Utah’s Brad Anderson surveys the Stewart Lake wetland on September 27, 2016, nine days into the 1-month draining period.

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**Field Report 2016**

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

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**Program Coordinator’s Message**

*By Sharon Whitmore, Program Coordinator, San Juan River Basin Endangered Fish Recovery Program*

Four science-based programs manage native fish in the Colorado River Basin: the San Juan River Basin Recovery Implementation Program (San Juan Program); the Upper Colorado River Endangered Fish Recovery Program; the Glen Canyon Dam Adaptive Management Program; and the Lower Colorado River Multi-Species Conservation Program. Each has unique purposes, goals, and organizational structures, but they share the common goal to improve conditions for native species and habitat in compliance with the Endangered Species Act. Similarly, the programs face common challenges as well as challenges unique to each system.

The San Juan Program faces both management-related and science-related challenges. Management challenges include financial limitations; achieving target dates for downlisting and delisting; and attaining balance between implementing recovery actions, funding research to gain more information, and executing specific requirements of biological opinions.

We identified three science challenges and solutions in the San Juan Program: 1) **Nonnative fish removal:** endangered fish response has been ambiguous and we lack empirical evidence showing that expensive and time-consuming channel catfish removal efforts benefit the endangered fish. Some committee members disagree as to whether we should continue the removal. The Fish and Wildlife Service views nonnative fish as a serious threat and doesn’t want to take a risk by not removing them. To reduce uncertainty, a new study design was developed to measure cause and effect to inform decision-making. 2) **Flow management:** Plans to mimic the natural hydrograph per 1999 flow recommendations were impeded by a rigid implementation decision tree, Navajo Dam limitations, and frequent droughts. Habitat and species response to managed flow regimes has not been conclusive. In response, the San Juan Program reviewed and revised the flow recommendations and developed a more flexible process for Navajo Dam releases. Under this new process, the Program implemented a 48-day spring peak release in 2016. 3) **Range expansion:** Potential for range expansion into tributaries like the Animas River and Lake Powell raises questions such as: is expansion into these areas needed for recovery and can fish be supported, how do Lake Powell fish fit into recovery, and should something be done about the endangered fish below the Lake Powell waterfall? To address the questions, the San Juan Program installed remote Passive Integrated Transponder (PIT) tag readers to better track fish movement, an upper basin-wide database was developed, diversion structures in the San Juan and Animas river were assessed, fish from below the waterfall were relocated to the river, and stocking in the Animas is being investigated.

Despite our challenges, Colorado pikeminnow and razorback sucker numbers are increasing, population age structures are improving, larval collections show both species are reproducing, and we have evidence of recruitment. Densities of some nonnative species are decreased, habitat restoration is ongoing, flow management has improved, and endangered fish in Lake Powell are being assessed. It’s easy to focus on obstacles, but they are just stepping stones in the broader basin-wide effort to improve the status of the endangered fish and habitat conditions for the whole native fish community.
For many years, we have used stocking to increase populations of the Colorado pikeminnow and the razorback sucker in the San Juan River. For true recovery to occur, we need to document survival of wild fish from birth into adulthood. The San Juan Program is very excited about this year’s small-bodied monitoring results. Monitoring assesses the effects of management actions on survival of both native and nonnative fish from early life stages through adulthood. Specific objectives are to: (1) annually document occurrence and density of native and nonnative age-0/small-bodied fishes in the San Juan River; (2) document habitat use by young-of-year (age-0) Colorado pikeminnow, razorback sucker, and roundtail chub, as well as other native and nonnative fishes in the primary channel, secondary channels, and large backwaters; (3) obtain data that will aid in the evaluation of the responses of native and nonnative fishes to different flow regimes and other management actions; (4) track trends in native and nonnative species populations, and; (5) characterize patterns of habitat use by native and nonnative small-bodied fishes.

In 2015, the first confirmed age-0 Colorado pikeminnow was captured in the San Juan River since monitoring began in 1998. This fish was captured in a large backwater at river mile 133.5 and was 3/4 “ long. Subsequently in 2016, 23 age-0 Colorado pikeminnow were captured. Mike Ruhl and Matt Ziegler from New Mexico Department of Game and Fish, Nate Franssen and Scott Durst from the San Juan Program Office, and Eileen Henry from the U.S. Fish and Wildlife Service, found these fish between September 19 and 27, across eight sites from approximately 10 miles downstream of the Four Corners Bridge to a backwater at the mouth of Lime Creek. All fish were captured in similar low velocity backwaters.

“It was great to see so many young of year pikeminnow on this trip. It shows survival of early life stage individuals, but the San Juan Program still faces the challenge of documenting wild recruitment in the future,” says Science Coordinator, Scott Durst.

In an email to the San Juan Program regarding the discovery, Ziegler stated “The presence of these fish in the river provides a unique opportunity to learn about a class of wild spawned Colorado pikeminnow in the San Juan River.” The San Juan Program’s Biology Committee members responded to Ziegler’s email with excitement and ideas on how to move forward. Jason Davis, U.S. Fish and Wildlife Service, summed up many comments, “the collection of these 23 individuals may certainly be linked to the San Juan Programs augmentation efforts, but may also be highly influenced by the 2016 peak flow regime.”

A Banner Year at Stewart Lake and the Potential of Managed Wetlands for Endangered Fish Recovery

Endangered razorback suckers in the middle Green River have been replenished by intensive stocking of fish raised in hatcheries, and large numbers of these migratory fish, drawn by spring runoff flows, can be seen assembling at gravel bars in Dinosaur National Monument to spawn. Major advancements over the last decade have addressed the bottleneck to a self-sustaining wild population of razorback suckers: larval recruitment to juvenile life stages. By tailoring peak spring releases from Flaming Gorge dam to overlap with larval razorback sucker drift under the Larval Trigger Study Plan, flows have been high enough in recent years to connect the Green River to off-channel wetland nursery habitats for larval razorback sucker. Picket weirs and similar devices exclude most large-bodied nonnative fishes from certain wetlands, improving water quality and reducing the predation pressure on razorback sucker larvae during their most vulnerable first weeks. At Stewart Lake, a gated wetland near Jensen, Utah, managed by the Utah Division of Wildlife Resources (UDWR), these management practices have made possible releases of wild-spawned young-of-year razorback suckers to the Green River during annual autumn draining every year since 2013. This year, 2016, Stewart Lake produced more razorback suckers during draining in September and October than in the previous three years.

Wild Young-of-Year Colorado Pikeminnow in San Juan River

By Melissa Mata, San Juan River Basin Endangered Fish Recovery Program

A Banner Year at Stewart Lake and the Potential of Managed Wetlands for Endangered Fish Recovery

By Robert Schelly and Matthew Breen, Utah Division of Wildlife Resources
combined. Stewart Lake also holds great promise as spawning and conditioning habitat for the other two endangered fishes found in the alluvial reaches of the Green River, bonytail and Colorado pikeminnow.

In 2016, UDWR filled Stewart Lake from the Green River through a downstream (outlet) gate protected by a picket weir during the first two weeks of June, following detection of razorback sucker larvae in the outlet channel. Sustained high Yampa River flows, augmented by Green River Larval Trigger releases from Flaming Gorge dam, resulted in peak flows of over 20,000 cfs at Jensen in mid-June. After filling to capacity, supplemental water delivery helped maintain wetland depth and water quality during a three-month entrainment period. In mid-September, a picket weir leading to a fish trap was installed in the outlet channel, and draining began on September 19th. The goal was to sample all fishes larger than the 1 cm mesh size of the trap, releasing native fish to the Green River and removing nonnative fishes such as green sunfish and carp. Over the course of one month as the wetland drained, fish were sampled twice daily by dip-netting the trap.

This year’s results underscored the incredible potential of managed off-channel wetlands as nursery and conditioning habitat important to the recovery of three of the four endangered fish species. For the second consecutive year, hatchery-raised adult bonytail stocked in nearby river and floodplain habitats found their way into Stewart Lake and spawned during the entrainment period (23 PIT-tagged adults were sampled at draining). For the first time in decades, since the extirpation of naturally reproducing bonytail populations in the Green River, wetland-spawned young-of-year bonytail were recovered at the end of a summer’s entrainment and released to the river, having survived the predation pressures of small-bodied nonnative fishes to achieve sizes from 1.5-2.5” long. Nineteen such bonytail were sampled in 2015 and...
nine in 2016, and their identification was confirmed through both morphological and molecular analyses of 2015 samples by the Colorado State University Larval Fish Lab and the Southwestern Native Aquatic Resources and Recovery Center. Additionally, a number of age-1 Colorado pikeminnow from the large 2015 cohort, having survived their first winter in the river, circumvented the weir during filling to enter Stewart Lake, resulting in capture of 18 wetland-fattened juveniles (5-7” long) during the first weeks of draining. These fish were PIT-tagged and released to the Green River. Though assumed to have occurred historically, this is important documentation of wetland habitat use by juvenile pikeminnow.

Finally, 2016 was by far the most successful year to date under the Larval Trigger Study Plan for razorback suckers. This year’s Stewart Lake razorback sucker cohort was almost three times as large as that from 2014, the previous best. During the latter stages of draining, 2,105 wild-spawned razorback suckers (2.25-6.75” long;) and 5 PIT-tagged adults were sampled and returned to the Green River. Of these, 1,767 razorbacks were implanted with PIT tags, providing an unprecedented opportunity to monitor the growth and survival of a wild-spawned cohort via recaptures or remote detections by submersible antennas, which are being deployed in the Green River in increasing numbers. Taken together, the excellent results obtained in 2016 at Stewart Lake—as nursery habitat for razorback suckers and bonytail, and conditioning habitat for age-1 pikeminnow—offer an increasingly optimistic model for the role of managed wetlands in the recovery of endangered Colorado River Basin fishes.

Matthew J. Breen Presented Researcher of the Year Award

By Tom Chart, Upper Colorado River Endangered Fish Recovery Program

Matthew J. Breen was presented with the 2016 Researcher of the Year Award. Matt, as Colorado River Fish Project Leader in the Vernal, Utah office has demonstrated exemplary professionalism, strong leadership, and first rate skills as a researcher on big western rivers working with a unique assemblage of Colorado River fish. Some of Matt’s accomplishments include:

- **Research on age-0 Colorado pikeminnow** — Matt is responsible for significant contributions to the Program’s understanding factors affecting age-0 pikeminnow densities. Matt continues to champion efforts to reduce competition and predation of age-0 pikeminnow in Middle Green River backwater habitats.

- **Floodplain research at Stewart Lake and contributions to Larval Trigger Study Plan (LTSP) operations** — LTSP times water releases to coincide with the appearance of wild razorback sucker larvae. The increased flows move young fish into wetland habitats that are gated to prevent introduction of larger predatory nonnative fish. Matt was instrumental in the design at Stewart Lake that was required to support LTSP.

- **Nonnative Fish Management** — Matt (and his crews) provide valuable fishery science input to basinwide discussions on nonnative fish control specifically as it relates to this threat in the middle Green and White Rivers. Matt also recognizes the need to bring our science to the public. Matt’s outreach efforts in spring 2015 went above and beyond as he sought local Vernal fishermen who had happened on-to spawning aggregations of nonnative walleye in the Middle Green River. Matt saw an opportunity to team up with Gary Winterton (“Hooked on Utah: 5/03/15." Hooked on Utah. KUTV.com. CBS, KUTV, Salt Lake City, UT) to clearly and concisely turn this fledging sport fish story into one about why the Green River is for native fish and that the State of Utah will not tolerate walleye in the river.

Matt Breen, UDWR accepts the ROY award from David Speas, US Bureau.
Going with the Flow in the San Juan River

By Scott L. Durst and Nathan R. Franssen, San Juan River Basin Endangered Fish Recovery Program

Streamflow regulation and its effects on habitat are significant threats to endangered fishes in the Colorado River Basin. The reduction of high magnitude spring discharges following construction of large main-stem dams has been implicated in lowering channel and habitat complexity, reducing the quantity of spawning bars, and decreasing the availability and quality of backwater nursery habitats. In an effort to mitigate these deleterious effects, the San Juan Program implemented flow recommendations in 1999 to mimic a more natural hydrograph downstream of Navajo Dam in the San Juan River to benefit Colorado pikeminnow and razorback sucker.

The flow recommendations were originally implemented via a “decision tree” to attain flow benchmarks of specific magnitudes for certain durations in a given frequency based on a 65-year hydrologic record (1929-1993; Table 1). However, the two highest benchmarks (8,000 and 10,000 cfs) can only be attained if the Animas River, the San Juan River’s largest tributary, contributes sufficient flows in addition to the Navajo Dam discharge capacity (5,000 cfs). (Table 1).

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Table 1. The magnitude, prescribed duration, and frequency of the high-flow benchmarks from the San Juan River’s 1999 Flow Recommendations. The last column is the observed frequency of each benchmark between 1998 and 2015.

In response, the San Juan Program developed a new way to calculate the volume of water in Navajo Reservoir available to benefit endangered fish recovery in the San Juan River. Now, the volume of water in Navajo Reservoir in excess of an End of Water Year Storage Target (EWYST) elevation of 6,063 or 6,050 feet is deemed available for use by the San Juan Program. This also provides multi-year protection against shortages that are shared among San Juan River water users under extreme drought conditions. And releases are now only made if there is sufficient available water to release 5,000 cfs for a minimum of 21 days. In contrast, the original flow recommendations included prescriptions for 7, 14, 21, and 28-day releases. Forgoing 7 and 14 day releases allows for this water to be “banked” in favor of attaining more frequent longer duration releases in other years.

In 2016, it became apparent a spring peak release of at least 21 days would be possible and the San Juan Program outlined a specific plan. Following a five day ramp-up, peak release would be a minimum of 21 days at 5,000 cfs timed as best possible to match the Animas River peak flow to maximize discharge downstream. The release would then be terminated when the spring peak discharge from the Animas River was spent or when available water was depleted, whichever occurred first.

Dam discharge would then be diminished during a 12-day ramp-down until reaching target base flows of 500-1,000 cfs.

During the ramp-up, San Juan River flooding upstream of the Animas River caused structural damage to some properties and threatened others. Apparently the channel capacity of the San Juan River could not contain flows of such magnitude. Releases were curtailed to prevent further damage, but due to high spring discharge from the Animas River, even with the reduced release from Navajo Dam, one of the three higher-flow benchmarks was attained (Figure 1).

San Juan Program researchers working on the river during the 2016 field season reported substantial habitat changes along with strong reproductive output by both Colorado pikeminnow and razorback sucker, presumably in response to the long-duration release. While the curtailed releases provided benefits in 2016, more positive responses might have occurred if the full release from Navajo Dam had been attained. The San Juan Program is working with its partners to ensure future releases are not curtailed due to channel capacity and those releases can be made to their maximum potential for the benefit of endangered fish recovery.

![Figure 1. Stream discharge in the San Juan River (at 4 Corners), discharge from Navajo Dam, and natural spring snow-melt runoff in the Animas River in 2016. The three higher-flow benchmarks and the number of days the San Juan River experienced each are noted.](image-url)
The US Fish and Wildlife Service and the states of Utah and Colorado sponsor very popular native fish education programs in classrooms. “The razorback in the classroom project is a hands-on opportunity for students to raise endangered fish species in the classroom. The fields of study that it encompasses in our classroom are science, art, language arts, math, communication skills, and preservation and conservation of our local area.” said Ms. Jennie Biggs, 4th grade teacher, Vernal, Utah. The project starts in October with aquarium set-up, and stocking the tank with “fingerlings” or juvenile razorback suckers. The kids are visited by a species expert to talk about the razorback sucker during the school year. Most of the children are in the 4th grade, which is when they cover native species, endangered species, and ecosystems. In May, the fish are PIT tagged in the classroom. Just before the end of the school year, the students have a field trip to the river to release the fish.

Not every classroom can raise razorback suckers, but students are reached with the message of the importance of conservation of native species as part of a healthy river system in several other ways, too. In 2016, more than 1,700 school children were reached in various classrooms in Utah and Colorado and 720 students toured the Ouray National Fish Hatchery in Grand Junction, Colorado.

Please watch this exciting video from the National Park Service about this program. https://www.youtube.com/watch?v=NH0fjue3jQg&feature=youtu.be

For more information, please call 303-236-9881 or email upstream@fws.gov.

By Katherine Creighton, Utah Division of Wildlife Resources

DAY 1: MINER’S CABIN
13:00: Arrive at Site #1. Set up camp. Make lunch (Rueben’s—my favorite).
14:00: Zach and Matt take the electrofishing cataraft out to look for juvenile chubs that are too small to be captured via trammel nets. They also deploy a submersible PIT antenna to passively detect tagged fish.
15:00: Brian and Katie head out in the sport boat to set six trammel nets.
16:00: The crew patiently waits as the nets set for the first two hours. It’s been three years since we’ve sampled Westwater Canyon to estimate the population size of humpback and roundtail chub and we’re eager to see these fish again and get a feel for how they’ve been doing since we last visited.
17:00: Jonathan and Nate leave on the first net check.
17:45: Something must be wrong. Usually it takes just an hour to check 4-6 nets but they are still on Net #2.
18:00: Finally they finish the second net. Only when they begin to motor back to camp can we see their excited grins. As the boat hits shore, water sloshes out of the livewell and we can see backs of 30 roundtail and humpback chubs! We transfer the fish from the boat to an aerated holding tank on shore so the net crew can head back out and check and re-set the remaining nets. On shore we weigh and measure the fish, scan for a tag, implant PIT tags, take fin clips for genetic analysis, count fin rays, and release the fish.
19:00: We are still measuring and tagging fish from the first net check when the second net check heads out. We take turns working up fish and checking nets every two hours until midnight.
19:30: Nate (tonight’s chef) breaks to cook dinner: bison burgers with dutch oven potatoes and salad from his garden. We inhale food in the spare seconds between working on fish. This is some varsity-level fish squeezing!
00:20: The last chub is released. We sleepwalk to our tents.

DAY 2: MINER’S CABIN
07:00: First morning net checkers head out. The rest of the crew is up when they return to help work up fish, make coffee and breakfast (huevos rancheros this morning). Nets will be checked every two hours again this morning.
11:00: Nets are checked and then pulled for a midday break (for us and the chubs).
14:00: Electrofishing crew heads out. Repeat Day 1.

DAYS 3–7: UPPER COUGAR, LITTLE HOLE, HADES:
We move camp a few miles every two days to our downstream sites. More nets, more chubs, more grins, more food. Repeat.

DAY 8: RAPID DAY AND TAKE-OUT
11:00: By the time the last nets are pulled on the morning of Day 8, a rare quiet has rolled into camp. The characteristically boisterous crew is preparing for their last big challenge of the trip: running the rapids. After the boats are rigged, the straps are tightened and re-tightened, superstitions and pre-rapid rituals are tended to, we take a deep breath, and push silently into the canyon.
11:45: A chorus of excited whoops fills the canyon as the last raft successfully clears the massive hole in Skull Rapid. Adrenaline is high, boats are wet, and smiles are wide!
19:00: Trucks and trailers pull into the warehouse back in Moab and six grubby fish biologists and technicians pile out. Later that night but embarrassingly early: We fall into our beds exhausted, close our eyes and dream of the next time we get to see those fascinating little creatures. Luckily we won’t have to wait three years this time; that next 5 am shift will come soon enough.
few people that inhabit the vast watershed of the Upper Colorado River and its tributaries understand the plight of the four endangered fish species native to the area. While a few may learn about the fish by visiting an endangered species hatchery (there are four hatcheries in the basin available for tours), only a small percentage do so. Consequently, if the people can’t be brought to the fish, the fish have to be brought to the people.

Enter the Utah Field House of Natural History, complete with a large garden pond and an education curator eager to tell this story. While this combination may seem all that is necessary, two large hurdles stood in the way: a leaky pond that would take thousands of dollars and hundreds of hours to fix, and the administrative support necessary to get it done.

With a little help from the southeast region manager and crew of Utah State Parks — whose motto is “the impossible just takes a bit longer”, the vision became a reality. And the local community stepped up to the plate and supported the project by giving homes to the hundreds of goldfish and the few koi that formerly lived in the pond.

Now the museum’s pond holds razorback suckers and bonytail who will be “meeting” people from all over the world on a daily basis (the museum averages about 50,000 visitors per year). Visitors will be able to view the fish directly as well as educate themselves through exhibits about the life history of the fish and measures being implemented to ensure their survival. This project evolved as a cooperative effort between the U.S. Fish and Wildlife Service and Utah State Parks.

New Sportfish Doing Well in Red Fleet Reservoir
By Tonya Kieffer, Utah Division of Wildlife Resources

Biologists with the Utah Division of Wildlife Resources (UDWR) have good news to report: after two nights of electroshocking and using gill nets to capture fish in Red Fleet Reservoir, fish stocked in the reservoir over the past several months are doing well.

In October 2015, the reservoir was treated with rotenone to remove fertile walleye that someone placed in the reservoir illegally. Fertile walleye pose a threat to endangered fish that live below the reservoir, in the Green River because the walleye can escape over the dam when the reservoir spills. Rotenone kills all of the fish in the reservoir, giving biologists a chance to create a brand new sport fishery that is compatible with recovery efforts.

UDWR hatchery personnel began stocking fish in the reservoir last fall immediately after the rotenone treatment and continued through the spring. As Natalie Boren and other biologists put their boats on the water during the first week in August, they were excited—and a little nervous—about what they might find. “It was apparent that the 1,000 yellow perch we caught at Fish Lake, and transferred to Red Fleet, had produced thousands of offspring,” says Boren. “We were also impressed with how the wipers (sterile hybrid striped bass) are doing. When stocked in April, they were 10 inches long. Now, just three months later, they’ve grown to 14½ inches.” Good numbers of black crappie, Colorado River cutthroat trout, and tiger trout were also observed. Sterile walleye fry were found in all of the survey locations across the lake.

Three of the seven fish that have been stocked in the reservoir—walleye, wipers (a cross between a striped bass and a white bass) and tiger trout (a cross between a brown trout and a brook trout) are sterile—they can’t reproduce. (You can read more about the sterilization process at www.wildlife.utah.gov/blog/2016/stocking-sterile-fish). Sterile fish are a win-win for anglers and biologists. “They give anglers a chance to catch a top predator while allowing us to control the size of the predator population through restocking,” Boren says. “We don’t have to worry about the predator population reproducing and getting too large for its forage base.”

All seven of the fish species introduced to the water, as part of the Red Fleet Management Plan, were successfully accounted for during the two-night survey. “We observed a wide variety and wide distribution of many of the species stocked,” she says. “It was exciting to see.” To learn more about sportfish stocked at Redfleet Reservoir, watch this video: http://www.ksl.com/?nid=1112&sid=39654696

If you have questions about fishing at Red Fleet Reservoir, call the DWR’s Northeastern Region office at 435-781-9453.
Because certain nonnative fish can have a large impact on native species in the river, Colorado Parks and Wildlife is changing fisheries on the western slope to more compatible species. But first, the troublesome fish have to be removed.

The smallmouth bass tournament at Ridgway Reservoir June 4 –12, 2016 attracted 150 anglers who caught 1,101 fish. Based on population estimates, anglers removed about a third of the population. Colorado Parks and Wildlife biologists were pleased with the number of fish removed and have begun planning for next year’s tournament.

The Elkhead fishing tournament ran from June 11–19, 2016 to engage anglers in helping CPW remove non-native smallmouth bass and northern pike. The event helped to educate anglers regarding nonnative fish concerns and will be held again next year. Fifty-seven registered anglers removed 529 smallmouth bass ranging from 3.3” to 18.4” and 53 northern pike ranging from 12.0” to 27.6” long. CPW Aquatic Biologist Cory Noble and his crew PIT-tagged ten smallmouth bass prior to the tournament, and three of these fish were caught by anglers. Ten northern pike were also tagged prior to the tournament, and none of those fish were caught.

Anglers at Elkhead Reservoir Fishing Tournament show off their catch.

Would hatchery fish survive longer if they were raised in flowing water? San Juan Program biologists, Nathan Franssen, and Scott Durst are collaborating with Southwestern Native ARRC to study the effects of flow conditioning on survival and condition of hatchery-reared razorback sucker to answer that question. Over 1,000 razorback sucker produced at Southwestern Native ARRC were harvested, sorted, and PIT tagged in August 2016 and randomly placed into a flow-conditioning treatment or control group. Flow in the treatment group was increased every two weeks while flow in the control remained at 0 ft/sec. The fish were released into the San Juan River in November 2016. Recapture data will be analyzed in 2017 and 2018 to evaluate the effect of flow conditioning on survival and detection probability. Stocking has been the most effective management action to increase the size of the razorback sucker population in the San Juan River, thus methods to improve its efficiency will benefit recovery.
Elkhead Reservoir Gets a Spillway Net
By Kevin McAbee, Upper Colorado River Endangered Fish Recovery Program

Elkhead Reservoir is a popular recreational destination in Moffat County, Colorado which impounds Elkhead Creek in the Yampa River basin. The State Park surrounding the reservoir is known for great boating, fishing, swimming, wildlife watching, hiking and camping. The reservoir is also an important component of the Upper Colorado Program. The reservoir provides water essential to restoring the endangered fish, but is also a source of nonnative sport fish that compete with and eat endangered fish.

In 2006, the Colorado River Water Conservation District (River District), the Colorado Water Conservation Board (CWCB), and the Upper Colorado Program worked together to increase the capacity of Elkhead Reservoir. This project provided 5,000 acre-feet of water specifically allocated for fish conservation, which the Recovery Program uses to enhance vitally important summer base flows.

Smallmouth bass and northern pike are especially effective predators that have serious impacts on native fish in the river. Both of these fish exist in Elkhead Reservoir and can get to the endangered fish in the Yampa River if not stopped. Therefore, during the enlargement, the River District screened the reservoir outlet to prevent nonnative fish from escaping via water releases from the bottom. Unfortunately, smallmouth bass tagged and released in Elkhead Reservoir still escaped over the spillway and were later recaptured downstream in the Yampa River.

Colorado State University’s Larval Fish Lab was brought in as a partner to evaluate escapement and found that too many smallmouth bass were still making it to the river, so stakeholders had to find a new solution. After considering a long list of options, the team decided that a net would prevent escapement and provide adequate time to change fishery management in the reservoir. The River District once again led the effort. Deputy Chief Engineer Ray Tenney worked with Pacific Netting Products (PNP) to design and install the $1.3 million feature. CWCB contributed $500,000 towards the net and the Upper Colorado Program contributed the remainder.

In September of 2016, PNP and the River District completed a flawless install of the net. The net is roughly about 575 feet long net, 30 feet high, and has 1/4 inch mesh openings to stop even small fish from reaching the spillway. It is woven out of Dyneema, a fiber uniquely suited to handle harsh UV radiation, freezing water, and algal build-up. The net floats in response to lake levels and is designed in ‘panels’, so a portion of the net can be repaired or replaced if needed. PNP and the River District also installed a boom to protect the net from large debris and anchors to keep the net in place.

The net has a life span of about 10-15 years, which gives Colorado Parks and Wildlife (CPW) time to implement a new Lake Management Plan to transition from a smallmouth bass to a largemouth bass fishery. Largemouth bass provide recreational opportunities for fishermen on the lake without endangering the natives in the river. To encourage anglers to assist in removing these problematic species, CPW enacted an unlimited harvest regulation for Elkhead Reservoir (and almost all other West Slope waters) and held a fishing tournament in June with a grand prize fishing boat.

While the net is an expensive and non-permanent solution, it allows the local anglers, state park, and community time to transition to new fish species at the reservoir. This major success couldn’t have been accomplished without efforts from many cooperators. The Upper Colorado Program wishes to extend immense gratitude to the River District, PNP, CWCB, CPW (fisheries and state parks), the Bureau of Reclamation, water users, and the local community for their help completing the net project.

Pictures of the net installation at Elkhead Reservoir.
Small Antennas Yield Big Results at the Waterfall in the San Juan River near Lake Powell

By Mark McKinstry, Bureau of Reclamation, Nathan Cathcart, Kansas State University, Chris Cheek, The Navajo Nation, and Peter MacKinnon, Utah State University

B iologists from the Navajo Nation, Kansas State University, Utah State University, Bureau of Reclamation, USFWS, Biowest and the State of Utah recently discovered 716 razorback suckers, 16 Colorado pikeminnow, and a single bonytail using a 1-acre area below the waterfall on the San Juan River near Lake Powell, Utah. From one small PIT tag antenna designed and built by BioMark for remote applications, came 22,500 unique tag detections from 744 endangered fish during a 5-month period in 2015 and 2 months in 2016. Year classes of endangered fishes indicate the presence of adult razorback sucker and subadult and adult Colorado pikeminnow. Ten razorback sucker originated from the Upper Colorado River Basin, mainly from the Green River (nine fish).

Forty-five percent of razorback suckers detected in 2015 were also detected in 2016. Six razorback sucker with 2015 and 2016 detections were from the upper Colorado River basin. Subsequent netting and electrofishing by biologists in 2015 and 2016 captured 12 Colorado pikeminnow and 183 razorback suckers. Forty-six (25%) of the 183 captured razorback suckers were not PIT tagged, suggesting that more than 1,000 razorbacks could be using this area at certain times of the year. Since almost all razorback suckers are PIT tagged prior to stocking in the San Juan River, the number of untagged fish also suggests that fish may be recruiting in the area downstream of the waterfall (although the number of untagged fish can also be explained by cumulative PIT tag loss by the fish after stocking). Additional work should help provide information on recruitment of fish in this area.

The waterfall was created within the last 30 years when the water level of Lake Powell dropped and the San Juan River carved another channel that detoured it over a 30-foot cliff. Except for the late 1990’s and two weeks in 2011 when the water rose enough to inundate the waterfall, the waterfall has served as a barrier to upstream fish movement. Although the waterfall serves as a barrier that helps exclude nonnative fish from the river, it also prevents the return of razorback suckers and Colorado pikeminnow that have travelled over the waterfall.

In 2016, USFWS, UDWR, and Reclamation began to trap and relocate a portion of the fish that are captured at the waterfall. Several of these fish were implanted with acoustic and radio tags and transported around the waterfall into the mainstream river. Receivers track the fish to determine if they stay in the river or return to the lake, and may help researchers identify spawning areas in the river. Moving fish around the waterfall and tracking additional fish will continue with a bigger project by Kansas State University starting in 2017.
In 2016, we collected 242 individual razorback sucker in 296 captures at Lake Powell. Trammel nets accounted for 166 capture and electrofishing accounted for 130 captures. Nearly 11% of the individuals captured were without a PIT tag, suggesting potential recruitment or PIT tag loss. Three new spawning sites were discovered; one on the south eastern shore of Good Hope Bay, one in Blue Notch Canyon, and another in the Red Canyon inflow.

We placed two submersible PIT tag antennas on two of three spawning bars (south shore across from Trachyte Canyon, and Castle Butte) discovered in 2014 and 2015 in the Colorado River arm. Throughout the sampling season, these two antennas detected 140 individual razorback sucker and 46 of these individuals were also collected by either trammel netting or electrofishing. This is quite incredible considering that these antennas are only 1-meter in diameter and detect fish at a maximum range of 40 inches! Two additional antennas were deployed on the San Juan arm of Lake Powell near Neskahi Canyon where we found spawning razorback sucker in 2011 and 2012. This was in an attempt to see if fish are still actively using this area at the lower lake elevations in preparation for anticipated work in 2017. These antennas detected 11 individual razorback sucker stocked in the San Juan from 2013 to 2015.

In total, 346 individual razorback sucker were either detected or handled. The fish of known hatchery origin came from all stocking sites on the Green (n=252), Colorado (n=28), Gunnison (n=14), and San Juan Rivers (n=11) with movements downstream as far as 402 miles. The earliest stocked fish came from 2002 and we collected/detected fish stocked as recently as 2015. Other native fishes either detected or collected in 2016 included five bonytail, one Colorado pikeminnow, (detected in the San Juan arm), and four flannelmouth sucker.

Research conducted in the inflow areas of Lake Powell continue to produce large beautiful specimens of razorback sucker that are completing much of their life cycle within the Lake. Please visit www.coloradoriverrecovery.org/general-information/general-publications/newsletter/winter2015z.pdf for a more detailed article regarding this important project.

For more information, contact Travis Francis, 970-628-7204, travis_francis@fws.gov
Habitat alteration, flow manipulations, climate change, introductions of non-native fishes and plants, disease, and contaminants all play a part in the disappearance of native fish populations throughout the world. Communities in western Colorado’s Grand Valley (Palisade, Clifton, Grand Junction, Fruita, Loma, and Mack) are intrinsically tied to irrigated agriculture and the water from the Colorado and Gunnison rivers that make it possible. Four dams (Grand Valley Water Users (GVWU), Price Stubb, and Grand Valley Irrigation Company Dam (GVIC) on the Colorado and Redlands Diversion Dam on the Gunnison River) have provided water to the residents of the Grand Valley since the early 1900’s; however, they have also negatively impacted native fishes by disconnecting over 100 miles of habitat and altering downstream flows.

A major conservation measure achieved by the Upper Colorado Program is restoring fish passage at all four of these diversion structures. GVIC and Price Stubb, are non-selective (all fish can pass through) and Redlands and GVWU are the furthest upstream and selective, meaning they have a fish trap that allows biologists to sort and pass native fishes and while removing problematic nonnative fish species.

Redlands Fish Passage was completed and fully operational in 1996 and GVWU Fish Passage was completed in 2004 (fully operational in 2005). These passage structures not only benefit endangered fishes, they benefit all of the native fishes. To date, biologists have allowed upstream passage of 150,795 native fishes at the Redlands Fish Passage (Table 1). In 2016, the 7,486 native fishes passed at Redlands included a record setting 33 Colorado pikeminnow, 33 bonytail, and one razorback sucker. At GVWU passage, biologists have allowed upstream passage of 111,595 native fishes. In 2016, 13,754 native fish made passage at GVWU including one Colorado pikeminnow, 44 bonytail, and 36 razorback sucker. The cooperative partnership between irrigators and resource agencies has made these fish passage projects highly successful!

**Table 1. Number of Colorado pikeminnow, razorback sucker, bonytail and native fish capture events in the fish trap of the Redlands passageway between 1996 and 2016.**

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**Table 2. Number of Colorado pikeminnow, razorback sucker, bonytail and native fish capture events in the fish trap of the GVWU passageway between 2005 and 2016.**

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For more information, contact Travis Francis, 970–628–7204, travis_frankis@fws.gov
Endangered species updates

**Colorado pikeminnow**
In 2015, Utah Division of Wildlife Resources reported collecting 202 young-of-year Colorado pikeminnow in the middle Green River, (the 9th highest catch in 30 years), and 461 in the lower Green River, (the 8th highest catch in 30 years). In the lower Colorado River, 1,331 young-of-year were collected which is the highest catch for this reach since sampling began in 1986. The numbers of these young fish encountered in the fall can sometimes predict the juvenile recruitment to adults that may take place 6 to 7 years in the future.

**Humpback chub**
In Black Rocks this fall, U.S. Fish and Wildlife Service personnel collected 133 adult humpback chub. This is similar to numbers collected in the late 1990s when the population was estimated to be about a thousand, the highest estimate for this population. They also collected 85 young-of-year Gila species with baited hoop nets. Biologists call them Gila species because at this size, distinguishing a humpback chub from a roundtail chub is difficult (while trying to keep them alive and returning them quickly to the river). This is encouraging news because young-of-year Gila species are very elusive and difficult to collect.

**Bonytail**
Some of the most exciting news comes from Stewart Lake near Jensen, Utah which is screened during flooding to keep large fish out, but allows larval razorback sucker into the floodplain. In 2015, Utah Division of Wildlife Resources personnel found at least 5 stocked adult bonytail had jumped the screen. When the lake was emptied in early fall, 19 young-of-year Gila species were collected among over 400,000 fish. Four of those Gila species were preserved and examined morphologically and genetically. Both methods positively identified them as bonytail and confirmed that bonytail reproduction took place in Stewart Lake when it was not connected to the river.

**Razorback sucker**
As evidenced in numerous articles in this issue of Swimming Upstream, we have much good news about razorback sucker. From Lake Powell inflows upstream through the San Juan, Colorado and Green rivers, stocked adults are surviving and are now considered abundant. Adult razorback suckers are spawning in more locations every year. Larval production has increased, and survival of wild larvae produced in the Green River represents a huge step toward recovery (see Stewart Lake story, pg 3-5).

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**Increasing the Colorado Pikeminnow Broodstock at Southwestern Native ARRC**

By Southwestern Native Aquatic Resources & Recovery Center, U.S. Fish and Wildlife Service

The Southwestern Native ARRC has begun a 5-year collaboration with the Utah Division of Wildlife Resources (UDWR) to supplement the Colorado pikeminnow broodstock population at Southwestern Native ARRC. Southwestern Native ARRC’s Wade Wilson, Tracy Diver, and Ian Paige worked with UDWR’s Chris Michaud in October 2016 to collect approximately 150 young-of-year pikeminnow from low velocity habitat in the Colorado River near Moab, UT. Southwestern Native ARRC plans to collect 1,000 individuals over the next 5 years to help maintain sufficient genetic diversity in Colorado pikeminnow produced and distributed from the hatchery.

Fish Illustration © Joseph R. Tomelleri
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://wgfd.wyo.gov/Regulations/Regulation-PDFs/WYFISHINGREGS_BROCHURE
http://www.wildlife.state.nm.us/fishing/game-fish/