swimming upstream

Field Report 2019

San Juan River Basin Recovery Implementation Program
Upper Colorado River Endangered Fish Recovery Program

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The San Juan River below Navajo Dam

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COVER PHOTO BY MELANIE FISCHER, USFWS

swimming upstream

Swimming Upstream is a publication of the Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program. These programs are national models of cost-effective public and private partnerships. The programs are working to recover endangered fishes while water development continues in accordance with federal and state laws and interstate compacts, including fulfillment of federal trust responsibilities to American Indian tribes.

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Program Coordinator's Message

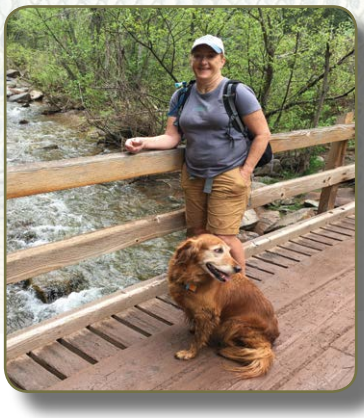
By **Melissa Mata**, *Program Coordinator, San Juan River Basin Recovery Implementation Program*

First, I want to thank all who have contacted me to offer kind words of congratulations and welcome during my recent transition from the Assistant Program Coordinator to the role as Program Coordinator for the San Juan River Basin Recovery Implementation Program. I am looking forward to working closely with my staff and colleagues from the Upper Colorado River Endangered Fish Recovery Program and their partners as we strive for progress toward recovery. I would also like to take this opportunity to thank my predecessor, Sharon Whitmore, for all she did for the San Juan Recovery Program during the past 4 years, in assisting the growth of both the staff and program itself.

The Upper Colorado and San Juan Recovery Programs and partners worked together to develop a Species Status Assessment (SSA) for humpback chub and razorback sucker. The SSA is a focused, repeatable, and rigorous scientific assessment that provides the foundation for all Endangered Species Act (ESA) policy decisions. This SSA provided the opportunity to receive input from technical experts and recovery partners using the best available science through consistent analysis structure to review species needs, under current and future conditions. The Recovery Programs and partners had reasons to celebrate based on these SSA's because the U.S. Fish and Wildlife Service (USFWS) recommended downlisting the humpback chub and razorback sucker from endangered to threatened. This would not be possible without our recovery programs partners' long standing commitment to collaboration that drives the success of these Programs.

Both Recovery Programs have been highly regarded for their collaborative approach working with recovery program partners to help recover endangered fishes while continuing to meet the needs of water development in the Upper Colorado Basin. This has been possible through the established cooperative agreement, program guidance and forums for open communication. Communication is the key to building trust, developing and maintaining partnerships, and as Program Coordinator/Director, one of our primary objectives is to keep the lines of communication open, as well as encourage program partners and others to work cooperatively toward shared goals and outcomes. The Recovery Program's success, again, would not be possible without the hard work and dedication from everyone involved. We thank you for your efforts that have led to our success thus far.

A special acknowledgment goes out to Sharon Whitmore, recently retired Program Coordinator for the San Juan River Program, for her career of dedication to the recovery of the endangered fishes of the San Juan River.



Fish Illustration © Joseph R. Tomelleri

The Upstream March of Spawning San Juan River Razorback Sucker

By **Steven P. Platania and Michael A. Farrington**, *American Southwest Ichthyological Researchers, L.L.C.*

Some of the most important metrics researchers use to gauge progress towards recovery of endangered fish are the distribution of spawning individuals and the magnitude of their reproductive effort. And in both cases, more is better.

Stocking of razorback sucker in the San Juan River began in 1994. Four years later, efforts began to see if stocked individuals were finding each other and spawning. In May 1998, larval razorback sucker were collected for the first time ever about 12 river miles downstream of Aneth, Utah. The discovery reinforced belief that razorback sucker could be recovered in the San Juan River.

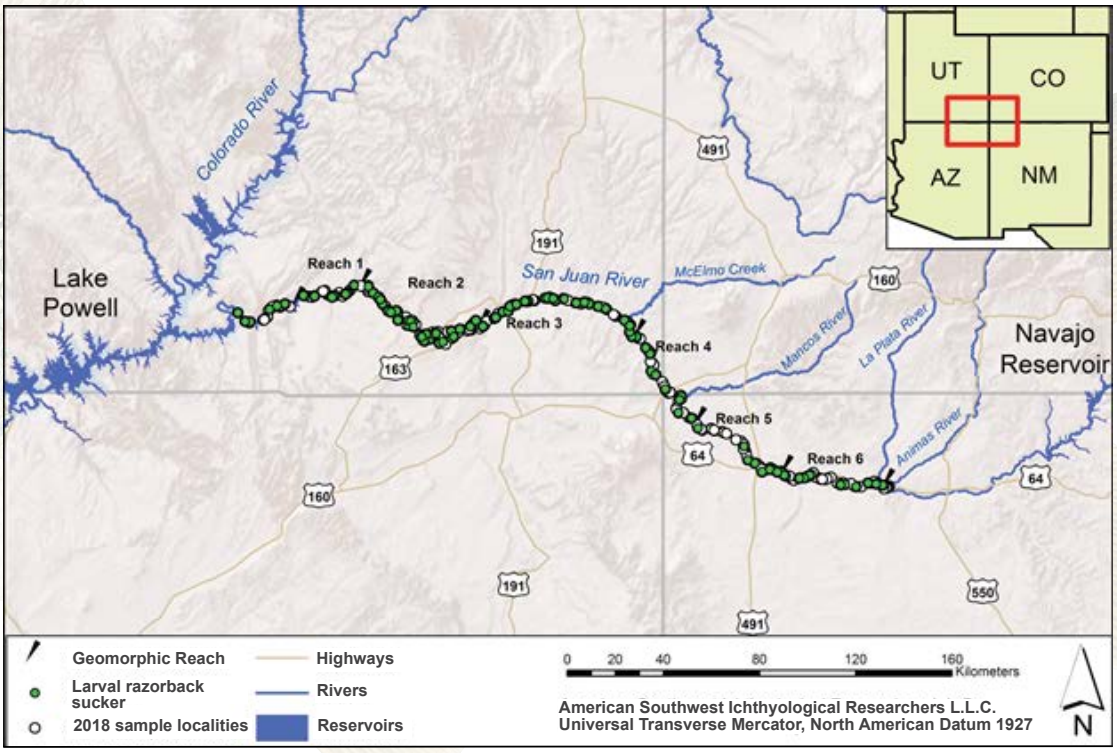
Once researchers knew razorback sucker were spawning, they wanted to know 'when, where, and how much'. The following year, sampling efforts expanded. In April, May, and June of 1999, larval fish were sampled from just upstream of Four Corners, near the Mancos River confluence river mile (RM 127.5),all the way downstream to Clay Hills Crossing (RM 3). Seven more larval razorback sucker were collected near Clay Hills (RM 11.5) and near Aneth (RM 96.2). Two consecutive years of documented spawning in the San Juan River buoyed hopes for continued reproductive success.

Annual larval fish surveys created a picture of success and, like marking the height of growing children on a bedroom door jamb, documented 'the growth' of the range of this endangered fish. By the end of the 20th Century, razorback sucker larvae had been collected upstream an additional 28.6 river miles and were collected in New Mexico for the first time. In 2010, the number of larval razorback sucker collected exploded to over 1,250 at 62 sites throughout the study area, and larvae were collected as far upstream as RM 139.7.

In 2012, the study area was again expanded upstream, this time to the U.S. Highway 64 Bridge at Shiprock, New Mexico (RM 147.9). In the first year of the new study area, larval razorback sucker were collected within 0.4 river miles of the upstream boundary of the study area, indicating that spawning was already occurring above the new study area.

In 2018, sampling from Farmington, New Mexico to Shiprock, New Mexico produced a surprising 90 larval razorback sucker with the most upstream collection being immediately downstream of the Animas River confluence (RM 179.8). Researchers have not yet decided how far upstream the next study area boundary should be, but recognize the range of spawning razorback sucker appears to be expanding.

In the 7,320 days since the collection of the first larval razorback sucker in a backwater downstream of Aneth to the specimen taken on June 5, 2018 less than 1 river mile below the confluence of the San Juan and Animas rivers, spawning razorback sucker have continued their promising and progressive 100 river mile upstream march in small, deliberate, and incremental steps, and in doing so, have left a well-documented legacy of their march towards recovery.



The Importance of Larval Razorback Sucker in the River

By **Steven P. Platania and Michael A. Farrington**, *American Southwest Ichthyological Researchers, L.L.C.*

The presence of larval fish at a sample site provides researchers with several important snippets of information. First and foremost, it equips researchers with proof that adult fish successfully spawned, thereby producing the offspring. While researchers do not know where the adults spawned, they know spawning occurred upstream of where the larval fish were collected, based on their knowledge of spawning behavior, egg type, and early life-history of razorback sucker. They have discovered that razorback sucker eggs are laid in the gravel, that they are adhesive, and that they remain in the interstitial spaces of the gravel where the embryo develops for about eight days before hatching.

After the egg hatches, the larval fish begins its free-wheeling downstream journey, during which it lacks any control over its movement and is at the mercy of the current. In the underwater whirlwind that characterizes the environment which drifting organisms must navigate, some larval fish may remain in the thalweg (deepest part of the main channel) and be rapidly (within one week) transported to Lake Powell. However, the more likely scenario is that somewhere on their turbulent downstream journey, larvae will be transported into low velocity habitats such as shorelines, backwaters, or lateral canyons where the warm water, as compared to cooler main channel temperatures, provides more food, a safer environment, and the ability to grow more rapidly. Within a few weeks of hatching, larval fish will have developed most of their fin rays, become very strong swimmers relative to their size, and will no longer be passive members of the drift.

In addition to knowing that spawning occured somewhere upstream of where larval suckers are collected, the size and developmental phase serves as a relative indicator of how far upstream those individuals were spawned. The smaller or less developed the larvae, the shorter the distance to the putative spawning area. When these snippets are combined with a concurrent absence of larval fish at study sites upstream of a larval fish collection site, the researcher has a good indication of the approximate upstream limit of the distribution of spawning adults.

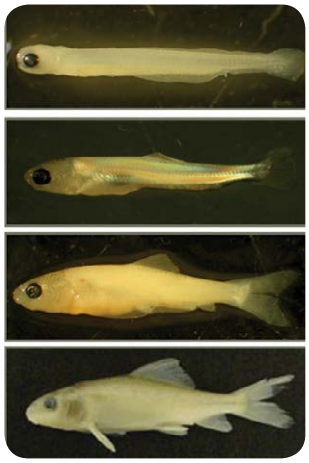


PHOTO BY USFWS

Razorback sucker proceed through several larval developmental stages before transitioning to juvenile fish that are characterized by completely absorbing their fin folds, developing the full complement of rays and spines, and developing segmentation in at least a few rays. These stages of larval development proceed sequentially through protolarvae, mesolarvae, and metalarvae (top to bottom).

A "Field of Dreams" Moment: Razorback Sucker Numbers Up

By **Eliza Gilbert,** *San Juan River Basin Recovery Implementation Program*

Fishery surveys conducted by SJRIP have revealed surprising—and quite welcome—information. The number of young-of-year razorback sucker discovered during fall 2018 reached an all-time high. Biologists captured over 200, the greatest number found since surveys began more than 20 years ago and implies that young-of-year fish in the river could have numbered in the thousands. Moreover, last year marks only the second time that yearling razorback sucker were captured in the fall.

PHOTO BY NMGF

Large amounts of water purposely released for weeks at a time from Navajo Reservoir by the Bureau of Reclamation in the spring of 2016 and 2017, created fish habitat. The high flows scoured the channel and restored slow-flowing, warm backwaters needed by young fish. After these large flows, backwater habitat was at the highest levels observed in the river since the mid-1990s.

"It was amazing to see these little fish in the river," said USFWS biologist Dr. Nathan Franssen. "We have been stocking razorbacks and managing the river for many years hoping to see these signs of recovery. It's a 'Field of Dreams' moment: build habitat and they will come."

What's more, Navajo Nation biologists moved nearly 300 adult razorback sucker over a migration barrier in the upper portion of the river in 2018, while researchers led by the Bureau of Reclamation moved another group of adults upstream of a waterfall at the bottom end of the river near Lake Powell. Both of these efforts assisted razorback sucker, which migrate upstream in the spring to spawning habitats. Razorback suckers live in eight rivers in the Colorado River basin and only those in Lake Mead, Nevada, show consistent survival past the larval fish stage. These young-of-year fish may indicate the same is possible in the San Juan River.

Matheson Wetlands Preserve: A Nursery for Endangered Fish

By **The Nature Conservancy (TNC)**

PHOTO © TNC / LINDA WHITHAM

Scott M. Matheson Wetlands Preserve in Utah

PHOTO © TNC / LINDA WHITHAM

A razorback sucker captured in the Scott M. Matheson Wetlands Preserve in Utah

In the perfect spot on the Colorado River, we're blending science and engineering to give razorback suckers a fighting chance.

For the Colorado River's endangered razorback sucker, survival to adulthood is a struggle. The fish—which sports a tell-tale, sharp-edge hump behind its head—can live up to 40 years. Instead, today most don't live past their first year.

At TNC's Scott M. Matheson Wetlands Preserve near Moab, Utah, scientists and engineers are giving nature a boost. Taking advantage of the preserve's location along the Colorado River, the team plans to bring razorback sucker larvae into the preserve's sheltered habitats in late spring, where they will be protected during their most vulnerable stage of development.

Engineers will widen the connecting channel, allowing the water and larval razorback suckers to enter the preserve, floating through a control gate and into the central pond. After several months of safely growing in the preserve's pond, the more mature fish will be released back into the river's mainstem in early fall.

What is the goal for this project? Restore what has been disrupted on the river through years of human impacts, and re-establish a wild, self-sustaining population of an endangered species.

A River Forever Changed

More than 100 years ago, razorback suckers thrived throughout the Colorado River Basin, at home in the swift waters of the free-flowing rivers in seven states and Mexico. They often migrated hundreds of miles in one year and grew up to 3 feet in length. But then the Colorado River entered a new era: one of dam building, increasing water withdrawals and sport fish stocking. Like other native fish, the razorback suckers began to die off, veering toward extinction as the Colorado River's flows and habitats were altered. Climate change—and its deepening impacts on the entire Colorado River Basin—hasn't helped. Intensifying high temperatures and on-going low precipitation have caused river levels to drop steadily, with predictions even more dire for the future. "We used to say it's a drought," Taylor Hawes, TNC's Colorado River Program Director, told the Durango Herald last summer. "After 19 years, we can say this is a pattern and trend that is punctuated by super dry years like 2002 and 2018."

The sad reality is that for many native fish like the razorback sucker, the Colorado and its tributaries are drastically less livable.

It's a Hard-Knock Youth

Since 1991, when the razorback sucker was placed on the endangered species list, conservation partners and state and federal agencies have been working throughout the Colorado River Basin to bolster populations. One key challenge is getting the fish in the wild to survive past their larval and juvenile phases. For reproduction and the first year of life, razorback suckers need slow-moving, back-eddy waters—a type of habitat that has been dramatically reduced along the Colorado as dams change flow dynamics and invasive plants crop up along river banks. To make matters worse, over the past 100 years, more than 70 non-native fish species have been introduced into the Colorado River Basin, many as sport fish. These invasive species wreak havoc on the river's native ecosystem. Razorback sucker eggs and juveniles are easy prey for toothed non-native predators.

Discovery at the Matheson Preserve

A few years ago, at TNC's Scott M. Matheson Wetlands Preserve along the Colorado River near Moab, biologists made an exciting find while sampling for native fish. They uncovered a surprising number of wild-born razorback sucker larvae along the shoreline of the preserve. In fact, the scientists concluded the Matheson Preserve provides the only suitable nursery habitat for this species along 65 miles of the river. Encouraged by these findings, and the prospect that there could be a way to help these fish reach adulthood in the wild, TNC joined forces with the Utah Division of Wildlife Resources, Jones and DeMille Engineering, and PE Engineering to transform the preserve's central pond into a protective nursery habitat for the fish.

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Creative Engineering

Inspired by a similar effort on the middle Green River near Jensen, Utah, the team of scientists and engineers developed a plan to modify a portion of the preserve's wetlands by widening an existing channel from the Colorado River to the preserve's central pond. This will allow more water into the preserve during spring runoff—the time when the larvae need a safe place to grow.

Engineers have designed a control structure to channel both the water and the razorback larvae into the preserve. They are also exploring strategies to bring in alternative water sources to ensure the baby fish have enough good quality water during their three-month stay.

PHOTO BY MORGAN JACOBSEN, SERO, UDWR

Excavator widening a wetland connecting channel

"This unique control structure will be the key to our success," said Ryan Jolley, PE Engineering Project Manager. "It will have a specially designed concrete channel with a control gate and screen system that will only allow larval fish to pass while keeping larger non-native predatory fish from entering. The structure will also have a fish capture area where the young fish can be measured and tagged before being released back to the Colorado River."

Prior to the introduction of any razorback sucker larvae, the team will drain the preserve's central pond to remove non-native fish that entered the wetland as larvae during the previous year. Large machinery will also deepen the pond to provide more habitat and optimize water quality.

Scott Durst & Nathan Franssen Named 2018 Researchers of the Year

By **Melissa Mata,** *San Juan River Basin Recovery Implementation Program*

Scott Durst, Science Coordinator and Nathan Franssen, Fish and Wildlife Biologist were selected as the 2018 San Juan River Recovery Program Researchers of the Year. Both have been instrumental in improving the San Juan River Basin Recovery Implementation Program's progress toward recovering Colorado pikeminnow and razorback sucker populations. They have been the drivers in emphasizing the need for annual data integration and analyses, cross project coordination, and appropriate study design to answer specific biological questions to make better informed management decisions. Their work has been documented in over a dozen scientific journal publications since 2006. Through these publications, their exemplary efforts in research, collaboration and leadership, have improved future efforts not only along the San Juan River, but other areas where the species are (or could be) present.

PHOTO BY USFWS

Nathan Franssen and Scott Durst

Mike Gross & Zane Olsen Named 2019 Researchers of the Year

By **Melanie Fischer,** *UpperColorado River Endangered Fish Recovery Program*

Mike Gross, USFWS and Zane Olsen, Utah Division of Wildlife Resources were selected as the 2019 Upper Colorado River Recovery Program Researchers of the Year. Both have been instrumental in improving the health of hatchery raised endangered fish. They both have the ability to distill complex scientific information and communicate it to the general public in a way that can easily be understood. Their individual outreach work reaches thousands of people each year. Mike Gross spearheaded the effort to put an aquaculture facility inside Palisade High School in Palisade, CO. Mike's work helped to unite a community in support of endangered fish recovery. His work engages thousands of students in the Grand Valley each year. Zane Olsen attends trade shows and stakeholder meetings bringing live bonytail. His contagious enthusiasm for conservation affords him the opportunity to engage water users and other stakeholders with solid reasons as to why native fish conservation is important to the health of the Colorado River system. Through their collective efforts, they help to meet the goals of the Recovery Programs and their partners.

PHOTO BY USFWS

Paul Badame & Zane Olsen

PHOTO BY USFWS

Dale Ryden, Melanie Fischer & Mike Gross

Palisade High School Fish Hatchery Project: A Student Perspective

By **Michael Gross,** *USFWS*

Every project, no matter the scale or the impact, takes true grit and perseverance to see through. The development of a hatchery at Palisade High School (PHS) is no exception. A dedicated group of students and teachers planned and raised money to make the hatchery a reality.

Last year's seniors: Kaleb Hawkins, Isabelle Haderlie, and Emily Tucker, raised more than $3,000 by donating scholarships they were awarded and selling peaches to help fund the project. In addition, they were instrumental in establishing relationships with many of the donors and organizations that committed to the PHS Fish Hatchery project.

This year's seniors: Levi Van Pelt, James Soria, and Dyllon Hoaglund, played a major role in recruiting younger students to create a legacy project. They also acted as public liaisons to develop public relations and secure the additional $35,000 in funding that enabled the fish hatchery's construction and maintenance to begin.

"This project has meant so much more to me than a simple service project," says Van Pelt. "Through my work on the Palisade High School Fish Hatchery, I have been able to truly act on the ideals of the International Baccalaureate Program, not only working to improve my local community, but embodying the ideals of altruism while making a substantial difference to address global challenges. This project has allowed all of us working on it to address the global issues of water scarcity, biodiversity, and the education that surrounds both of them, and make an actual impact in changing them. With a strong passion for environmental science and the goal to expand my education through collegiate studies, this project has provided me with an opportunity to make headway into something that falls in-line with what I plan to pursue as a career field, environmental studies and sustainability."

The dedication displayed by PHS students is evidence of the collaboration and excitement that has made this project a profound success. "The passion behind this project originates with education and environmental protection. To have the ability to encompass both in a single venture is an outstanding feat that has made me so proud to be a part of this community," says Hoaglund. "Palisade's academic and nurturing culture has had an amazing effect on its students, and it has been evident throughout this project." This project is, and will continue to be, a prodigious addition to Palisade High School and the rest of the district, where environmental education will continue to thrive and develop.

Isabelle Haderlie and Kaleb Hawkins, former Palisade High School (PHS) students, sell peaches to raise money for the PHS Fish Hatchery project. They raised $1,500 by selling peaches and donating scholarship money.

Pictured from left to right: Patrick Steele, PHS science teacher, Levi Van Pelt and James Soria, PHS students, and Mike Gross, USFWS, hold four endangered fish raised at the Ouray National Fish Hatchery, Grand Junction, CO

The Piute Farms Waterfall; Options for Solving the Fish Passage Problem

By **Mark McKinstry**, *U.S. Bureau of Reclamation*, **Casey Pennock**, *Kansas State University*, **Eliza Gilbert,** *USFWS*, **Chuck Cathcart,** *Alaska Dept. of Fish and Game*, and **Peter MacKinnon,** *Utah State University*

The Piute Farms Waterfall, located just upstream of Lake Powell on the San Juan River, has prevented movement of endangered razorback sucker and Colorado pikeminnow back upstream to the San Juan River almost continuously since 2001 and may have done so even earlier. The waterfall is not a historically natural feature of the San Juan River. Rather, it was formed through superimposition: the river moved out of its original channel and cut a new channel through the lakebed sediments, eventually hitting a sandstone ledge that formed the approximately 18-foot waterfall. In March of 2015, a single submersible PIT tag antenna was placed in an eddy just below the Piute Farms Waterfall. During the next three months over 600 individual endangered fish were detected. From 2015-2018, a total of 1,625 unique fish have been detected at this site, including 1,377 razorback sucker, 63 Colorado pikeminnow, and 19 flannelmouth sucker. These are significant numbers when one considers that 4,000 razorback sucker are required to meet recovery goals in the San Juan River and the 2016 estimated population of adult Colorado pikeminnow was 133.

The majority of the razorback sucker are 4+ years old, suggesting they are attempting to move into the river to spawn. In addition, 17 of the razorback sucker were stocked in the Gunnison, Green, and Colorado rivers, suggesting that razorback sucker move much further than originally thought, and that Lake Powell is not an insurmountable barrier for this species. In fact, additional work by the USFWS and UDWR suggests that Lake Powell may provide essential habitat for at least the adult life-stage of these fish.

When the issue of the Piute Farms Waterfall is brought up many people comment that it should be "blown up" with explosives. This seems simple and feasible, but upon further inspection is not that simple. Removing the waterfall would allow free passage of nonnative fish to the San Juan River, a risk that may be more than the reward. Furthermore, removing the waterfall might require a large excavation project since the sandstone ledge likely extends hundreds of meters upstream. Other solutions have been proposed including: restoring the river to the old channel, constructing a selective fish passage, continuing to trap and transport fish from below the falls upstream, altering habitat below the waterfall to provide spawning habitat for fish that are trapped there, and ignoring the issue. All of these solutions have pros and cons but none are easy, especially considering the remote location of the waterfall, nor will the solution be cheap. The SJRIP is currently investigating various fish passage options at the waterfall to support the endangered species.

Chris Cheek, displays an endangered razorback sucker captured below the Piute Farms Waterfall, which is in the background.

Mark McKinstry, holds a striped bass and walleye, two of many nonnative fish captured below the Piute Farms Waterfall (in far background)

ALL PHOTOS BY MARK MCKINSTRY, BOR

Casey Pennock (oaring), and Nate Cathcart (netting) capture native and nonnative fish in the eddy below the Piute Farms Waterfall.

The Redlands Diversion Dam 1996-2018, Reconnecting Habitat

By **T.A. Francis,** *USFWS*

In Western Colorado, the upper ends of the Grand Valley have four dams (Government Highline Roller Dam {GVWU}, Price Stubb, and Grand Valley Irrigation Company Dam {GVIC} on the Colorado River and Redlands Diversion Dam on the Gunnison River) that have provided water annually to the residents of the Grand Valley since the early 1900s. These diversions have been paramount in developing these communities; however, they have also negatively impacted native fishes that call these rivers home by disconnecting over 100 miles of habitat and altering natural flows downstream of the diversions. Beginning in the 1990's, the Upper Colorado River Endangered Fish Recovery Program partnered up with water user groups and built passages at each of these facilities. The 2 facilities furthest upstream (GVWU and Redlands Diversion Dam) have fish traps so non-native fish can be sorted from native fish and the remaining two (Price Stubb and GVIC) are "pass through" facilities where all fish can make passage. Redlands passage was opened in 1996 and much attention was given to it by the local media because of the costs associated with providing passage to "rough fish" (fish that some people consider less desirable as sport and table fare). Unfortunately, the big news from 1996 was that only one endangered Colorado pikeminnow made passage at a cost of one million dollars. Nowhere in the articles and editorials published in 1996 was it mentioned that passage was given to another 7,885 native fishes which included roundtail chub, flannelmouth sucker, bluehead sucker and mountain whitefish.

Fast-forward to 2018, an annual record number of adult Colorado pikeminnow (n=39) made passage from the end of June through end of August. Surprisingly, flows immediately below the fish passage last year were among the lowest on record. This reach had riffles that would have made it difficult to get your ankles wet when walking across the entirety of the river – and these fish likely had their bodies exposed to the air. Yet, they made the trek during a time of year when they were most likely looking for good foraging habitat as their spawning season typically ends toward the latter part of June.

After 23 years of operation we can report 226 fish trap captures of 201 individual pikeminnow (*Figure 1*). Twenty-five (12%) of those fish are repeat users of the facility, 19 were re-encountered in future years and 6 were re-encountered during the same year. We began translocating Colorado pikeminnow further upstream in 2015, to hopefully aid in long term retention of fish in the Gunnison River. Prior to this operational change, only one Colorado pikeminnow was re-encountered in the Gunnison River above Redlands Diversion Dam in a future year (after making passage). This fish made passage in 1998, was collected at Gunnison RM 8.2 in 1999, and was collected again in the Gunnison River at RM 25.3 in 2000. This same fish was collected in 2001 in the Green River only to return and be re-encountered in the Colorado River each year from 2003-2005. Even after implementing translocation of fish in 2015, only the previously mentioned fish has been re-encountered in the Gunnison River above the Dam during a future year. However, 135 (67%) of the fish that have made passage have not been re-encountered and some of these fish may have remained in the Gunnison River above Redlands Diversion Dam evading detection. Only two electrofishing passes occur each year in the Gunnison River since 2011, and only one antenna array (deployed and managed by Kevin Thompson, Colorado Parks and Wildlife) is in the system in Roubideau Creek. Therefore, evading detection or capture is possible. After 23 years of operation, I believe the following graph's data speaks for itself when answering the question "Is it worth it?"

For more information, contact Travis Francis, 970-628-7204, travis_francis@fws.gov

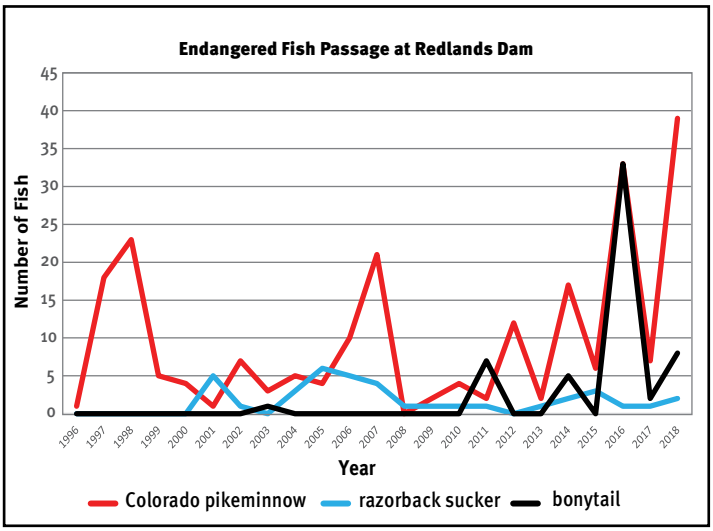


Figure 1. Total number of endangered fish that made passage at Redlands Fish Passage from 1998-2018. Note – these are encounters not individuals, some fish made multiple passages.

PHOTO BY T.A. FRANCIS, USFWS

From 1996–2018 a total of 161,538 native fish passed through the Redlands Diversion Dam.

CPW's Fishing Tournaments Offer Fun, Education and Participation

By **Mike Porras**, *Colorado Parks and Wildlife*

To encourage angler harvest of two non-native predatory fish species, Colorado Parks and Wildlife created two annual fishing tournaments on the state's Western Slope, one at Ridgway Reservoir (Uncompahgre River) beginning in 2015, the other at Elkhead Reservoir (Yampa River) the following year.

Ridgway Reservoir holds a large population of smallmouth bass. Elkhead Reservoir, located near the town of Craig, also supports a sizable population of smallmouth bass in addition to northern pike. Both non-native fish species compete with and prey on Colorado's native fishes that exist downstream of both reservoirs.

With the possibility of going home with big prizes on their minds, many anglers have participated in the free tournaments each year, catching and removing several thousand smallmouth bass and northern pike. Based on responses, a clear majority of anglers have had a great experience during the tournaments. Several have gone home with cash prizes and other rewards for catching tagged fish, catching the most fish, the largest fish and even the smallest fish.

The annual tournaments have several goals; suppress populations of non-native predators, provide outstanding outdoor recreation, educate the public about non-native fish concerns, and involve anglers with native fish conservation. On each count, CPW says the tournaments have been effective and have so far precluded the need for additional rigorous, management actions considered unpalatable by many anglers, although those options remain on the table.

According to CPW's Southwest Region Senior Aquatic Biologist John Alves, contestants removed 1,439 smallmouth bass during the nearly month-long tournament at Ridgway Reservoir last year. Prior to the tournament's inaugural year in 2015, an estimated 3,632 smallmouth existed in the reservoir; however, current population estimates are 1,511 - a 58% reduction.

Lori Martin, CPW's Northwest Region Senior Aquatic Biologist reports 269 anglers removed 540 smallmouth bass and 319 northern pike during last year's tournament at Elkhead Reservoir. Smallmouth bass ranged in size from three to 19 inches, and northern pike ranged in size from nine to 41 inches.

In 2017, 332 anglers at Elkhead Reservoir harvested 963 smallmouth bass and 395 northern pike. In 2016, the inaugural year of the Elkhead Reservoir Fishing Classic, 57 anglers harvested 529 smallmouth bass and 53 northern pike.

In 2019, Ridgway's Smallmouth Bass Classic is scheduled from July 6-27, and the Elkhead Fishing Classic will take place June 22-30.

PHOTO BY CPW

PHOTO BY CPW

PHOTO BY CPW

YES - Compatible Sportfish can be stocked in reservoirs

BLACK CRAPPIE

YELLOW PERCH

BLUEGILL

RAINBOW TRUTH

KOKANEE

BROWN TRUTH

LARGEMOUTH BASS

WALLEYE (STERILE FISH)

HYBRID STRIPED BASS (STERILE FISH)

...and many others!

NO - Incompatible Sportfish cannot be stocked in reservoirs

SMALLMOUTH BASS

WALLEYE (FERTILE FISH)

NORTHERN PIKE

BURBOT

Walleye Invasion of the Upper Colorado River Basin

By **Tildon Jones,** *Upper Colorado River Endangered Fish Recovery Program*

Walleye are a large-bodied fish that primarily prey upon other fish species. They are recognizable for their large eyes, mouth full of teeth, and large, spiny dorsal fin. Walleye are not native to the Colorado River basin. The species is a desirable sport fish with a reputation as an excellent food fish. As such, the species has been introduced into reservoirs, both by state agencies and through illegal stocking. Lake Powell, the downstream reservoir into which the upper basin drains, has had a walleye population since it began filling in the 1960s.

Walleye were generally considered rare in the Green and Colorado rivers until around 2010. At that time, numbers of the fish increased until reaching a peak for both basins in 2013. Biologists believe the expansion corresponded to increasing numbers of gizzard shad, a preferred prey species for walleye. Gizzard shad numbers rose in Lake Powell, and the species began moving upstream into the rivers. In response, walleye populations multiplied in the lake and started following their prey upstream. Once upstream, walleye also prey upon native species, which lack heavy scales and spines for defense.

Walleye numbers in the Green and Colorado rivers have been highest in the lower reaches, which are also important nursery habitat for Colorado pikeminnow and razorback sucker. Larvae and young-of-year fish of both species drift into these reaches and use backwaters and other habitats sheltered from the river's current to feed and grow quickly. The presence of high densities of large, toothy predators in these same reaches presents obvious risks to these small, young native fishes. The young fish in these lower reaches also move upstream to contribute to populations throughout the basin as they grow into adults. As a result, losing young fish to predation in the nursery reaches can influence the population river-wide.

Partners in the Recovery Program have implemented containment actions including in-river removal, reservoir renovation, and screening of source populations. Throughout the Green and Colorado rivers, field crews remove walleye whenever they are encountered. After an illicit introduction of walleye into Red Fleet Reservoir near Vernal, UT, Utah Division of Wildlife Resources mounted a rotenone project to eliminate this source population. As a preventative measure, they have reintroduced sterile triploid walleye to the reservoir, and are in the process of installing a screen to prevent escapement. Other reservoirs with walleye have also been screened, including Rifle Gap near Rifle, CO and Starvation Reservoir in Utah. The measures help reduce the risks of walleye escaping into river systems while still providing anglers with the opportunity to fish for the species.

Want to help? Just go fishing! Remember to keep all size classes of walleye, smallmouth bass and northern pike you encounter in the upper Colorado River basin.

PHOTO © KEVIN BESTGEN

PHOTO BY T.A. FRANCIS, USFWS

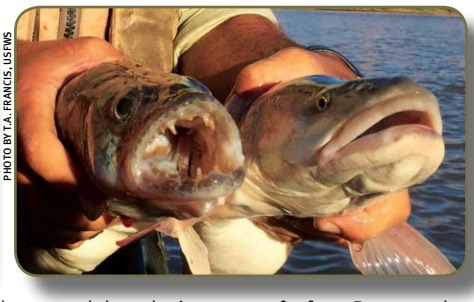


PHOTO BY T.A. FRANCIS, USFWS

Colorado pikeminnow can live to be 40 years old and can reach lengths in excess of 4 feet. Because they are long lived fish, they are not mature enough to spawn until they are 7-8 years old. In the far left picture, you can see the size disparity between a young Colorado pikeminnow and an adult walleye. The young pikeminnow is easy prey for this top line predator. In the center picture, please note the sharp teeth of the walleye and the hard lips of the adult Colorado pikeminnow. A fish can eat another fish up to two-thirds of its size. At this point, the adult Colorado pikeminnow is too large for the toothy walleye. Colorado pikeminnow are vulnerable to predation by walleye up to 3 years old. In the far right picture, a biologist is holding a walleye that was captured in critical habitat of the Colorado pikeminnow.

Estimating Population Size of Razorback Sucker Dwelling in the San Juan River-Lake Powell Inflow Area

By **Casey Pennock & Keith Gido,** *Kansas State University (KSU),* **Darek Elverud & Travis Francis,** *US Fish & Wildlife Service (USFWS),* **Mark McKinstry**, *Bureau of Reclamation (BOR)*

It's a 60-mile boat ride to our Lake Powell base camp. All four boats are loaded to the brim with enough personal gear, food, and gasoline to get us through the next week of work. The "whale", a boat previously set up for trawling, causes the ride to take up to 4 hours because it is carrying so much weight. Spirits are high, though we know we'll make this trip two more times over the next month and other crew members will make it every week for eight straight weeks.

Since 2011, researchers from Utah Department of Wildlife Resources (UDWR) and USFWS have been making these trips to sample the San Juan River-Lake Powell (SJR-LP) inflow area to document endangered razorback sucker. In May 2018, KSU, USFWS, BOR, and UDWR combined efforts to estimate the population size of razorback sucker using the SJR-LP area. For three weeks, we set nets across ~25 miles of shoreline capturing 2,567 fish (*Figure 1*) and estimated the population size of tagged razorback sucker using a combination of acoustic telemetry receivers and traditional mark-recapture techniques.

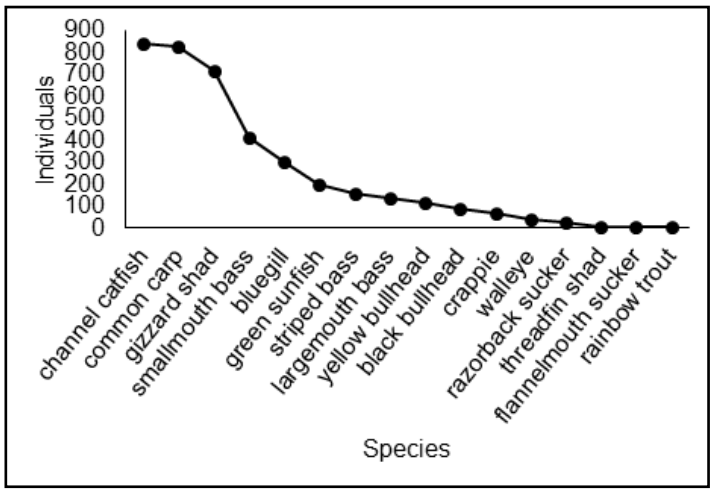


Figure 1: Razorback sucker were the 13th most abundant species. We captured 28 unique fish, eight out of a single net in addition to ~500 lbs of common carp.

From our work, we estimated the minimum population size of razorback sucker in May 2018 to be 499 with a possible range of 103-895 individuals. This estimate was similar to those using data from additional sampling efforts by USFWS and UDWR.

In a more upstream portion of the SJR-LP, an impassable waterfall has been present since 2001. During a different effort in February and March 2017, we estimated the minimum population here below the waterfall to be 755 individuals (Cathcart et al. 2018, in River Research and Applications).Together these minimum seasonal estimates and the detection of a total of 1,377 unique individuals below the waterfall from 2015-2018, suggest the SJR-LP supports a substantial number of razorback sucker and presents an interesting opportunity for managers. In the San Juan River upstream of the waterfall, population estimates in 2015 were 2,300-4,000. Allowing passage upstream of the waterfall could allow a substantial number of reproductively active fish to enter the upper river and contribute to spawning. More larvae in the upper river could lead to greater population capacity.

The potential conservation value of reservoirs for native fish is generally under-studied, but river-reservoir inflow areas such as SJR-LP could provide high quality habitats (e.g., high turbidity, abundant food, warm temperature, and slow velocity) not typical in contemporary river reaches throughout the Colorado River Basin. Thus, another consideration is to manage the population of Lake Powell-dwelling razorback sucker. If the SJR-LP provides adequate habitat then perhaps it is time to consider stocking these inflow areas with larvae or juvenile fish. The threat of non-native fishes is hard to ignore, but complex habitat (e.g., submerged riparian vegetation, gradients of turbidity) available in river-reservoir inflows might afford stocked fish adequate protection. Until options like those mentioned above are researched thoroughly, it is difficult to assess the true potential of areas like SJR-LP to recovery of fish such as the razorback sucker.

A razorback sucker collected during trammel netting efforts in Lake Powell.

Turbid water from river inflows coupled with submerged vegetation might provide refugia from non-native fish predators.

PHOTOS © CASEY PANNOCK, KSU

Hydropower Plants Turn Water into Power

By **Kevon Storie,** *Western Area Power Administration (WAPA)*

From processing food to providing energy for factories and plants to powering cities, people have harnessed rushing water to grow civilizations for thousands of years. Today, flowing water turns turbines in hydroelectric plants to supply 7 percent of the nation's electricity with an environmentally clean, renewable and economical energy source.

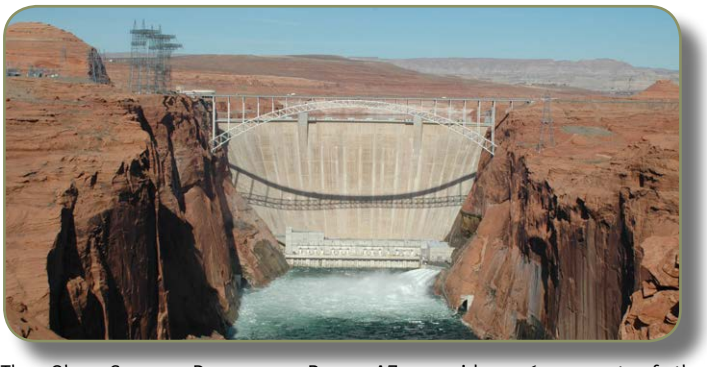


PHOTO BY WESTERN POWER ADMINISTRATION

The Glen Canyon Dam near Page, AZ, provides 76 percent of the generated energy to the 157 customers of the Colorado River Storage Project Management Center. WAPA staff assist the Glen Canyon Dam Adaptive Management Program with experiments focused on improving the health of the Colorado River below Glen Canyon Dam for the benefit of all the river's users.

From Rivers to Electricity

Rain and melting snowpack fill rivers and rivers flow to oceans. As water flows, it becomes a source of kinetic energy, the energy of motion. There are two types of hydropower plants that convert energy into electricity. The first is a run-of-the-river plant that uses little or no stored water to provide flow through the turbines. Seasonal changes in stream or river flow and weather conditions affect the plant's output. The second type, a storage plant or dam, offers a more constant supply of electricity. A dam on the river stores the water flowing down from the mountains, creating a reservoir. This manmade lake acts much like a battery, holding the power of water in reserve.

To generate power, water falls to a lower elevation, releasing its stored energy. The energy-producing potential of a hydropower plant depends on the difference in elevation between the reservoir (forebay) and the water below the dam (tailwater) and the volume of water available for release. The greater the volume of water stored in the reservoir and the greater the difference in elevation, the more potential for energy production.

The difference between these elevations is called head. Dams are divided into three categories:

- **High-head (800 or more feet)**
- **Medium-head (100 to 800 feet)**
- **Low-head (100 feet or less)**

Some plants may operate as a medium-head plant part of the year and as a low-head plant other parts of the year, depending on the amount of rainfall and snowmelt.

As energy is needed for power generation, water stored behind the dam is released through a penstock, or tunnel, to a turbine-driven generator below the dam. The turbine converts falling water into mechanical energy when the force of water spins the turbine blades, which, in turn, drive a rotor, the moving part of a generator. The rotor contains coils of wire wound on an iron frame to create a strong magnetic field. As the rotor's magnetic field sweeps past the generator's stationary coil, it converts mechanical energy into electrical energy.

After the water passes over the turbine blades, it exits through an exhaust structure under the turbine called the draft tube. The water then flows back into the riverbed in an area called the tailrace or afterbay and on down the river.

From Powerplant to Consumers

Electricity exits the powerplant through power lines to a substation, which feeds the electricity into the transmission grid, where WAPA takes over from the Bureau of Reclamation.

WAPA delivers hydropower from 12 powerplants in the Upper Colorado River Basin across more than 2,000 miles of transmission line. High-voltage transmission lines act much like a highway system. Instead of cars, the lines carry electrical energy from hydropower, wind farms, fossil fuel and nuclear plants and other generators to local utilities across the country. These utilities distribute electricity to homes and businesses.

From Power Provider to Environmental Partner

Dams offer many benefits that other forms of generation do not. In addition to being a source of safe, economical, renewable electricity, dams regulate rivers for navigation, provide flood control and store water for irrigation and domestic supplies. Dams can improve downstream conditions by allowing mud and other debris to settle out. Reservoirs have scenic and recreation value for campers, fishing enthusiasts and those who enjoy water sports.

The water is also home to fish and wildlife, and WAPA has participated in many innovative programs in recent years to ensure that hydropower generation protects sensitive downstream habitats. For example, fish screens have been added to prevent fish from swimming through dam turbines, and fish ladders have been constructed to assist native fish in navigating rivers. The Recovery Program has been a valuable partner in WAPA's continuous search for innovative ways to protect the hundreds of plant and animal species that depend on the rivers, lands and reservoirs.

Program Partner Collaboration Eases the Pain of a Bad Water Year

By **Don Anderson,** *Upper Colorado River Endangered Fish Recovery Program*

2018 was the kind of year that West Slope Colorado water users would just as soon forget. Disappointing winter snowpack was followed by hot and dry conditions that set in early and persisted for most of the irrigation season. The 2017-2018 Water Year was the warmest in 124 years of recorded Colorado history, and the second-driest. River flows dwindled and reservoirs were drawn down to alarmingly low levels.

Drought conditions threaten endangered fish recovery too. Low river flows and high water temperatures in early summer stress native fish by reducing their food base and forcing them to seek refuge in scarce pools and backwaters. Problematic non-native species like smallmouth bass get a jump-start under warm conditions. They eat young endangered fish, and grow to a size that promotes over-winter survival, allowing them to wreak more havoc in subsequent years.

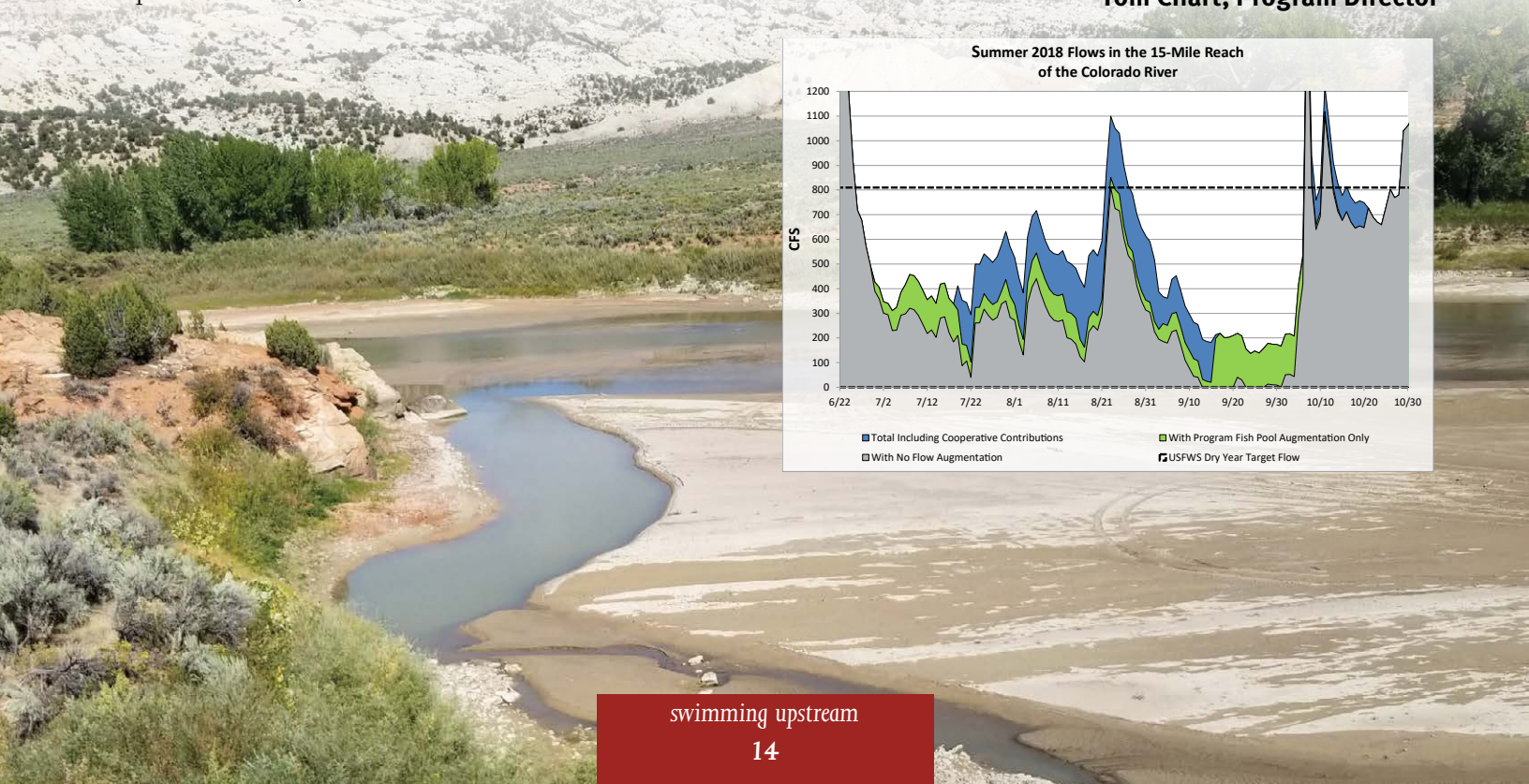
The Recovery Program accesses substantial amounts of water from reservoirs annually to boost flows for endangered fish during low-flow periods of the year. However, in years when augmentation water is most crucial, less is available. Thousands of acre-feet accessible in a "normal" year from West Slope reservoirs like Green Mountain and Ruedi are unavailable in very dry years. As a result, flow conditions for endangered fish grew particularly dire in 2018, especially in the lower Yampa River and in the '15-Mile Reach' of the Colorado River above the Gunnison River confluence.

The good news: Recovery Program partners stepped up to provide extraordinary support for maintaining instream flows for endangered fish in 2018. In the lower Yampa River basin, the Colorado River Water Conservation District (CRWCD) leased water from Elkhead Reservoir to help prevent the dismally low flow conditions in the lower Yampa from becoming worse. In the Colorado River above the 15-Mile Reach, multiple partners stepped up and voluntarily provided desperately needed water. The CRWCD advantageously timed their maintenance releases from Wolford Reservoir to provide maximum benefits for endangered fish. The Ute Water Conservancy District of Grand Junction leased their unused water in Ruedi Reservoir to support flows in the 15-Mile Reach. ExxonMobil subsidiary XTO Energy released their hold on 5,000 acre-feet of contract water in Ruedi Reservoir, enabling an equivalent amount to be released for endangered fish. The collective benefits of these multiple water contributions are illustrated in the accompanying graph – note that without these collaborative efforts, the 15-Mile Reach likely would have gone completely dry for approximately 12 days in late September and early October. Not good.

Others making these water deliveries possible included the Colorado Water Conservation Board, the U.S. Bureau of Reclamation, the Colorado State Engineer's Office, and agricultural water users like the Grand Valley Water Users Association and Orchard Mesa Irrigation District in Palisade, Colorado. The Recovery Program is fortunate to count these entities among its Program partners.

"Our public and private partners are amazing at coming up with instream flow solutions, even in drought years like this. Without their collective expertise and collaborative efforts, we'd struggle to find sufficient water for these fish."

Tom Chart, Program Director



Endangered species updates

PHOTO BY USFWS

An adult Colorado pikeminnow caught in the San Juan River.

Colorado pikeminnow

The US Fish and Wildlife Service office in Grand Junction began another three-year round of population estimates on the Colorado River for 2019-2021. Field crews conduct four to five trips in order to sample the river from the Grand Valley Project diversion dam through the Grand Valley to Westwater, and from Cisco to the confluence for a total of 182 miles of river. The Grand Junction office also monitors the Gunnison River for pikeminnow, and captured 39 fish using the Redlands fish ladder in 2018. This is the most pikeminnow at that facility since 1996.

PHOTO BY UDWR

Humpback chub encountered in Westwater on the Colorado River.

Humpback chub

Humpback chub prefer the deep and turbulent habitats found in the whitewater canyons of the Green and Colorado rivers. UDWR or USFWS crews completed population estimates for humpback chub in Westwater Canyon, Black Rocks and Cataract Canyons of the Colorado River in 2016 and 2017 and resumed estimates in Desolation Canyon (Green River) in 2018. Biologists reported strong numbers of young adults in all four locations. The USFWS has recommended that the humpback chub be downlisted from endangered to threatened based on the persistence of the upper basin populations and a larger population found in the lower basin in the Grand Canyon.

PHOTO BY UDWR

Zane Olsen holds a bonytail raised at UDWR's Wahwep Fish Hatchery in Big Water, Utah

Bonytail

Despite low survival of stocked bonytail, encounters have increased over the years. In 2018, USFWS crews captured an age-12 bonytail within miles of where it had been stocked almost 11 years prior by Utah Division of Wildlife Resources. While bonytail captures occur, over 95% of bonytail encounters are PIT tag antenna detections. In 2015-2018, Colorado Parks & Wildlife stocked 2,305 bonytail in Salt Creek: 520 have been detected while only one has been captured, with eight individuals detected beyond five months post release. An additional 118 bonytail were detected in Salt Creek that were originally stocked in the mainstem Colorado River.

PHOTO BY NPS

Close up of a razorback sucker.

Razorback sucker

Razorback sucker populations continue to expand throughout the Green, San Juan and Colorado basins, showing up in tributaries where they have not been seen before. After a dismal snowpack in 2018, which did not provide many floodplain connections, the flows in 2019 are expected to connect four managed floodplains along the Green River to entrain razorback sucker larvae. The floodplains provide warm, rich, predator-free environments for larval razorback sucker to thrive. In the San Juan River, sightings of record numbers of age-0 razorback sucker in 2018 and age-1 razorback sucker in spring of 2019 provide the first consistent signs of recruitment on a large scale.

PHOTO© MARK NEWELL III

Never in my Wildest Dreams

By **Janay Newell,** *Conservationist, Angler and Artist*

Every year, my husband and I go hunting for elk and mule deer antler shed while camping along the White River. In 2018, as we packed up, I baited and cast a line into the river hoping to catch a few bass to take home for dinner. First cast, I throw it across and WHAM, I get a huge hit and keep reeling and there's a giant huge fish on! It immediately took drag. The line kept zipping and I had to pull it around some huge snags and downstream towards the beach. My husband got behind the colossal fish as I pulled it toward the edge of the water. I was sure it was a big catfish but my husband said it wasn't. I felt all the fins for spines which it had none. I looked inside the mouth which had no teeth and was pure white inside. I held the fish in place in the water with just my thumb in the end of its mouth. Rather than teeth it felt as though his mouth was more beak-like with flesh over top. The mouth was large enough to fit a young mallard inside. The head was smooth and the body of the fish had beautiful pale gold reflecting smooth scale shapes that became more condensed and sparkly towards the tail. We tried to estimate the size and knew it was over 4 feet long. In the photograph I am holding the fish with my knee supporting it because its HEAVY and it would have been uncomfortable to the giant fish to be held with just two hands. I set it back in the water and enjoyed a little more time looking over this gorgeous Colorado pikeminnow as it gently swam away.

UCREFRP
PO BOX 25486
DENVER, CO 80225

HELP PREVENT THE SPREAD OF NONNATIVE SPECIES

CATCH & keep

SMALLMOUTH BASS

NORTHERN PIKE

WALLEYE

UTAH AND WYOMING HAVE
CATCH & KEEP
REGULATIONS. IT IS ILLEGAL TO RETURN THESE FISH TO THE RIVER.

One hundred years ago only 13 native species swam in the Upper Colorado River and its tributaries–today they have been joined by more than 50 nonnative species. Introduction and establishment of problematic nonnative predators affect native fishes, the Recovery Program, anglers, and local communities with high environmental and economic costs.

Removing illegally introduced species is expensive and time-consuming. We must all join forces to prevent the spread of these problematic nonnative predators in order to preserve native fish in the river and desirable sport fisheries in the reservoirs.

Review your state fishing regulations. State regulations may vary based on river mile and are the LAW. Regulations on the river may be **very different** than in reservoirs. **Know the law.**

http://cpw.state.co.us/Documents/RulesRegs/Brochure/fishing.pdf
https://wildlife.utah.gov/guidebooks/2019_fishing.pdf
https://wgfd.wyo.gov/Fishing-and-Boating/Fishing-Regulations
http://www.wildlife.state.nm.us/fishing/game-fish/