Upper Colorado River Endangered Fish Recovery Program

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

Highlights 2013-2014

San Juan River Basin Recovery Implementation Program

- The Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program (recovery programs) use innovative, cost-effective measures to recover four species of endangered Colorado River fishes. At the same time, water and hydropower resources are being managed within state and federal laws and tribal rights to meet the needs of people in growing western communities.

- The Programs' partners represent state and federal agencies, water and environmental organizations, power customers, and American Indian tribes. These diverse interests continue to demonstrate that working cooperatively produces far greater results than independent efforts and minimizes conflicts such as lawsuits over water use.

- The recovery programs provide Endangered Species Act compliance for 2,391 federal, tribal, and non-federal water projects.

- The recovery programs use adaptive management to evaluate and revise management actions as new information becomes available.

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. All fish illustrations © Joseph Tomelleri*

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

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

Creed Clayton, a U.S. Fish and Wildlife Service biologist, and his son, Conor, look after fish used for community outreach during the 2012 Children's Water Festival.

Reaching Out to Local Communities

The recovery programs work proactively to ensure the public is informed about endangered fish recovery actions. Information is provided through news and social media, public meetings, interpretive exhibits, water festivals and other events, newsletters, fact sheets, and web sites.

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

The Upper Colorado River Endangered Fish Recovery and San Juan River Basin Recovery Implementation Programs have a broad range of partners that includes state and federal agencies, water development interests, power customers, American Indian tribes, and environmental organizations. Partners have made long-term commitments to set aside individual interests and work collaboratively to create innovative solutions, helping to achieve the recovery programs' goals of species recovery while water development occurs.

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

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 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.

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

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

"In the Upper Colorado River Program, much progress has also been made ... in protecting the endangered fish in the Upper Colorado River through significant habitat improvements."

Ken Salazar, Secretary of the Interior, 2012

"Our recovery programs in the Colorado River are wonderful examples of successful partnerships ... These restoration projects also benefit local economies, and they create jobs."

Anne Castle, Assistant Secretary for Water and Science, 2011

"The Upper Colorado program has become a national model for recovering endangered species while addressing the demand for water development to support growing western communities."

Gale Norton, Secretary of the Interior, 2005

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 2,391 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 12/31/2013

		Historical Depletions	New Depletions	Total
State	**Number of Projects**	**Acre-Feet/Yr**	**Acre-Feet/Yr**	**Acre-Feet/Yr**
Colorado	1190	1,915,681	206,616	2,122,297
Utah	233	517,670	97,049	614,719
Wyoming	388	83,498	35,644	119,142
CO/UT/WY	238*	(Regional)	(Regional)	
Total	**2,049**	**2,516,849**	**339,309**	**2,856,158**

*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 12/31/2013

State	Number of Consultations	Depletions Acre-Feet/Yr
New Mexico	21	653,753
Colorado	306	217,845
Utah	15	9,311
Total	**342**	**880,909**

Photo courtesy Bureau of Reclamation

Flaming Gorge Dam.

Hydroelectric power produced by the Flaming Gorge Dam help meet the power needs of the West.

Photo courtesy Bureau of Reclamation

Aerial View of Navajo Dam and Reservoir.

The Navajo Dam is located on the San Juan River in New Mexico. Navajo Reservoir extends 35 miles up the San Juan River.

The Programs Rely on Recovery Goals to Guide Management 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[1] 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	**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 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, 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, 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 extant 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

[1]**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 fishes 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. What follows is a summary of population status, major recovery accomplishments to date, and significant challenges that remain.

Colorado pikeminnow: The population of adult Colorado pikeminnow in the Colorado River sub-basin averaged 658 individuals (1992 – 2010; next set of population estimates began in 2013). The USFWS' criteria for downlisitng this population is >700. The population in the Green River sub-basin averaged 2,843 individuals (2001 – 2008). Unfortunately, the most recent Green River sub-basin population estimates indicate that the population declined from 2011 through 2013. The USFWS' criteria for downlisitng this population is >2,600. Stocked pikeminnow are surviving and reproducing in the San Juan River *(see page 9)*.
Major accomplishments – 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 hatchery-reintroduction program occurs in the San Juan River; management of nonnative competitors has been underway for 10+ years.
Remaining challenges – nonnative northern pike outnumber Colorado pikeminnow 3:1 in the Yampa River in northwestern Colorado. More effective management of nonnative fishes and a positive upturn in the Green River population must occur before the USFWS will consider a change in ESA listing status.

Humpback chub: The Upper Basin "core" population, which consists of adult humpback chub in Black Rocks and Westwater Canyons has averaged 2,562 individuals since 1999. The USFWS' criteria for downlisting a core population is >2,100. However, this core adult population has been below 2,100 since 2004. The Lower Basin core population (Grand Canyon) greatly exceeds current demographic criteria.
Major accomplishments – flows managed to benefit most populations; nonnative fish management actions benefit populations in Green River sub-basin.
Remaining challenges – further study needed to understand declines in Upper Basin populations that occurred in the early 2000s.

Razorback sucker: The recovery programs have been stocking hatchery reared razorback sucker since 2004 to rebuild populations. Stocked fish are surviving and spawning, and wild produced juveniles were captured in 2013. The first population estimates for this species will be available in 2014.
Major accomplishments – recent advances in flow management to benefit larval survival; a small, but self-sustaining population occurs in Lake Mead.
Remaining challenges – all indications suggest that both programs are on a track to recovery.

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.
Major accomplishments – the Upper Colorado Program continues to refine hatchery techniques and stocking practices to improve survival. In recent years, deployment of remote sensing devices (stationary tag readers) is producing encouraging recapture information. Lower Basin researchers continue to stock in predator free, low velocity habitats.
Remaining challenges – continue to experiment with stocking practices and continue all other recovery actions.

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 (USFWS) 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)*

Service biologist, Tildon Jones, holds a Colorado pikeminnow captured in the Green River.

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)*. The current downlisting criteria for this sub-basin is 2,600 adults, but the criteria are being re-evaluated using recent survival estimates to determine if revision is necessary. The adult population in the Colorado River sub-basin is smaller *(Figure 2)*, but appears to be more stable.

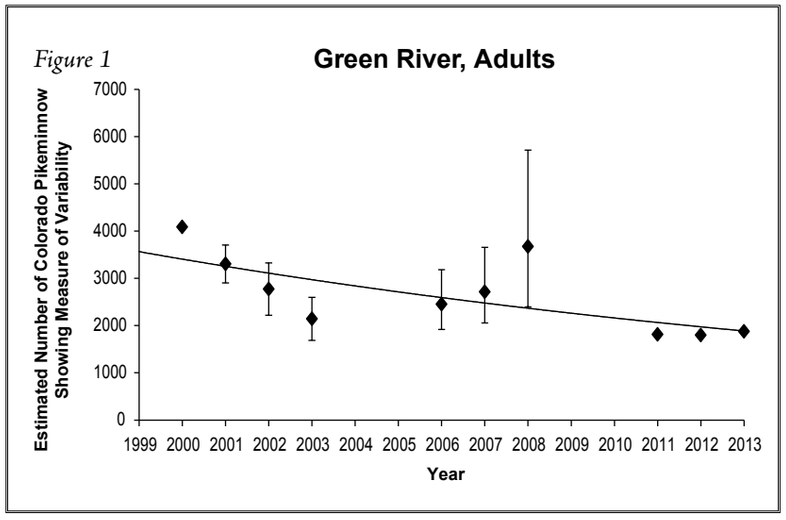
• Researchers are concerned that large nonnative predators are outcompeting Colorado pikeminnow and are the major cause for recent declines *(Figure 3)*.

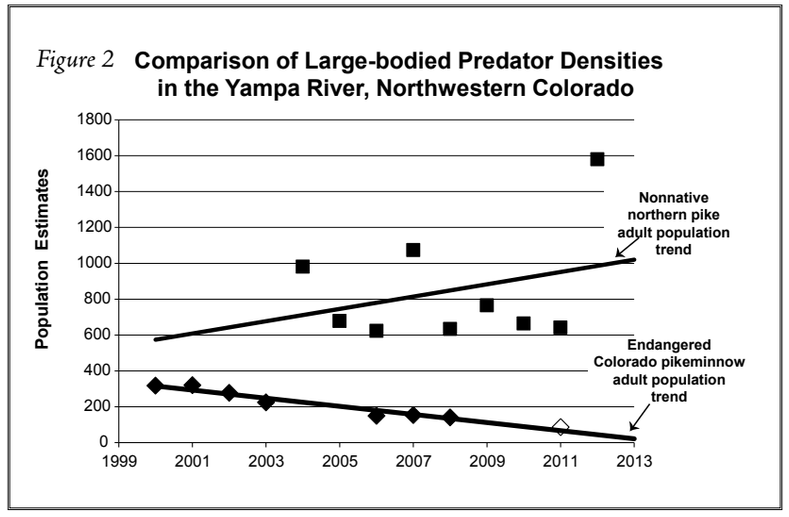
San Juan Program

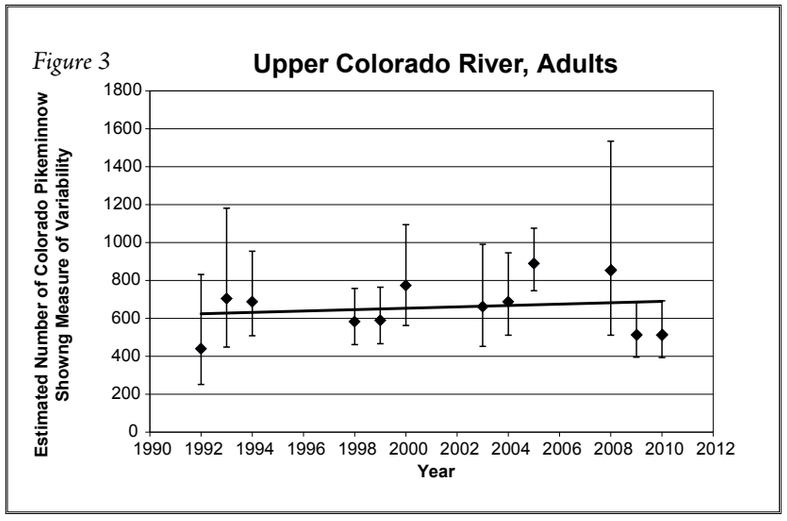
◆ Researchers are reestablishing a population of Colorado pikeminnow in the San Juan River. Stocking efforts have been very successful.

Photo courtesy UDWR

UDWR biologist, Adam Boehm with a Colorado Pikeminnow on the White River.







• Over the last five years, 1,944,212 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 4)*.

• Colorado pikeminnow larvae have been detected infrequently in low numbers since 1993.

• Researchers believe removal of nonnative riparian vegetation is needed to restore secondary channel habitat – nursery habitat for young pikeminnow.

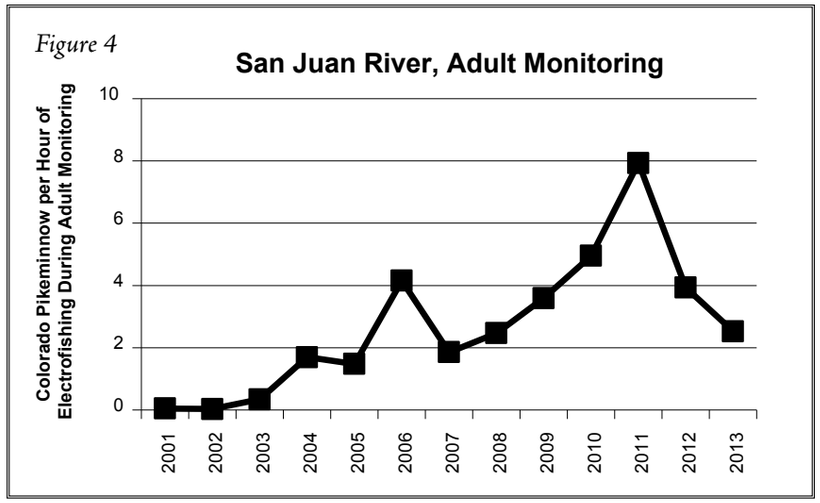


Photo by Charlie Card

Anglers are reporting the catch of more Colorado pikeminnow in the Green River below Flaming Gorge Dam in Utah.

Photo by Kevin Kappenman

More than 16,000 bonytail are stocked each year in the Green and Colorado rivers.

Bonytail are on display at the Downtown Aquarium, Denver, Colorado for Endangered Species Day.

BONYTAIL *(Gila elegans)*

Upper Colorado Program

◆ Stocking continues to reestablish populations in the Upper Colorado River Basin. When the Upper Colorado Program was established, the 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. Researchers are now experimenting with different stocking times and growing hatchery fish larger.

• All stocked fish receive an internal microchip tag before being released in the wild. Since 2009, increasing numbers of bonytail have been detected at locations throughout the Upper Colorado River Basin where stationary tag-reading antennas are used.

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

	Green River		Colorado/Gunnison River
	Middle	Lower	
2009	100%	101%	95%
2010	53%[1]	100%	46%[1]
2011	255%	147%	180%
2012	104%	0%[2]	102%
2013[3]	60%	0%	108%

Shaded cells indicate years when the stocking goal was not met (i.e., <100%).
[1] Approximately half of these bonytail scheduled for stocking in 2010 were held to ensure they were disease free – they were cleared for release in 2011.
[2] This 2012 group of fish were <10 inches total length and were transferred to Ouray National Fish Hatchery – Randlett Unit, for an overwinter study and were stocked in 2013.
[3] In 2013 some bonytail were held in a hatchery longer to achieve the 10-inch size. In 2014, three hatcheries are scheduled to stock 10,000 (10-inch) bonytail each, and another hatchery will produce 5,000 bonytail.

◆ When the recovery programs were established, wild razorback sucker had diminished to a few hundred adults in the Green River system and the species was considered lost from the Upper Colorado and San Juan rivers. Clearly, hatchery-produced fish would be needed to re-establish the species in the wild and preferred habitat would need to be restored via flow management and floodplain protection.

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

•Fish stocked in the Green, Colorado, and San Juan rivers are recaptured in reproductive condition and often in spawning groups *(Figure 5)*. Captures of larvae in the Green, Gunnison, Colorado, and San Juan rivers document reproduction *(Figure 6)*.

• For a second year, tag-reading antennas were placed on a spawning bar in the middle Green River near Dinosaur National Monument in northeast Utah. In 2013, 517 individual razorback sucker were detected, a ten-fold increase from 2012. These fish were stocked as early as 2000, and as late as 2011; for most of these fish (93%) this was their first detection since stocking.

•Wild produced juveniles were captured in the Green and Colorado rivers for the first time in 2013.

•The Upper Colorado Program is working with the Bureau of Reclamation to experiment with the timing of their spring releases from Flaming Gorge Dam to allow fish access to floodplain habitats – important nursery habitat for larval razorback sucker *(Figure 7)* – when larvae are present.

•Researchers have confirmed that razorback sucker stocked in the San Juan River have moved into Lake Powell after passing over a waterfall that formed at the interface between the river and lake during low-lake levels. Larval and adult life stages have been collected suggesting those fish are reproducing in the lake.

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

	Green River		Colorado/Gunnison River	San Juan River
	Middle	Lower		
2009	151%	51%[1]	181%	74%[2]
2010	110%	101%	100%	250%
2011	91%	126%	121%	165%
2012	113%	103%	106%	118%
2013[3]	106%	0%	101%	135%

Shaded cells indicate years when stocking goal was not met (i.e., <100%).
[1] Permit not in place for Ouray National Fish Hatchery - Grand Valley Unit to stock at Green River, Utah; therefore, fish were stocked into the Colorado and Gunnison rivers.
[2] 4,021 razorback sucker from this year class were held in the hatchery and stocked in 2010 to experiment with alternative stocking seasons.
[3] The Upper Basin stocking strategy is being changed to shift some production from razorback sucker to bonytail.

Figure 5

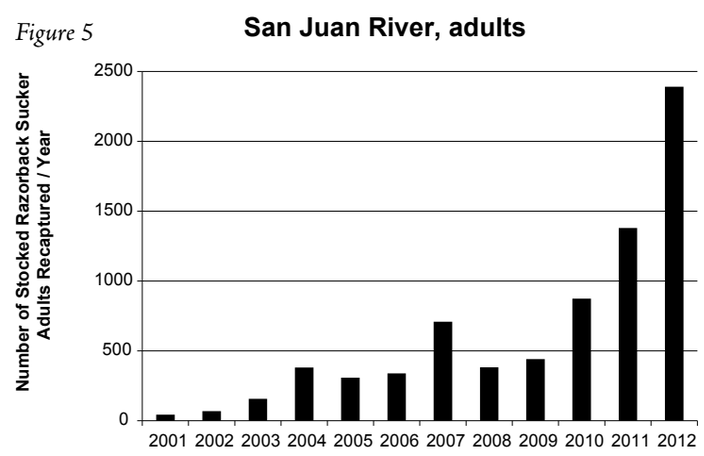


Photo courtesy UDWR

UDWR biologist, Brent Leite with a Razorback sucker on the middle Green River.

Figure 6

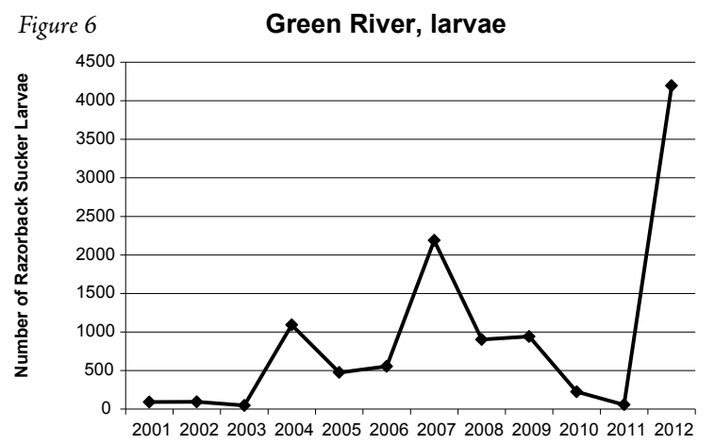
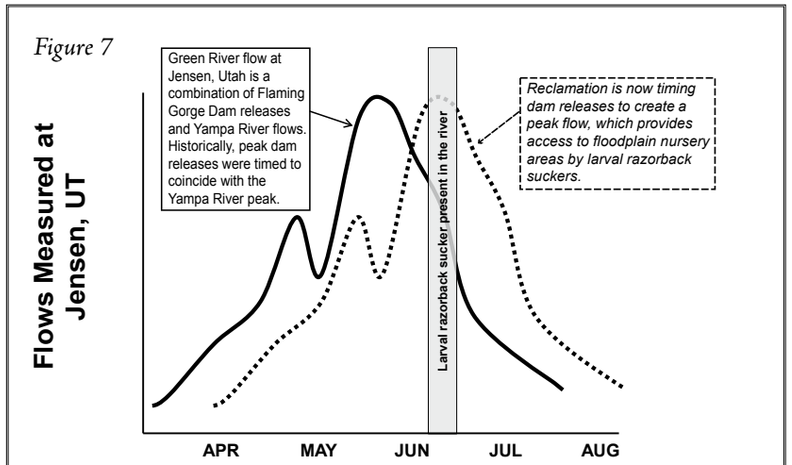


Figure 7



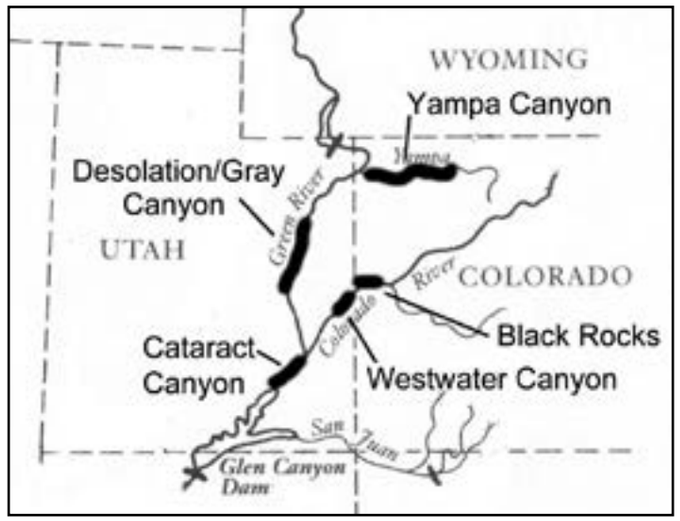
A waterfall formed at the confluence of the San Juan River and Lake Powell in 2003, preventing fish from moving upriver from the lake. During a brief period in July 2011, high lake levels inundated the waterfall. Subsequently, four razorback sucker tagged in Lake Powell were captured 180 miles upstream in the San Juan River. After the lake level receded in 2012, the waterfall reappeared as a barrier to upstream fish movement.

Wild-produced, juvenile razorback sucker were found for the first time in the Green and Colorado rivers in 2013.

USFWS Biologist Ben Schleicher captured this humpback chub in Black Rocks Canyon of the Colorado River in Colorado.

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 and in Desolation Canyon in the Green River) have been attributed to increased abundance of nonnative fish and habitat changes associated with low river flows.



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

•Concern over downward trends in the Yampa and Desolation Canyon populations caused the Upper Colorado Program to secure individuals from both these populations in the hatchery system. However, genetic analysis has indicated some hybridization has occurred with native roundtail chub. The Upper Colorado Program will find the purest fish to bring into captivity.

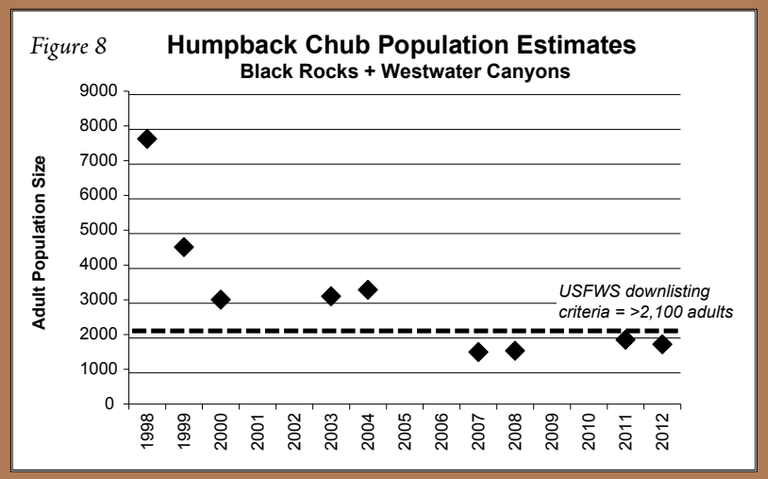
•The strongest population in the Upper Colorado River Basin consists of two groups in Black Rocks and Westwater Canyon *(Figure 8; depicts combined estimate)*. Both populations experienced declines about 10 years ago and have remained relatively stable since.

•Recent evidence of native chub reproduction may be due to a return to average hydrologic conditions from 2008 to 2011, coupled with ongoing native fish management.

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

•The USFWS will require sustained improvement (over the course of at least five years) in the other four Upper Basin populations before it will consider downlisting *(see page 6)*.

USFWS biologists Thomas Barnes and Benjamin Schleicher, holds humpback chubs caught at Black Rocks Canyon on the Colorado River.



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 9 and 10)*.

Facility, Location	River, Number Stocked in 2013 (Target Number)		
	Green	Colorado	San Juan
Bonytail (average size 8-inches)			
J.W. Mumma Native Aquatic Species Restoration Facility, Alamosa, CO	2,466 (2,665)	2,934 (2,665)	
Wahweap State Fish Hatchery, Big Water, UT[1]	6,037 (8,195)	0 (2,665)	
Razorback sucker (average size 12-inches)			
Ouray National Fish Hatchery - Randlett Unit, Vernal, UT[2]	10,606 (14,895)		
Ouray National Fish Hatchery - Grand Valley Unit, Grand Junction, CO[2]	0 (4,965)	10,061 (9,930)	
Navajo Agricultural Products Industry Ponds, Farmington, NM			6,243 (6,000)
Uvalde National Fish Hatchery, Uvalde, TX			9,119 (11,400)
Colorado pikeminnow (age-0 fingerlings)			
Southwest Native Aquatic Resources and Recovery Center, Dexter, NM			439,264 (400,000)

[1]The Upper Colorado Program is transitioning to stock more and larger (an average of 10-inch) bonytail. This required Wahweap hatchery personnel to hold fish for another growing season. The bonytail stocked in the Green River completed their hatchery growth at the Ouray National Fish Hatchery - Randlett Unit, Vernal, UT.
[2] The Upper Colorado Program is shifting some razorback sucker production to produce more bonytail.

Utah Division of Wildlife Resources Biologists Jessica Pierson (left) and Amber King captured this razorback sucker during monitoring in the San Juan arm of Lake Powell in 2012.

The Ouray National Fish Hatchery - Grand Valley Unit will be used to raise several endangered species.

A short video showing razorback sucker spawning at Ouray National Fish Hatchery-Grand Valley Unit.

• Three razorback sucker stocked near the Hogback diversion on the San Juan River were recaptured two to four years laterin 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 more cost-effective and efficient way to raise genetically-sound, endangered fish needed to achieve annual stocking goals.

*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

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 left)*, PBO Dec. 1999

Price River: minimum flows, Position Paper May 2012

Coordinated Water Releases (1997-2013) Benefit Endangered Fishes in the 15-Mile Reach in the Colorado River

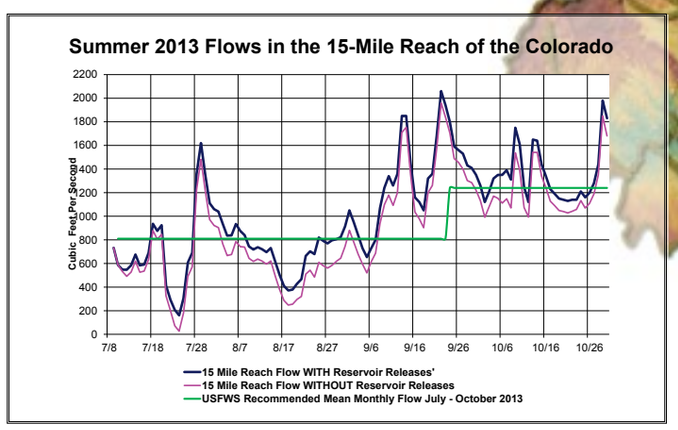
Reservoirs			Acre-Feet
Granby	43,871	Green Mtn	534,513
GVWM	113,692	Ruedi	301,750
Williams Fork	94,213	Willow Creek	9,853
Windy Gap	3,718	Wolford Mtn	143,616
		Total Ac-Ft:	**1,245,226**

Yampa: Elkhead Reservoir to manage baseflows, PBO Jan. 2005

White River: future Water Management Plan, PBO TBD

Aspinall Unit: assists to meet fish flows in Gunnison and Colorado Rivers, ROD May 2012

San Juan River: Navajo Reservoir releases to meet spring and baseflow target, ROD July 2006



Reservoirs

Critical Habitat

ROD = Record of Decision

PBO = Programmatic Biological Opinion

Capital Projects Important to Reconnect 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 "undoing" habitat fragmentation 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

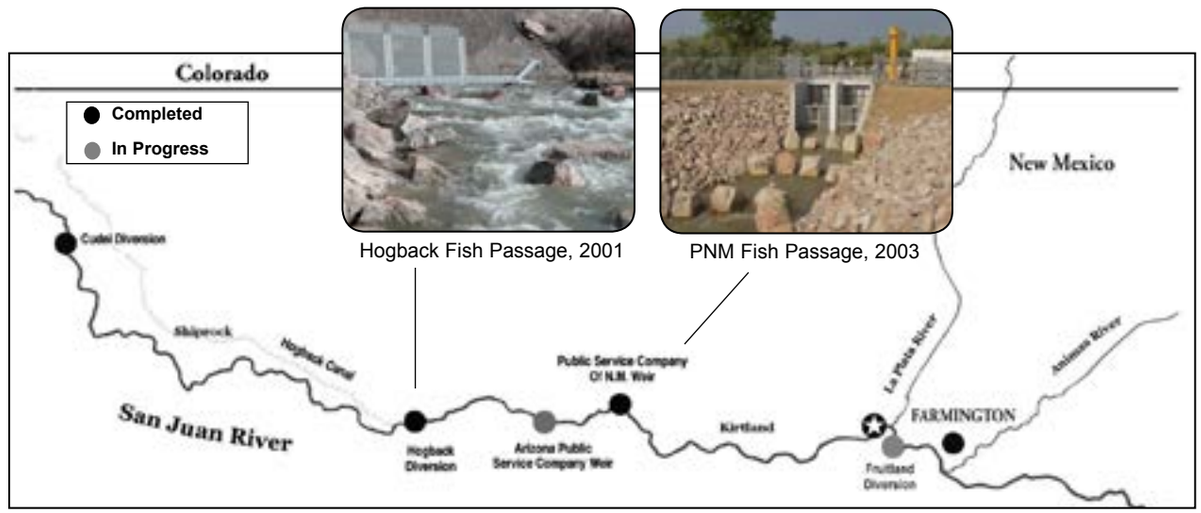
GVIC Fish Screen, 2002

GVIC Fish Passage, 1998

The majority of the Upper Colorado Program's construction projects needed to recover the endangered fishes are complete. 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) will rehabilitate the Tusher Wash Diversion Dam on the Green River in eastern Utah starting in the fall of 2014. The Upper Colorado Program will work with NRCS to install a barrier to prevent endangered fishes from entering and becoming trapped in the canal.

About 2,700 acres of restored floodplain habitat in the Upper Colorado River Basin are being managed for all life stages of endangered fish.

Construction of a barrier at the Tusher Wash Diversion Dam and Canal in eastern Utah is the last major capital project currently identified in the recovery goals for the Upper Colorado River system.



Hogback Fish Passage, 2001

PNM Fish Passage, 2003

Fish access has been restored to an additional 36 miles of critical habitat on the San Juan River with the construction of passages at the Public Service Company of New Mexico (PNM) Weir and the Hogback Diversion Dam, and removal of the Cudei Diversion Dam. The need for additional fish passages at Arizona Public Service Company and Fruitland irrigation diversion structures is being evaluated.

Navajo Engineering Construction Authority completed construction on a weir wall at the Hogback Diversion Dam on the San Juan River near Shiprock, New Mexico, in 2013. The fish weir will prevent endangered fish from getting trapped in the irrigation canal.

The Nature Conservancy (TNC) restored several backwater and side channels along the San Juan River in 2011 to assist in the recovery of endangered species by increasing channel complexity and improving habitat conditions. TNC will begin construction on additional restoration sites in 2014.

The San Juan Recovery Program will construct a passive integrated transponder (PIT) tag antenna at the Public Service Company of New Mexico fish passage facility and weir in 2014. The antenna will operate year-round to remotely detect and track the movement of PIT-tagged fish including Colorado pikeminnow and razorback sucker.

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 there were only 12 native species swimming in the Upper Colorado River and its tributaries – today they have been joined by ~50 nonnative species. The graphic below depicts the spread of a few of the most predaceous and invasive species through the life of the Program.

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

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

Legend

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

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 548 miles in four rivers. Some river reaches are sampled more than a dozen times annually. Similar sampling intensity is expended in 164 miles of the San Juan River.

Closeup of a walleye.

Melissa Trammell, National Park Service biologist, poses with a northern pike.

Photo courtesy UDWR

Smallmouth bass eating a native chub species.

Photo courtesy UDWR

Joe Skorupski with two smallmouth bass on the middle Green River.

River	Species	History and Current Status
Colorado (112 miles)	Smallmouth bass	•Increases in abundance first observed in 2003; removal began in 2004. •Strong year classes of smallmouth and largemouth bass produced in western Colorado's Grand Valley in 2012.
	Northern pike	•Additional northern pike were captured in the river near Rifle, Colorado, in 2012 and in a nearby gravel pit.
Green (198 miles)	Smallmouth bass	•Increases in abundance first observed in 2003; removal began in 2004. •Densities generally in decline, but increased slightly in some reaches in 2012. •Low flows in 2012 provided more time for spawning and growth.
	Northern pike	•Since removal began in 2001, abundance has been greatly reduced, however, the number of adults captured increased markedly in 2012.
Yampa (134 miles)	Smallmouth bass	•Increases in abundance first observed in 2001; removal began in 2004. •Little Yampa Canyon supports high densities of adult smallmouth bass, which need to be reduced by removal from adjacent river reaches and from Elkhead Reservoir in northwest Colorado. •Despite persistence of smallmouth bass in some areas, native fish continue to rebound.
	Northern pike	•Abundance steadily increased during the 1980s and 1990s; removal began in 1999. •Ongoing removal has shifted the size to smaller individuals, but densities remain excessive. •Future action – increased control efforts at upstream sources in river, floodplain, and reservoirs.
White River (104 miles)	Smallmouth bass	•Site of the most recent expansion of this species, which is a major concern because of the relatively intact native fish community in this river. •Greatest densities immediately downstream of Taylor Draw Dam.
San Juan (164 miles)	Channel Catfish	•Removal since 2001 has shifted channel catfish distribution and population structure. The population is now dominated by juveniles.
	Common carp	•Removal since 2001 has reduced abundance to a level where Colorado pikeminnow and razorback sucker now outnumber common carp.

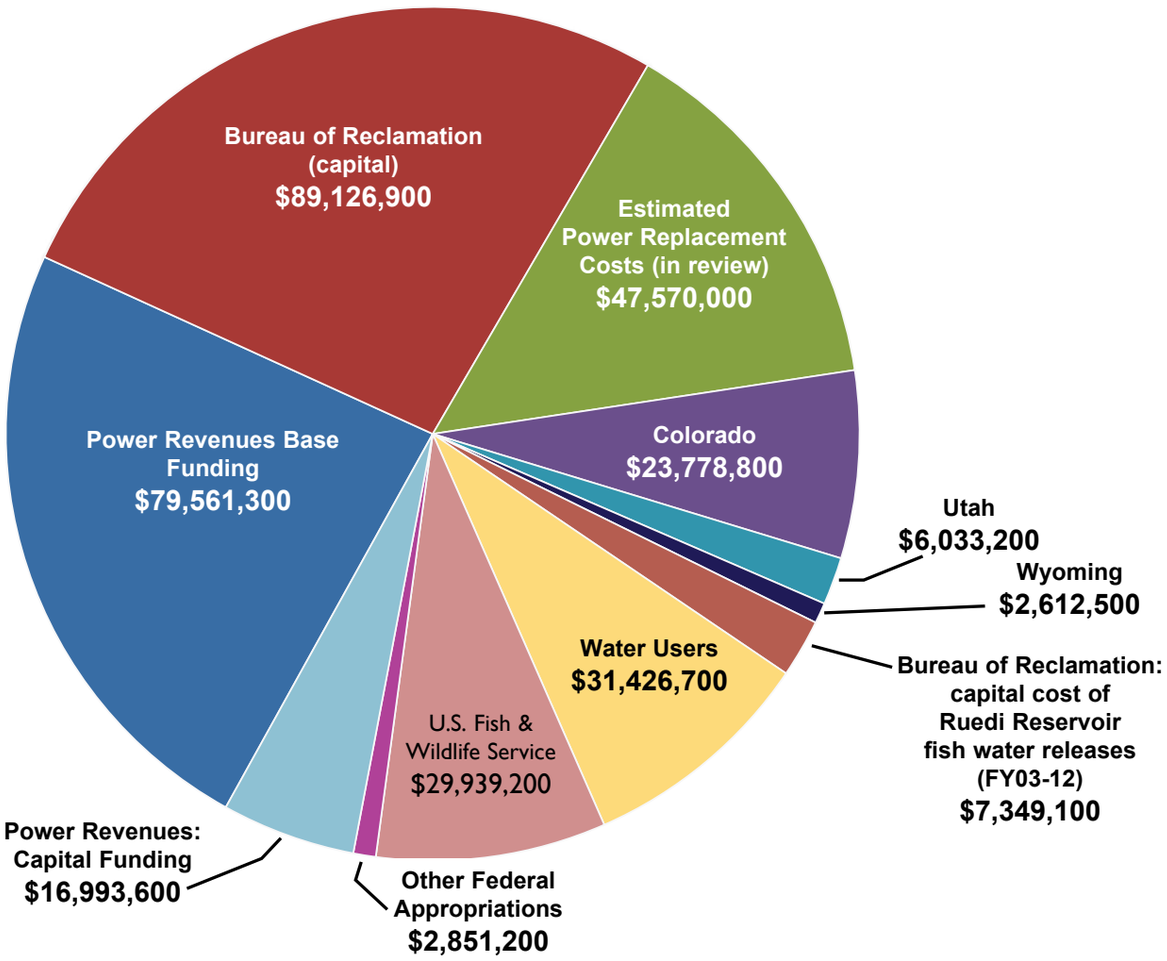
The Upper Basin States approved this Basinwide Strategy to increase the Upper Colorado Program's chances of successfully reducing the nonnative threat. That Strategy promotes:

- A coordinated position that several worst-of-the-worst species do not belong anywhere in the Upper Colorado River sub-basin; manage accordingly;
- Reducing the incidence of illegal introductions via changes in policy and regulation;
- Focusing control efforts on known sources (e.g spawning areas in upstream reservoirs and preferred riverine habitats);
- Experimenting with innovative techniques to contain and control nonnative predators;
- Conserving native species strongholds (e.g. the Gunnison and lower White rivers).

Expenditures
Upper Colorado River Endangered Fish Recovery Program

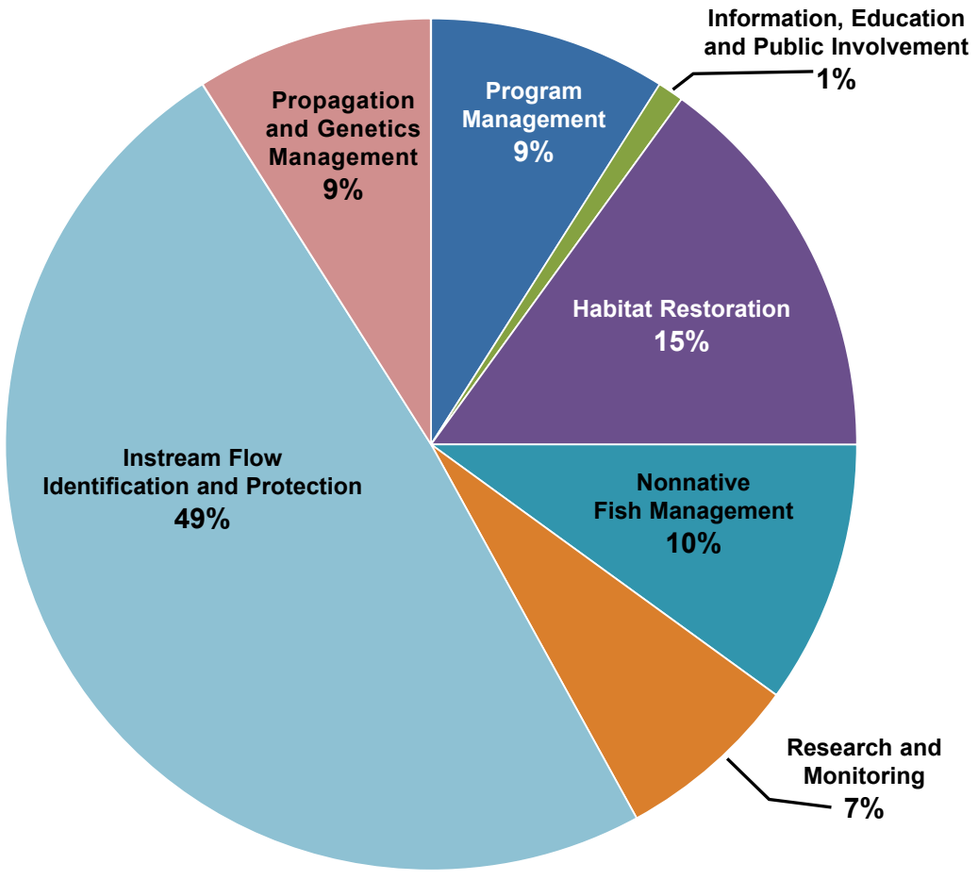
Total Partner Contributions = $337,242,300

(FY 1989-2014)



Projected Expenditures by Category

(FY 2014 only)

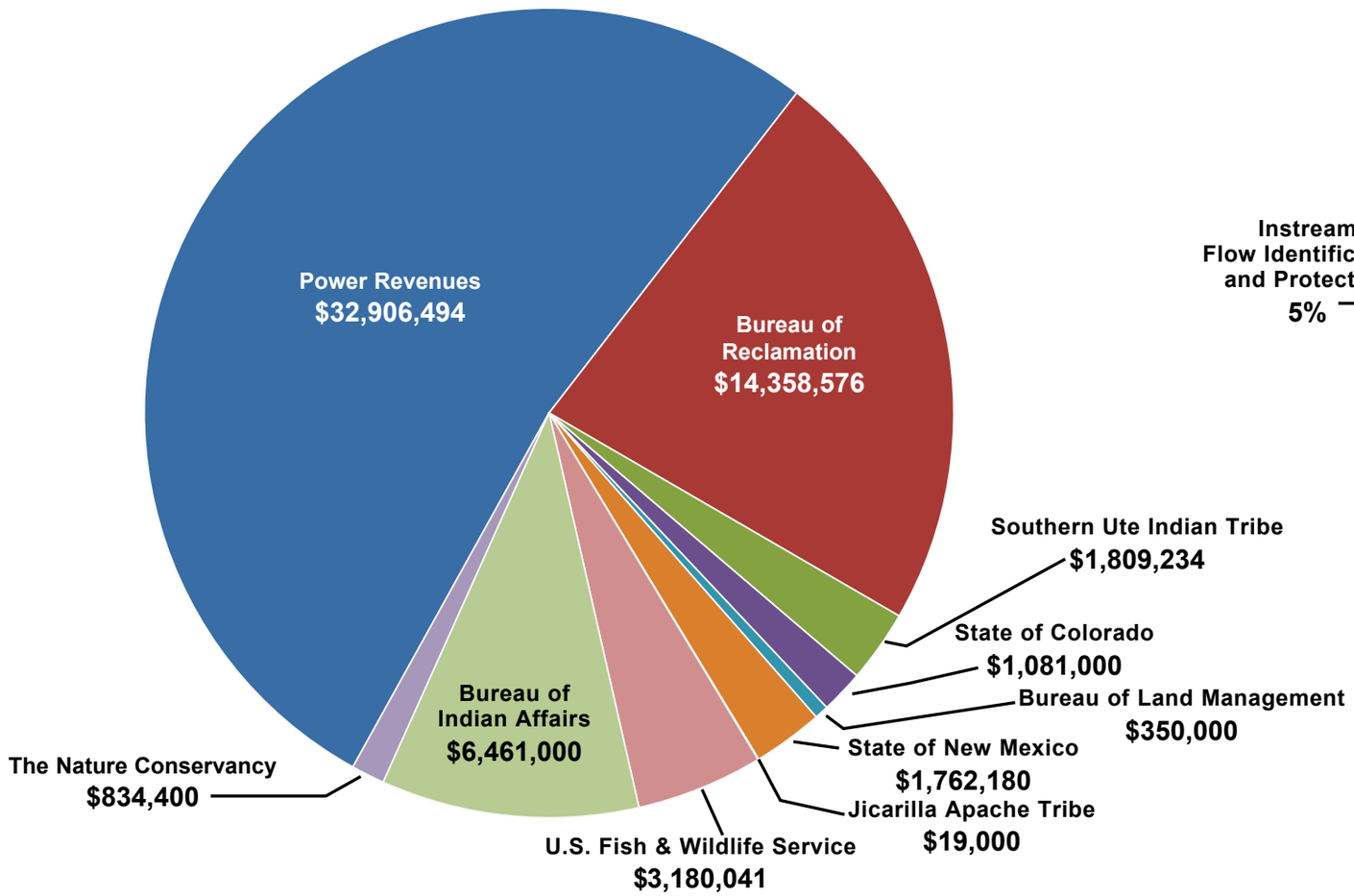


Expenditures
San Juan River Basin Recovery Implementation Program

Total Partner Contributions = $62,761,925

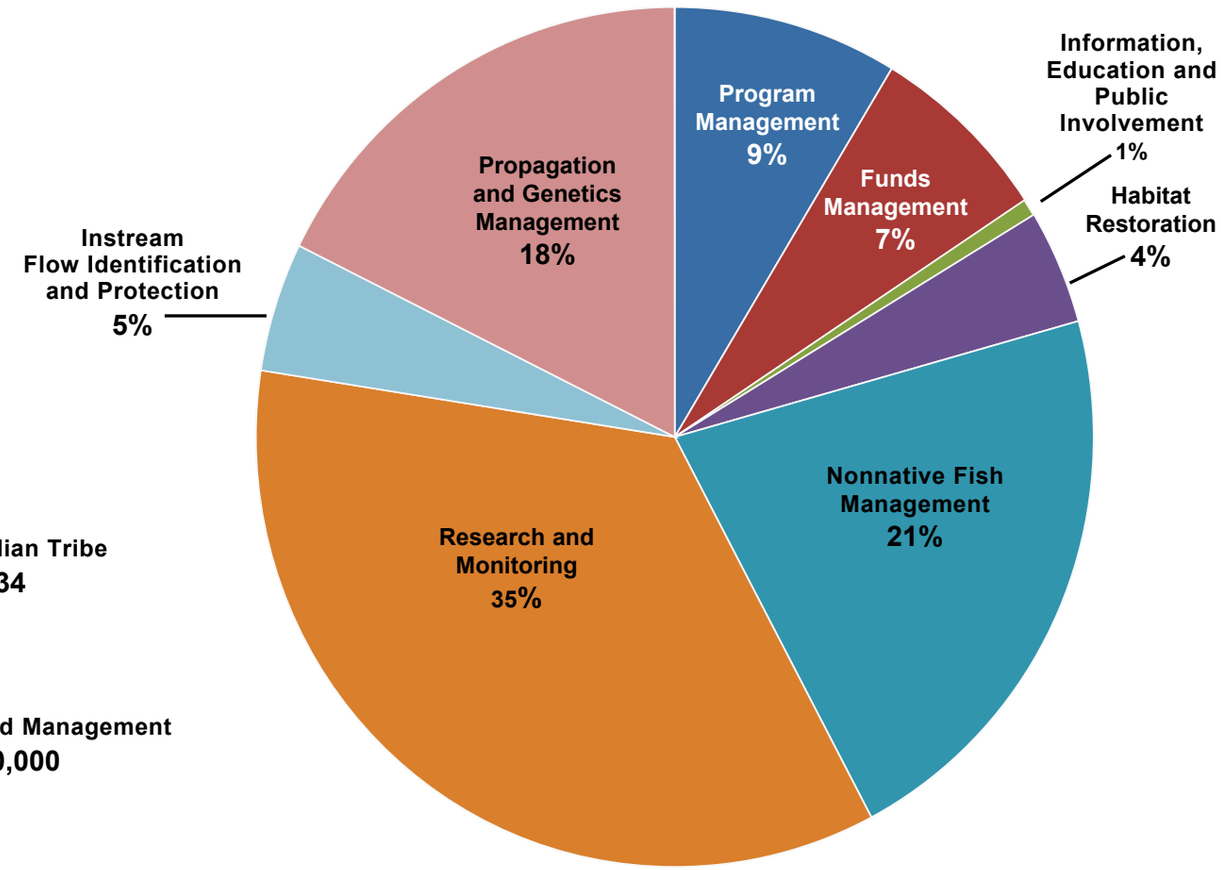
(FY 1992-2014)

(Not including in-kind contributions)



Projected Expenditures by Category

(FY 2014 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 12)*, **fish passages and screens** *(see pages 14-15)*; **complete water acquisition projects** *(see page 13)*; **and restore floodplain habitat** *(see page 15)*.

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	1.689 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.