Implementing Innovative Solutions to Recover Endangered Species

Program Highlights

- The recovery programs use science-based, cost-effective measures such as reoperating federal reservoirs to create and maintain habitat, working with irrigators to improve their water efficiency, and constructing fish passages to assist in endangered fish recovery.

- Predation and competition by nonnative fish species is the primary threat to endangered fish recovery and the most challenging threat to manage. While the recovery programs remove problematic nonnative species, they promote compatible sport fisheries in off-channel reservoirs.

- The recovery programs’ actions provide Endangered Species Act compliance for approximately 2,500 water projects providing water for irrigation, cities, industry, recreation, and tribal uses.
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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, newsletters, fact sheets, and web sites.

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*Lauren Angelo kisses a native sucker as part of Ute Water’s Childrens Water Festival in Grand Junction, CO.*

*Anderson Batey holds a four foot Colorado pikeminnow cutout at the Denver Aquarium.*

*Wesley and Brett Walker release a Colorado pikeminnow encountered while fishing in Grand Junction, CO.*
Partners’ Long-Term Commitment to Collaboration Drives Recovery Programs’ Success

In the upper Colorado River basin, water and power customers, American Indian tribes, conservation groups, and state and federal agencies COLLABORATE to RECOVER endangered fish species.

**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

Improvements in irrigation efficiency in the Grand Valley help redirect water back to the Colorado River to benefit the 15-Mile Reach. This includes Orchard Mesa Irrigation District’s (OMID’s) new regulating reservoir and other improvements that redirect ~17,000 AF/year. Improvements at the Government Highline Canal (Colorado River mainstem) and Maybell Canal (Yampa River) allow for more precise control of water, improving efficiency, reducing diversions that exceed end-user needs, and enhancing instream flows.
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.

State Leaders Value Endangered Fish Recovery Programs’ Accomplishments:

“"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

“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 rivers’ water to grow food, generate electricity, and serve the needs of cities and towns.”

John W. Hickenlooper, Governor, State of Colorado

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 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

“For its many collaborative undertakings demonstrating that endangered species conservation and water development and management can be compatible, the San Juan River Basin Recovery Implementation Program is granted the Cooperative Conservation Award of the Department of Interior.”

Dirk Kempthorne, Secretary of the Interior, April 21, 2008

“The Colorado River recovery programs have become a national model for implementing the Endangered Species Act while addressing the demand for water development to support growing western communities. In one of the nation’s fastest growing areas, Interior agencies work collaboratively 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 and preserving the natural heritage in the Colorado River basin.”

Timothy Petty, Assistant Secretary of the Interior, 2018

“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 River and San Juan River Basin Recovery Implementation Programs are models for Endangered Species Act implementation and help provide water reliability for approximately 2,500 municipal, industrial, and agricultural water projects throughout the Upper Colorado Basin,” said Commissioner Brenda Burman. “These programs were established under cooperative agreements between federal, state, tribal and non-government agencies who are working collaboratively to ensure the future of the endangered fish while meeting the water delivery requirements of communities within the basin.”

Brenda Burman, Commissioner of Reclamation, 2018
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 2,500 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 12/31/2017

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Projects</th>
<th>Historical Depletions Acre-Feet/Yr</th>
<th>New Depletions Acre-Feet/Yr</th>
<th>Total Acre-Feet/Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>1232</td>
<td>1,915,682</td>
<td>207,213</td>
<td>2,122,895</td>
</tr>
<tr>
<td>Utah</td>
<td>263</td>
<td>517,898</td>
<td>98,777</td>
<td>616,675</td>
</tr>
<tr>
<td>Wyoming</td>
<td>416</td>
<td>83,498</td>
<td>36,574</td>
<td>120,072</td>
</tr>
<tr>
<td>CO/UT/WY</td>
<td>238¹</td>
<td>(Regional)</td>
<td>(Regional)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2,149</td>
<td>2,517,078</td>
<td>342,564</td>
<td>2,859,642</td>
</tr>
</tbody>
</table>

¹Small 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 12/31/2017

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Consultations</th>
<th>Depletions Acre-Feet/Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Mexico</td>
<td>23</td>
<td>653,758</td>
</tr>
<tr>
<td>Colorado</td>
<td>313</td>
<td>217,986</td>
</tr>
<tr>
<td>Utah</td>
<td>15</td>
<td>9,311</td>
</tr>
<tr>
<td>Total</td>
<td>351</td>
<td>881,055</td>
</tr>
</tbody>
</table>
The Programs Rely on Recovery Goals to Guide Recovery Actions and Measure Success

The overall goal for recovery of the four endangered species is to achieve naturally self-sustaining populations and protect the habitat on which those populations depend. Science-based, 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.

Box 1. Demographic Criteria for Recovery

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

*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.
<table>
<thead>
<tr>
<th>Species</th>
<th>Population Status</th>
<th>USWFS Pending Recovery Decisions</th>
</tr>
</thead>
</table>
| Colorado pikeminnow     | - Adults in the Colorado and Green rivers have declined in the past decade, requiring increased effort to: a) reduce nonnative predators; and b) improve base flow management to increase survival of young Colorado pikeminnow.  
- Hatchery fish are accumulating and spawning in the San Juan River. | - A Species Status Assessment (SSA)\(^1\) was initiated in late 2015 and is scheduled for completion in 2018.  
- Recent population declines could delay downlisting.\(^2\)                                                                 |
| Humpback chub           | - 4 of 5 Upper Basin populations have stabilized after declines were detected in the late 1990's. The fifth population (Yampa River) appears to have been lost.  
- In the Lower Basin, a population near the Little Colorado River is doing very well. | - The USFWS approved the final SSA in December 2017.  
- Long term stability in most populations may support a five-year status review that recommends downlisting. If that is the recommendation, USFWS will move to a rulemaking action reclassifying to threatened by 2019. |
| Razorback sucker        | - In the Upper Basin, stocked adults are accumulating in Colorado, Green, and San Juan rivers and in the inflows to Lake Powell.  
- The Lower Basin is home to the only wild, self-sustaining population which is found in Lake Mead and the lower Grand Canyon.  
- Positive trends for this species are reported throughout the Colorado River. | - An SSA for this species is scheduled for completion in 2018 which the USFWS will use to complete a five-year status review of whether the species should be recommended for downlisting or delisting. |
| Bonytail                | - Programs throughout the Upper and Lower basins rebuild populations with hatchery fish.  
- Spawning in the wild was detected for the first time in Green River floodplains in 2015, 2016, and 2017. | - When survival of stocked fish improves, the USFWS will initiate an SSA.                                                                                   |

\(^1\)Species Status Assessments (SSA) comprise the best available information on species needs, current condition, and viability. The Service uses SSAs as the foundation for various ESA actions (e.g., changes in listing status).

\(^2\)“Downlisting” refers to a USFWS decision to reclassify an endangered species as a threatened one.
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). Humpback chub are not stocked in the Upper Colorado River basin.

<table>
<thead>
<tr>
<th>Facility, Location (Target Number)</th>
<th>River, # Stocked and Average Size in 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green</td>
</tr>
<tr>
<td><strong>Bonytail:</strong> average size 10 inches</td>
<td></td>
</tr>
<tr>
<td>J.W. Mumma Native Aquatic Species Restoration Facility, Alamosa, CO (5,000)</td>
<td>2,321; 12.3”</td>
</tr>
<tr>
<td>Wahweap State Fish Hatchery, Big Water, UT (10,000)</td>
<td>11,046; 10.0”</td>
</tr>
<tr>
<td>Ouray National Fish Hatchery – Randlett Unit, Vernal, UT (10,000)</td>
<td>12,802; 9.0”</td>
</tr>
<tr>
<td>Ouray National Fish Hatchery – Grand Valley Unit, Grand Junction, CO (10,000)</td>
<td>10,501; 9.8”</td>
</tr>
<tr>
<td><strong>Razorback sucker:</strong> average size 14 inches</td>
<td></td>
</tr>
<tr>
<td>Ouray National Fish Hatchery – Randlett Unit, Vernal, UT (6,000)</td>
<td>8,186; 13.4”</td>
</tr>
<tr>
<td>Ouray National Fish Hatchery – Grand Valley Unit, Grand Junction, CO (6,000)</td>
<td>7,420; 15.2”</td>
</tr>
<tr>
<td>Ouray National Fish Hatchery-Horsethief Canyon Native Fish Facility, Fruita, CO (2,000-3,000)</td>
<td>4,102; 13.9”</td>
</tr>
<tr>
<td>Navajo Agricultural Products Industry (NAPI) Ponds, Farmington, NM (6,000-8,000)</td>
<td>4,315; 14.2”</td>
</tr>
<tr>
<td>Southwest Native Aquatic Resources and Recovery Center, Dexter, NM (11,000)</td>
<td>1,891; 13.4”</td>
</tr>
<tr>
<td><strong>Colorado pikeminnow:</strong> fingerlings, 45+ mm total length</td>
<td></td>
</tr>
<tr>
<td>Southwest Native Aquatic Resources and Recovery Center, Dexter, NM (400,000)</td>
<td>200,736; 1.7+”</td>
</tr>
</tbody>
</table>

*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:** Releases from Flaming Gorge Reservoir augment spring and base flows, ROD Feb. 2006

**White River:** Future Water Management Plan and PBO will identify flow protections

**Duchesne River:** Releases from Starvation and Big Sand Wash Reservoirs augment spring and base flows, BO July 1998

**15-Mile Reach—Colorado River:** Releases from multiple reservoirs (see table, top right) and irrigation efficiencies augment flows, PBO Dec. 1999

**Price River:** Opportunities being investigated to help achieve USFWS suggested minimum flows, Position Paper May 2012

**Gunnison & Colorado Rivers:** Releases from Aspinall Unit augment spring and base flows, ROD May 2012

**San Juan River:** Lake Nighthorse, completed in 2011

**Yampa River:** Releases from Elkhead Reservoir augment base flows, PBO Jan. 2005

**White River:** Future Water Management Plan and PBO will identify flow protections

---

**Coordinated Water Releases (1997-2017)**

**Benefit Endangered Fishes in the Colorado River**

<table>
<thead>
<tr>
<th>Reservoirs</th>
<th>Acre-Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granby</td>
<td>85,478</td>
</tr>
<tr>
<td>Palisade Bypass</td>
<td>232,344</td>
</tr>
<tr>
<td>Williams Fork</td>
<td>110,862</td>
</tr>
<tr>
<td>Windy Gap</td>
<td>4,624</td>
</tr>
<tr>
<td>Green Mtn</td>
<td>829,607</td>
</tr>
<tr>
<td>Ruedi</td>
<td>427,419</td>
</tr>
<tr>
<td>Willow Creek</td>
<td>25,124</td>
</tr>
<tr>
<td>Wolford Mtn</td>
<td>179,703</td>
</tr>
</tbody>
</table>

**Total Ac-Ft:** 1,895,161

---

**Summer 2017 Flows in the 15-mile Reach of the Colorado River**

- WITH Reservoir Releases
- WITHOUT Reservoir Releases
- USFWS Mean Monthly Target

---

**Reservoirs**

**Critical Habitat**

**BO = Biological Opinion**

**PBO = Programmatic Biological Opinion**

**ROD = Record of Decision**
Predation or competition by nonnative fish species is the primary threat to endangered fish recovery and the most challenging threat 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 and San Juan Programs.

<table>
<thead>
<tr>
<th>River</th>
<th>Program Inception</th>
<th>Today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td><img src="image1.png" alt="Channel catfish" /> <img src="image2.png" alt="Gizzard Shad" /> <img src="image3.png" alt="Northern pike" /> <img src="image4.png" alt="Rusty crayfish" /> <img src="image5.png" alt="Smallmouth bass" /> <img src="image6.png" alt="Virile crayfish" /> <img src="image7.png" alt="Walleye" /> <img src="image8.png" alt="White sucker" /></td>
<td><img src="image9.png" alt="Channel catfish" /> <img src="image10.png" alt="Gizzard Shad" /> <img src="image11.png" alt="Northern pike" /> <img src="image12.png" alt="Rusty crayfish" /> <img src="image13.png" alt="Smallmouth bass" /> <img src="image14.png" alt="Virile crayfish" /> <img src="image15.png" alt="Walleye" /> <img src="image16.png" alt="White sucker" /></td>
</tr>
<tr>
<td>Gunnison</td>
<td><img src="image1.png" alt="Channel catfish" /> <img src="image2.png" alt="Gizzard Shad" /> <img src="image3.png" alt="Northern pike" /> <img src="image4.png" alt="Rusty crayfish" /> <img src="image5.png" alt="Smallmouth bass" /> <img src="image6.png" alt="Virile crayfish" /> <img src="image7.png" alt="Walleye" /> <img src="image8.png" alt="White sucker" /></td>
<td><img src="image9.png" alt="Channel catfish" /> <img src="image10.png" alt="Gizzard Shad" /> <img src="image11.png" alt="Northern pike" /> <img src="image12.png" alt="Rusty crayfish" /> <img src="image13.png" alt="Smallmouth bass" /> <img src="image14.png" alt="Virile crayfish" /> <img src="image15.png" alt="Walleye" /> <img src="image16.png" alt="White sucker" /></td>
</tr>
<tr>
<td>Green</td>
<td><img src="image1.png" alt="Channel catfish" /> <img src="image2.png" alt="Gizzard Shad" /> <img src="image3.png" alt="Northern pike" /> <img src="image4.png" alt="Rusty crayfish" /> <img src="image5.png" alt="Smallmouth bass" /> <img src="image6.png" alt="Virile crayfish" /> <img src="image7.png" alt="Walleye" /> <img src="image8.png" alt="White sucker" /></td>
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</tr>
<tr>
<td>White</td>
<td><img src="image1.png" alt="Channel catfish" /> <img src="image2.png" alt="Gizzard Shad" /> <img src="image3.png" alt="Northern pike" /> <img src="image4.png" alt="Rusty crayfish" /> <img src="image5.png" alt="Smallmouth bass" /> <img src="image6.png" alt="Virile crayfish" /> <img src="image7.png" alt="Walleye" /> <img src="image8.png" alt="White sucker" /></td>
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</tr>
<tr>
<td>Yampa</td>
<td><img src="image1.png" alt="Channel catfish" /> <img src="image2.png" alt="Gizzard Shad" /> <img src="image3.png" alt="Northern pike" /> <img src="image4.png" alt="Rusty crayfish" /> <img src="image5.png" alt="Smallmouth bass" /> <img src="image6.png" alt="Virile crayfish" /> <img src="image7.png" alt="Walleye" /> <img src="image8.png" alt="White sucker" /></td>
<td><img src="image9.png" alt="Channel catfish" /> <img src="image10.png" alt="Gizzard Shad" /> <img src="image11.png" alt="Northern pike" /> <img src="image12.png" alt="Rusty crayfish" /> <img src="image13.png" alt="Smallmouth bass" /> <img src="image14.png" alt="Virile crayfish" /> <img src="image15.png" alt="Walleye" /> <img src="image16.png" alt="White sucker" /></td>
</tr>
<tr>
<td>San Juan</td>
<td><img src="image1.png" alt="Channel catfish" /> <img src="image2.png" alt="Gizzard Shad" /> <img src="image3.png" alt="Northern pike" /> <img src="image4.png" alt="Rusty crayfish" /> <img src="image5.png" alt="Smallmouth bass" /> <img src="image6.png" alt="Virile crayfish" /> <img src="image7.png" alt="Walleye" /> <img src="image8.png" alt="White sucker" /></td>
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</tr>
</tbody>
</table>

**Legend**

<table>
<thead>
<tr>
<th>Channel catfish</th>
<th>Gizzard Shad</th>
<th>Northern pike</th>
<th>Rusty crayfish</th>
<th>Smallmouth bass</th>
<th>Virile crayfish</th>
<th>Walleye</th>
<th>White sucker</th>
</tr>
</thead>
<tbody>
<tr>
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<td><img src="image7.png" alt="Walleye" /></td>
<td><img src="image8.png" alt="White sucker" /></td>
</tr>
</tbody>
</table>
Invasive Predators of Greatest Concern

Smallmouth Bass

Multi-agency crews coordinate smallmouth bass removal efforts in the Yampa, White, Green, and Colorado rivers timed specifically to target spawning adults. This effort has dramatically decreased the number of adult smallmouth bass.

Northern Pike

Gill netting backwaters in late winter is a cost-effective and efficient way to remove large numbers of northern pike before they can spawn. This removal method began in 2014, and has resulted in reduced numbers of northern pike caught in the nearby Yampa River.

Walleye

Nonnative walleye have increased dramatically over the last decade in the upper Colorado River basin. The threat from walleye is highest in areas favored by young Colorado pikeminnow and razorback sucker, but low in areas inhabited by humpback chub. This trend is similar in the upper Colorado River, where walleye have been documented to prey on young Colorado pikeminnow.
WHY ARE CERTAIN NONNATIVE FISH A PROBLEM?

PREDATION & COMPETITION

HIGH REPRODUCTION POTENTIAL
Providing Angler Opportunity and Satisfaction is a Critical Part of Nonnative Fish Management

The Upper Colorado River Endangered Fish Recovery Program and the States of Colorado, Utah, and Wyoming strive to provide angler satisfaction by:

Seeking angler input in management decisions:
Angler input provides public support and sportfishing satisfaction.

Enacting appropriate fishing regulations:
Liberalized fishing regulations make anglers part of the solution.

Researching and using new technologies:
Stocking fish that cannot reproduce (sterile fish) offers angling opportunity.

Providing angling opportunities compatible with endangered species recovery:
Families can enjoy compatible sportfishing year round.

Public meetings are held to determine what compatible species anglers would like to fish for in Upper Basin reservoirs.

Tournaments with prizes for catching problematic species promote interest in species removal.

Sterile versions of popular sportfish like walleye provide angler opportunity while reducing risk to downstream endangered fish.

Public meetings are held to determine what compatible species anglers would like to fish for in Upper Basin reservoirs.

**YES - Compatible sportfish can be stocked in reservoirs**

LARGEMOUTH BASS  BLACK CRAPPIE  YELLOW PERCH  BLUEGILL

BROWN TROUT  KOKANEE  RAINBOW TROUT

HYBRID STRIPED BASS (STERILE FISH)  WALLEYE (STERILE FISH)

...and many others!

**NO - Incompatible sportfish cannot be stocked in reservoirs**

SMALLMOUTH BASS  WALLEYE (FERTILE FISH)

NORTHERN PIKE  BURBOT
Preventing Nonnative Fish Escapement in Reservoirs

Reservoir escapement of incompatible species such as smallmouth bass, northern pike, and walleye impairs recovery program removal efforts downstream. In order to prevent this escapement, recovery program partners have installed barriers such as screens or nets at Rifle Gap Reservoir, Elkhead Reservoir, and others, but still need to install structures at Ridgway Reservoir and Lake Catamount. Ridgway Reservoir is the highest priority for the program because the downstream Gunnison River has no smallmouth bass, but does have a healthy native fish community.

High Quality Fishing Opportunities in Reservoirs

It is important to the recovery program that communities retain high quality fishing opportunities as reservoirs are managed with endangered species considerations. Transitioning reservoir fisheries from incompatible northern pike, walleye, and smallmouth bass to compatible species, such as black crappie and largemouth bass is a key aspect of reservoir management. In Utah, Red Fleet Reservoir has been stocked with black crappie and sterile walleye after removing an illicitly introduced fertile walleye population. In Colorado, CPW stocks sterile walleye to replace fertile walleye, and largemouth bass to replace smallmouth bass.

Fishing Tournaments

In 2017 anglers removed over 2,000 smallmouth bass during the Ridgway Smallmouth Bass Classic, some as long as 17 inches! Monitoring estimates that anglers removed over 50% of fish larger than 6 inches. In 2017, almost 400 northern pike were removed during the Elkhead tournament, up from around 50 in 2016. The majority of these fish were large adults, some 3+ feet!
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.

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.
Planned renovations to the Fruitland Diversion will include upstream and downstream fish passage and a weir to prevent fish entrainment. The need for additional fish passages and weirs at other diversions along the San Juan and Animas rivers is being evaluated.

Juvenile razorback sucker produced in Stewart Lake: a managed off-channel wetland that provides warm, food-rich habitats important to the recovery of three of the four endangered fish species.

Johnson Bottom Wetland Enhancement Project: This kettle collects fish as the wetland drains, allowing biologists to sample all exiting fish. In 2016, biologists captured 41 stocked bonytail and 5 young-of-year that were spawned in the wetland.

Natural Resource Conservation Service and local water users rebuilt Tusher Wash Diversion in 2016. It has downstream passage for fish and boats and a fish ladder for upstream passage.

Hogback Fish Weir – In 2013, a weir wall was installed in the Hogback Diversion Canal off the San Juan River near Shiprock, NM to prevent endangered fish from being entrained in the canal.

Habitat Restoration – The Nature Conservancy, with assistance from the San Juan Program, restored several backwaters and side channels in 2011 and 2014 and now is planning a third phase of restoration.
The recovery programs monitor reproduction, growth, survival, and abundance of endangered fishes in the wild. Results are used to track progress toward achieving recovery and assess 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*)

**Upper Colorado Program**

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

  - The population of adult (8+ years old) Colorado pikeminnow in the Green River has varied from a high of approximately 4,000 individuals to about 2,000 currently (*Figure 1*). Another round of abundance estimation is ongoing (2016 – 2018). The Service’s downlisting criterion for this sub-basin is 2,600 adults.

  - Estimates of adult Colorado pikeminnow abundance in the Colorado River sub-basin began in 1992 (*Figure 2: estimates for 2013 – 2015 are preliminary*). The population has fluctuated from a low of about 400 adults (current) to more than 800 adults in 2005. The Service’s downlisting criterion for this sub-basin is 700 adults.

  - Survival of wild produced Colorado pikeminnow young of the year (Y0Y) varies greatly from year to year. Catch of YOY in the upper Colorado River basin was very good in 2015, slightly above average in 2016, and poor in 2017. Continued control of invasive predatory fish and improvements in summer base flow management are expected to improve YOY survival.
San Juan Program

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

  - Over the last seven years, 2,909,663 YOY Colorado pikeminnow have been stocked in the San Juan River.

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

  - Of the 937 total wild-produced Colorado pikeminnow larvae captured since 1993, most (94%) have been collected in 2014-2016 indicating Colorado pikeminnow spawning success is improving.

  - The San Juan Program is restoring secondary channels along the river to increase the amount of low velocity nursery habitat for young pikeminnow. Nonnative vegetation along the shoreline is removed so that these habitats can function naturally and persist into the future.

Figure 3  San Juan River, Colorado Pikeminnow

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of individuals captured</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>1,320</td>
</tr>
<tr>
<td>2004</td>
<td>1,000</td>
</tr>
<tr>
<td>2005</td>
<td>1,500</td>
</tr>
<tr>
<td>2006</td>
<td>1,800</td>
</tr>
<tr>
<td>2007</td>
<td>2,000</td>
</tr>
<tr>
<td>2008</td>
<td>2,200</td>
</tr>
<tr>
<td>2009</td>
<td>2,500</td>
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<tr>
<td>2010</td>
<td>2,800</td>
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<tr>
<td>2011</td>
<td>3,100</td>
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<td>2012</td>
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<td>2014</td>
<td>4,000</td>
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<td>2015</td>
<td>4,300</td>
</tr>
<tr>
<td>2016</td>
<td>4,600</td>
</tr>
<tr>
<td>2017</td>
<td>4,900</td>
</tr>
</tbody>
</table>

Ernie Teller, USFWS, holds a healthy adult Colorado pikeminnow caught in the San Juan River.

BONYTAIL (Gila elegans)

- When the Upper Colorado River Program was established, bonytail had disappeared and little was known about their habitat requirements. Hatchery produced fish are stocked to determine their life history needs and to eventually rebuild self-sustaining populations.

  - Survival of stocked bonytail appears to be very low. Biologists continue to experiment with new hatchery techniques to produce healthier fish and new stocking strategies (e.g., different habitats and times of the year) to improve survival in the wild.

  - For the first time in 2015 (and each year since), hatchery produced bonytail spawned successfully in flooded wetlands along the Green River, which represents an unexpected use of this habitat type by this species.

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

Summary of Recent Bonytail Stocking in the Upper Colorado River Basin

<table>
<thead>
<tr>
<th>Year</th>
<th># of Bonytail Stocked in the Green and Colorado rivers (combined)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>11,487</td>
</tr>
<tr>
<td>2014</td>
<td>45,837</td>
</tr>
<tr>
<td>2015</td>
<td>40,645</td>
</tr>
<tr>
<td>2016</td>
<td>35,761</td>
</tr>
<tr>
<td>2017</td>
<td>39,521</td>
</tr>
</tbody>
</table>

Erroneous data entered in Table 1.

Photo by Melanie Fischer, USFWS
When the recovery programs were established, 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 have revised 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.

- Fish stocked in the Green (Figure 4), Colorado, and San Juan rivers (Figure 5) are recaptured in reproductive condition and often in spawning groups. In 2013, the abundance of stocked razorback sucker in the Green River subbasin was estimated at approximately 30,000 individuals.

- Captures of wild produced larvae in the Green, Gunnison, Colorado, and San Juan rivers document that the stocked fish are spawning.

- 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 floodplains — important nursery habitat for larval razorback sucker — coincident with larval presence. In September 2016, a record high catch of 2,110 young of the year (YOY) razorback sucker from Stewart Lake (Figure 6) was released into the Green River. Some of the YOY had grown more than 6 inches over the summer.

- In 2017 San Juan researchers transported razorback sucker upstream of a waterfall that formed at the Lake Powell inflow.
Humpback chub have inhabited five canyon-bound sections of the Colorado, Green, and Yampa rivers in recent times. In the past decade, the population in Yampa River canyon has declined below levels of detection. Downward trends in some populations have been attributed to periods of extreme low flow (particularly Yampa Canyon) and occasional invasions by invasive predatory smallmouth bass and walleye (particularly in Desolation and Gray canyons). Humpback chub populations in Black Rocks, Westwater and Cataract Canyon appear stable.

- Of the four endangered species, humpback chub appear to be least affected by invasive predatory species. The canyon habitats preferred by humpback chub do not appear to be favored by the invasives.

- Westwater Canyon and Black Rocks — Adult population abundance monitoring resumed in these Colorado River canyons in 2016 and 2017. Preliminary results from Westwater Canyon (Figure 7) indicate the population has stabilized and could be rebounding.

- Desolation Canyon — This population has been monitored since 1985. Although there are indications of long term stability, Utah researchers are concerned with relatively low survival of adult humpback chub and periodic influxes of invasive predators.

- Cataract Canyon — This is the smallest population of humpback chub in the upper basin, but Utah researchers report that it may be the most stable. Humpback chub catch rates in 2017 were the highest since monitoring began in 1991.

- Yampa Canyon — The abundance of humpback chub in the lower Yampa Canyon has dropped below level of detection for the past decade. The Upper Colorado Program is investigating a strategy to stock humpback chub back into the Yampa River and / or into the Green River near their confluence in Dinosaur National Monument. A permanent pool of water (5000 ac-ft) in Elkhead Reservoir in the upper Yampa River drainage was established in 2007 and is used to augment periods of low summer flow. Low summer flows (particularly during the droughts of the early 2000’s) are presumed to have contributed to decline of humpback chub at this location.

- A Species Status Assessment (SSA) for humpback chub was completed in December 2017. The Service will use the SSA to determine if downlisting this species is appropriate.
Expenditures
Upper Colorado River Endangered Fish Recovery Program

Total Partner Contributions = $394,325,800 (FY 1989-2018)

Projected Expenditures by Category (FY 2018 only)
Expenditures
San Juan River Basin Recovery Implementation Program

Total Partner Contributions = $78,291,243 (FY 1992-2018)
(Not including in-kind contributions)

Projected Expenditures by Category (FY 2018 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, authorized through 2023 by PL 111-11, 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
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

$17M of CRSP power revenues, have been provided by WAPA for capital construction projects. Consistent with P.L. 106-392, as amended, these revenues were treated as a non-federal contribution and as non-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

<table>
<thead>
<tr>
<th></th>
<th>Upper Colorado Recovery Program</th>
<th>San Juan Recovery Program</th>
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<tbody>
<tr>
<td>Total</td>
<td>$179 million</td>
<td>$30 million</td>
</tr>
<tr>
<td>*Sources of Revenue</td>
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</tr>
<tr>
<td>Federal</td>
<td></td>
<td></td>
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<tr>
<td>Power Revenues:</td>
<td>$17 million</td>
<td></td>
</tr>
<tr>
<td>States:</td>
<td>$17 million</td>
<td></td>
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<tr>
<td>Water and Power:</td>
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<tr>
<td>Total</td>
<td>$121 million</td>
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<tr>
<td>Non-Federal</td>
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<td></td>
</tr>
<tr>
<td>Congress (Approps. in USBR’s budget):</td>
<td>$88 million</td>
<td></td>
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<tr>
<td>Total Revenue</td>
<td>$209 million</td>
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**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.

### Capital Project Cost-Sharing by the States

<table>
<thead>
<tr>
<th>State</th>
<th>Total Amount</th>
<th>Upper Colorado Program</th>
<th>San Juan Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>$9.15 M</td>
<td>$8.07 M</td>
<td>$1.08 M</td>
</tr>
<tr>
<td>New Mexico</td>
<td>2.74 M</td>
<td>None</td>
<td>2.74 M</td>
</tr>
<tr>
<td>Utah</td>
<td>3.42 M</td>
<td>3.42 M</td>
<td>None</td>
</tr>
<tr>
<td>Wyoming</td>
<td>1.69 M</td>
<td>1.69 M</td>
<td>None</td>
</tr>
<tr>
<td>Total</td>
<td>$17.00 M</td>
<td>$13.18 M</td>
<td>$3.82 M</td>
</tr>
</tbody>
</table>

**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.
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  
Water Development Interests  

San Juan River Basin Recovery Implementation Program  
2105 Osuna Rd. NE  
Albuquerque, NM 87113  
505-781-4745  
505-346-2542 Fax  
southwest.fws.gov/sjrip

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