and Gray canyons in the Green River. These contiguous canyons provide ~45 river miles of occupied habitat. Biologists sample <20% of the available habitat each sampling season and then extrapolate those results to estimate overall population size. Although adult humpback chub survival and catch rates appear relatively stable for the past 15 years, juvenile survival rates are low.

✦ The strongest population in the Upper Colorado River Basin consists of two groups in Black Rocks and nearby Westwater Canyon (*Figure 7*). Both populations experienced declines about 15 years ago, but have remained relatively stable since. Population estimation, scheduled to resume in 2015, was delayed until 2016 to devote more effort to nonnative predator (walleye) control in the lower Colorado River.

✦ The humpback chub population in Cataract Canyon is small, but appears to be stable.

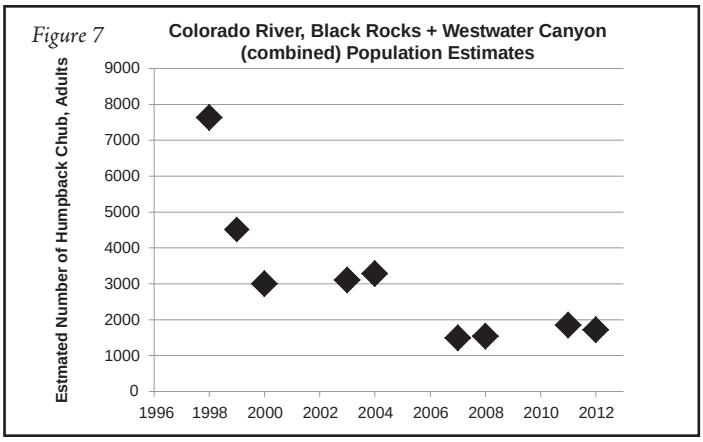
✦ Humpback chub in Yampa Canyon have never been common, but now are extremely rare. The Upper Colorado Program is developing an upper basin humpback chub brood stock to augment the population in Yampa Canyon if deemed necessary in the future.

✦ The U.S. Fish and Wildlife Service convened a recovery team to begin revising the Humpback Chub Recovery Plan in 2015.

Photo by Melissa Trammell, National Park Service

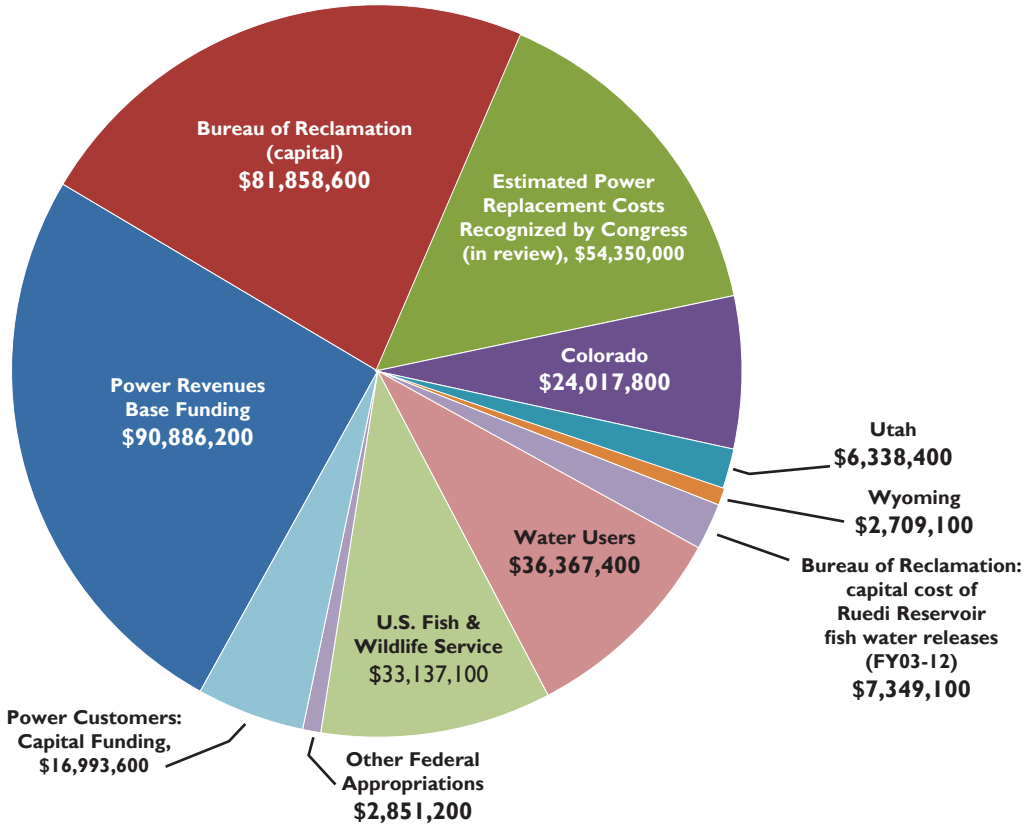
Humpback chub with tubercles (raised bumps on the head indicating reproductive condition), caught in the Colorado River.

Figure 7

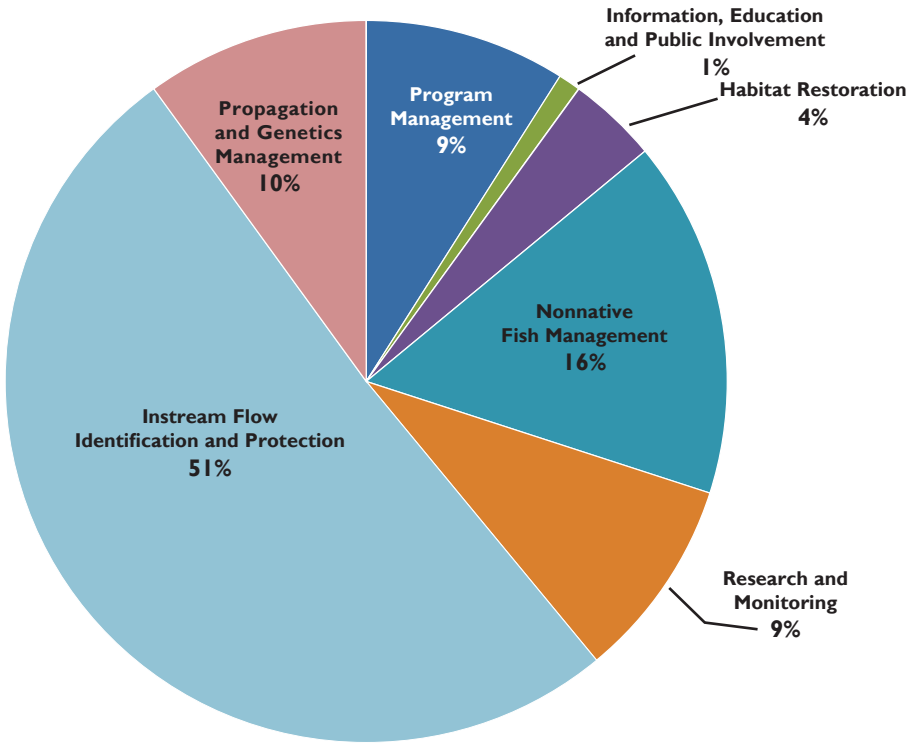


Expenditures
Upper Colorado River Endangered Fish Recovery Program

Total Partner Contributions = $356,858,500 (FY 1989-2016)



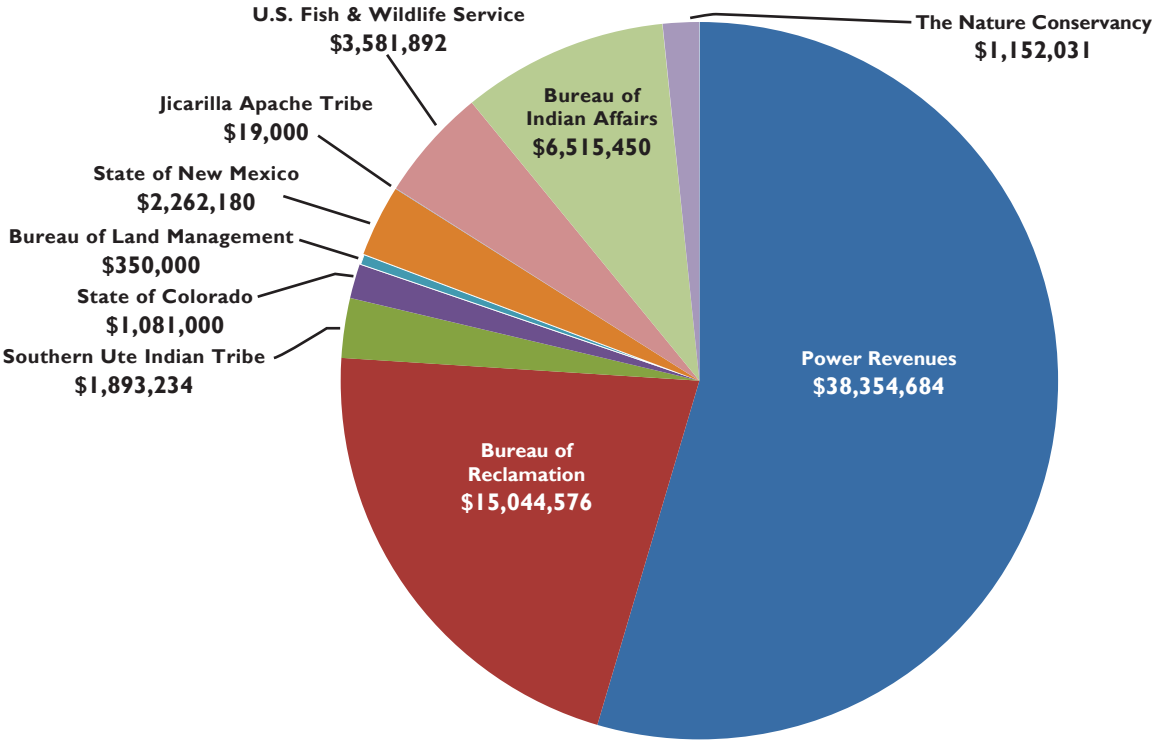
Projected Expenditures by Category (FY 2016 only)



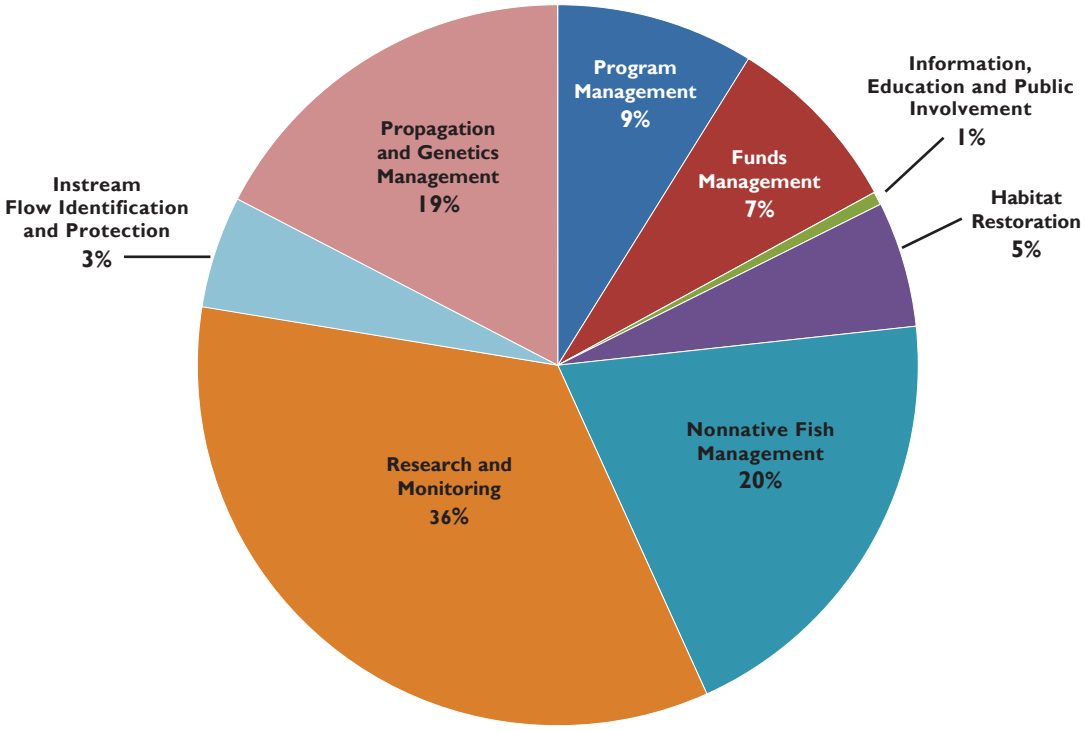
Expenditures
San Juan River Basin Recovery Implementation Program

Total Partner Contributions = $70,254,047 (FY 1992-2016)

(Not including in-kind contributions)



Projected Expenditures by Category (FY 2016 only)



Cost-Sharing Commitments and Power Revenues Support Species Recovery

Continuing the recovery programs' success requires funding to implement recovery actions. Public Law 112-270 (January 2013) extended annual funding at currently authorized levels through FY 2019. Capital funding has paid for extensive construction projects built with substantial non-federal cost-sharing (states' funds and Colorado River Storage Project power revenues) and federal appropriations.

ANNUAL FUNDS

P.L. 112-270 extended the funding authorization through fiscal year 2019. The programs may expend up to $6 million of Colorado River Storage Project (CRSP) power revenues per year (adjusted annually for inflation) for facility operation and maintenance expenses, endangered fish population and habitat monitoring, and critically important nonnative fish management, public involvement, and program administration.

The states, USFWS, water users and CRSP power customers contribute annual funding to both programs each year.

CAPITAL FUNDS

P.L. 106-392, as amended, authorizes the Bureau of Reclamation to cost-share capital construction projects. Water users, CRSP power customers, and the states of Colorado, New Mexico, Utah, and Wyoming have provided significant non-federal cost-sharing funds.

Capital funds have been used to construct hatchery facilities *(see page 8)***, fish passages and screens** *(see pages 16-17)***; complete water acquisition projects** *(see page 9)***; and restore floodplain habitat.**

Power Revenues Cost-Share

$17 million of CRSP power revenues have been expended for capital construction projects. Consistent with P.L. 106-392, as amended, these revenues were treated as a non-federal contribution and as reimbursable costs assigned to power for repayment under Section 5 of the CRSP Act.

States Cost-Share ($17 Million)

- **Colorado's** Legislature created a Native Species Conservation Trust Fund in 2000. Its "Species Conservation Eligibility List" is annually funded by a joint resolution of the State's General Assembly.

- **New Mexico's** Legislature appropriated funds into the State's "operating reserve," thus making them available at any time and not tied to a specific calendar year. Application of the funds is subject to approval by the New Mexico Interstate Stream Commission.

- **Utah's** 1997 Legislature created a Species Protection Account within the General Fund which receives Brine Shrimp Royalty Act-created revenue. In 2000, Utah dedicated one-sixteenth of a one cent general sales tax to water development projects and directed funding to the Upper Colorado Program.

- **Wyoming's** Legislature appropriated its funding share during their 1998 and 1999 sessions.

Capital Construction Cost-Sharing for Upper Colorado and San Juan Programs

Upper Colorado Recovery Program . . . . . $179 million
San Juan Recovery Program. . . . . $30 million
Total **$209 million***

***Sources of Revenue**

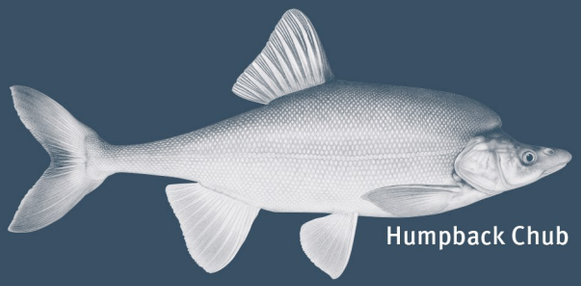
Federal	Non-Federal	
	Power Revenues:	$17 million
	States:	$17 million
	Water and Power:	$87 million**
		$121 million
Congress (Approps. in USBR's budget):		**$88 million**
	Total Revenue	**$209 million**

Capital Project Cost-Sharing by the States

	Total Amount	Upper Colorado Program	San Juan Program
Colorado	$9.15 M	$8.07 M	$1.08 M
New Mexico	2.74 M	None	2.74 M
Utah	3.42 M	3.42 M	None
Wyoming	1.69 M	1.69 M	None
Total	**$17.00 M**	**$13.18 M**	**$3.82 M**

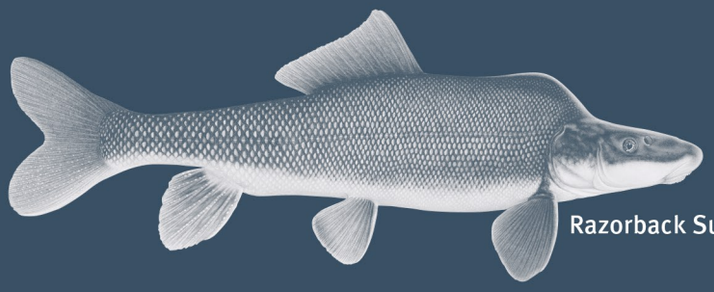
** Contributions by water and power customers are recognized and credited as cost-sharing towards recovery in Section 3(c)(4) of P.L. 106-392. These costs have included water provided from Wolford Mountain Reservoir and the Elkhead Reservoir enlargement and costs of replacement power purchased due to modifying the operation of the Colorado River Storage Project.

ColoradoRiverRecovery.org

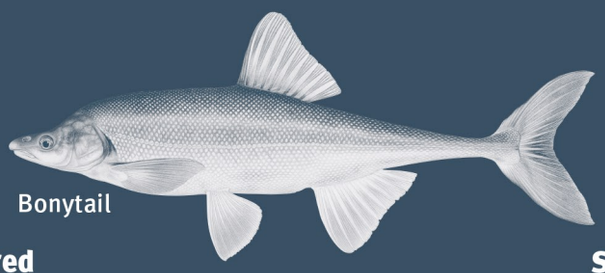


Humpback Chub

Colorado Pikeminnow



Razorback Sucker



Bonytail

southwest.fws.gov/sjrip

Upper Colorado River Endangered Fish Recovery Program Partners:

State of Colorado
State of Utah
State of Wyoming
Bureau of Reclamation
Colorado River Energy Distributors Association
Colorado Water Congress
National Park Service
The Nature Conservancy
U.S. Fish and Wildlife Service
Utah Water Users Association
Western Area Power Administration
Western Resource Advocates
Wyoming Water Association

Upper Colorado River Endangered
Fish Recovery Program
P.O. Box 25486, DFC
Denver, CO 80225
303-236-9881
303-236-8739 Fax
ColoradoRiverRecovery.org

San Juan River Basin Recovery Implementation Program Partners:

State of Colorado
State of New Mexico
Jicarilla Apache Nation
Navajo Nation
Southern Ute Indian Tribe
Ute Mountain Ute Tribe
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
The Nature Conservancy
U.S. Fish and Wildlife Service
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