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2017-11-16 11:45: Kaleb Smith*, Tony Robinson and Kent Mosher: Evaluation of Spikedace and Loach Minnow Repatriation and Monitoring

Spikedace *Meda fulgida* and loach minnow *Tiaroga cobitis*, both listed as federally endangered in 2012, have extant populations in only a few streams in Arizona and New Mexico. Repatriations are the primary actions used to recover these species. Since 2007, these two species have been repatriated to a handful of streams in Arizona. Loach minnow have been repatriated in five streams: Redfield Canyon, Hot Springs Canyon, Fossil Creek, upper and lower Bonita Creek and an augmentation to an existing population in the Blue River. To date, the only repatriation where the species has successfully established a population is at Hot Springs Canyon. Upper Bonita Creek and lower Blue River are still to be determined, while Redfield Canyon and Fossil Creek have not been considered a success. Spikedace have been repatriated in six streams: Redfield Canyon, Hot Springs Canyon, Fossil Creek, Bonita Creek, Blue River and most recently in Spring Creek (Yavapai County). Currently, Blue River and Fossil Creek are considered a success with established populations. Redfield Canyon, Hot Springs Canyon, and Bonita Creek were not successful repatriations. Spring Creek is yet to be determined because the first stocking was in 2015. Since 2007 there have been 9,918 loach minnow stocked into repatriation streams, while only 453 individuals have been observed in post-stocking surveys. Also, 17,022 spikedace have been stocked while 5,337 have been observed in post-stocking surveys over the years. Success (population establishment) of these repatriations has been hard to judge because of the adherence to a strategy of annual stockings and difficulty in detecting individuals during monitoring. Potential threats to repatriated fish may include poor habitat, loss of habitat due to drought and piscivorous fish predation. Future repatriations will commence in potential new streams.

2017-11-16 13:30: Drew Eppehimer*, Hamdhani and Michael Bogan: Can Treated Wastewater Reestablish Aquatic Communities in Desert Rivers?

The California Department of Fish and Wildlife (CDFW) conducted drought monitoring (stream flow and temperature) in three Redband Trout streams in the Goose Lake basin (Lassen, Cold, and Willow Creeks) that provide habitat for Goose Lake Redband Trout, Goose Lake Sucker, Goose Lake Lamprey, and Pit Sculpin) and six tributaries that provide habitat for Modoc sucker (Turner, Washington, Coffee Mill, Hulbert, Dutch Flat, and Johnson Creeks). Given a better water year, all streams appeared to be in good condition following the extreme drought conditions observed in 2014-2015. CDFW also collected tissue samples for genetic analysis of Eagle Lake Rainbow Trout (ELRT) to evaluate genetic diversity and inbreeding related to the effects of artificial propagation of this native strain and to evaluate genetic uniqueness of extant “resident” upper Pine Creek populations. Assessed spawning movements of 119 pit-tagged ELRT in Pine Creek and documented movement of two fish to the headwater spawning area. Conducted an assessment of Pine Creek headwaters for Brook Trout distribution and (planning) and ongoing removal efforts.

trials are needed, these initial tests indicate licensing and registration of this new fish removal tool may be warranted.

2017-11-16 15:45: Kent Mosher*, Anthony Robinson and Kaleb Smith: Blue River Native Fish Restoration Project

The Blue River Native Fish Restoration Project is a multi-agency effort focused on protecting and restoring the native fish assemblage within the Blue River drainage in eastern Arizona. The project was initially focused on the lower 19 km of the Blue River, from Fritz Ranch to its confluence with the San Francisco River, and consisted of three main components: construction of a fish barrier (completed in 2012), mechanical removal of nonnative piscivorous fishes, and repatriation and monitoring of federally listed warm-water fishes. Between 2009-2017, Arizona Game and Fish Department staff conducted 7 nonnative piscivorous fish removal efforts (Flathead Catfish, Channel Catfish, Common Carp, and Green Sunfish), 6 native fish stockings (2 Spikedace, 2 Loach Minnow, and 2 Roundtail Chub), and 6 post-stocking monitoring efforts in the lower Blue River. As of 2017, large-bodied piscivorous fish have not been detected in the lower Blue River for four years and Green Sunfish have not been detected for one year. Spikedace and Roundtail Chub have also established self-sustaining populations, and Loach Minnow abundance appears to be increasing following the 2011 Wallow Fire. Due to these successes in the lower Blue River, restoration efforts have expanded upstream to include the middle Blue River between The Box and McKittrick Creek. Roundtail Chub and Spikedace were stocked into the middle Blue River in 2016 and 2017, respectively, in efforts to expand the range of these species in the river. Roundtail Chub monitoring efforts in 2017 detected 57 Roundtail Chub in the middle Blue River; however, additional monitoring efforts are needed to determine if this population is establishing.

Hamdhani Hamdhani*, Drew Eppehimer and Michael Bogan: Water quality dynamics in an effluent-dominated reach of the Santa Cruz River, AZ

The Santa Cruz River system is one of several river systems in Arizona that have experienced groundwater declines and loss of perennial flow due to groundwater pumping and drought. Along with Gila River and Salt River, the Santa Cruz River currently has artificial, perennial reaches that are supported by effluent discharge from wastewater treatment plants. The return of perennial reaches has brought back habitat for numerous of aquatic and riparian taxa. However, since these reaches are artificially supported by effluent they no longer have a natural flow regime or natural water quality gradients. Little research has been conducted on the water quality gradients along these perennial effluent-dominated reaches. The objective of this study is to quantify physical and chemical water quality gradients downstream from the effluent outfall. Beginning in August 2017, we have collected water quality data (e.g. DO, pH, conductivity, nutrient levels) monthly from six reaches spaced ~2 miles apart along the effluent-dominated lower Santa Cruz River, and will continue to do so through 2019. Additionally, we will expand our study to include other effluent-dominated reaches of Santa Cruz, Salt, and Gila rivers, as well as reference streams unaffected by effluent input. The findings of this

study will help us understand how effluent can be used to restore perennial river habitats in arid climates, including habitat for native desert fishes.

Eliza Gilbert*, Robert Dudley, Tyler Pilger, Thomas Turner, Yvette Paroz, Carter Kruse, Joanna Hatt, Bryan Bakevich, Martha Cooper, Brock Huntsman, Colleen Caldwell, Timothy Frey, Megan Osborne: Native fish conservation and management in the upper/middle Rio Grande, Pecos River, Canadian River, Tularosa and Guzman basins, New Mexico during 2017

In 2017 research, conservation planning, habitat restoration, population augmentation and repatriation, and population monitoring by a number of federal, state, university, and private entities – such as Turner Endangered Species Fund, American Southwest Ichthyological Researchers, and The Nature Conservancy - greatly contributed to management of native fishes in New Mexico. In the Rio Grande (RG) Basin this included habitat creation for, and repatriation and augmentation of, RG Cutthroat Trout, the southernmost subspecies of cutthroat trout. Research on this subspecies secondary production rates (biomass accumulation) and water temperature variation identified a potentially shifting thermal bottleneck, important to consider as the climate continues to change. Other efforts in the basin focus on RG Chub (RGC) and RG Sucker (RGS) and has resulted in a multi-state, tribal, federal, and private entity Conservation Agreement for the two species. The plan is currently being finalized and includes repatriation. Collection of RGC and RGS tissues for assaying eDNA markers has resulted in a reliable and sensitive marker for RGC while development is ongoing for RGS. Considering both species are wide-ranging and there is limited information on their distribution, life history, and habitat needs, the development of these markers will greatly assist in the species' conservation. Habitat restoration for both species is occurring in the RG and Guzman basins, which in some places is also benefitting Longnose Dace, Chihuahua Chub, and Chihuahua Leopard Frog. The RG Sucker is wide-ranging in New Mexico and population monitoring and genetic analysis shows a high level of diversity and evidence for historical transcontinental introductions. Two decades of systematic sampling for the RG Silvery Minnow (RGSM) in the middle RG Basin continues to document fluctuations in this imperiled species. However, 2016 sampling resulted in one of the highest density estimates and ecological modeling revealed that changes in density were reliably predicted by river flows with extended high flows crucial in explaining elevated RGSM densities and low summer flows, low levels of occupancy. Genetic effective size also increased in 2017 reflecting the greater population stability from 2016-2017. The small, endorheic, Tularosa Basin has the White Sands Pupfish, for which a new monitoring protocol has been developed and implemented. The basin also has Longnose Dace. Surveys in Tularosa Creek document the species continued presence. Two rare minnows, Peppered Chub and Arkansas River Shiner, are found in the Arkansas River of the Canadian River Basin. A Species Status Assessment which will consider both species is currently underway and population and genetic monitoring continues. In the upper portion of the Canadian River Basin riparian restoration and fish assemblage monitoring is occurring in conjunction with partnering universities. In conjunction with high school students, genetic data from RG chub populations in Rio Mora, a Canadian River drainage stream, is being assessed to determine whether this population shows a greater affinity to the Canadian or Pecos River drainage. Barrier upgrades and construction in

and Lower Canyons reach of the Rio Grande. Monitoring on the Devils River continues for Devils River Minnow, Conchos Pupfish, Texas Hornshell, and salamanders. Restoration efforts along the Rio Grande near Big Bend and along Rio Grande tributaries continues to restore riparian habitats. Conservation partners met to establish the Chihuahan Desert Native Fish Conservation Area priorities and are working to establish this prioritization framework for the rest of the Rio Grande watershed.

2017-11-17 08:45: Michael Bogan*, Nathan Dorff, Drew Eppehimer, Hamdhani, Kelsey Hollien and Earyn McGee: Aquatic invertebrate diversity and community composition at Quitobaquito, Organ Pipe Cactus National Monument

Quitobaquito spring and pond support the only natural populations of endangered Sonoyta pupfish and mud turtle in the United States. Despite long-term monitoring of pupfish and mud turtle populations, little is known about the food web that supports these imperiled species. To address this knowledge gap, we began a comprehensive inventory of aquatic invertebrates at Quitobaquito in April 2017. We will sample four times a year in the primary aquatic macrohabitat units at Quitobaquito, including the headspring, the pond and moat, and spring channel riffles, runs, and pools. To date, we have identified 116 aquatic invertebrate taxa from our collections, which nearly doubles the number of taxa known from previous surveys at Quitobaquito. In April 2017, moat and spring channel pool samples were the most diverse (mean taxon richness = 33 and 30, respectively). Riffle samples were the least diverse (mean taxon richness = 15), but were the primary habitat for several rare taxa (e.g. riffle beetles, aquatic moths). Several taxa greatly increased in abundance between April and June, including *Helicopsyche* caddisflies. The impact of these changing invertebrate abundances on pupfish and mud turtles or general food web dynamics remains to be determined. In October 2017, we will expand sampling efforts to include tissue collection from important food web components (e.g. algae, zooplankton, detritus) for use in stable isotope analyses. These analyses should yield clues as to why Sonoyta pupfish and mud turtle populations fluctuate through time at Quitobaquito.

2017-11-17 09:00: Chuck Minckley*, Doug Duncan, Ross Timmons and Miguel Grageda: Fishes of the Sonoyta River, Past, Present, Future.

The Sonoyta River Basin lies adjacent to the U.S. Mexican border, south of Lukeville, Arizona. It is a disrupted segment of the Colorado River system. This talk presents information on native fish distributions, their status, past and continuing threats to those species. It also lists accomplished recovery actions, and presents/discusses options to maintain native fishes in the system.

2017-11-17 09:15: Miguel Angel Grageda* and Diego Garcia: Current population status of the Sonoyta pupfish (*Cyprinodon macularius*) and longfin dace (*Agosia chrysogaster*) in the Agua Dulce Ramsar site and reproduction refuges of Sonora, Mexico

We will describe the conservation status of Sonoyta pupfish (*Cyprinodon macularius*) and longfin dace (*Agosia chrysogaster*) in the Agua Dulce reach of the Rio Sonoyta in Sonora, Mexico. We will also describe the current distribution and status of these two threatened species in refuge habitats created at various locations in northwest Sonora. Ongoing threats to both species will be described and future management suggestions

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