Report to the Pecos River Commission

United States Fish and Wildlife Service Activities in the Pecos River Basin Calendar Year 2019

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service

May 2020

Cover photos –

Top and Bottom: Bitter Lake National Wildlife Refuge, courtesy Jeffrey Beauchamp, Wildlife Biologist, Bitter Lake National Wildlife Refuge, Roswell, NM.

Middle: Pecos bluntnose shiner survey, Pecos River, New Mexico 2019; courtesy Steven Davenport, Supervisory Fish Biologist, U.S. Fish and Wildlife Service, New Mexico Fish and Wildlife Conservation Office, Albuquerque, NM.

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September 2020

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U.S. Fish and Wildlife Service Activities in the Pecos River Basin – 2019

Introduction

The Pecos River Basin harbors many unique plant, fish, and wildlife species. The Pecos River itself is the centerpiece of the basin and is essential in maintaining the health and integrity of its distinctive natural resources. The U.S. Fish and Wildlife Service (Service) works with numerous stakeholders throughout the basin to help maintain a viable ecosystem, and it is our sincere commitment to continue conservation and management efforts for current and future generations.

This report summarizes Service's activities related to the Pecos River Basin. During calendar year 2019, the Service conducted activities associated with fish and wildlife conservation and management that included: 1) the Carlsbad Project Water Operations Biological Opinion; 2) species monitoring and restoration activities; 3) Endangered Species Act (ESA) section 7 consultations; 4) participation in weekly stakeholder conference calls and stakeholder meetings; and 5) restoration and management activities at Bitter Lake National Wildlife Refuge.

Biological Opinion for the Carlsbad Project Water Operations and Water Supply Conservation, 2016-2026

The Carlsbad Project Biological Opinion (2017 BO) was finalized in December 2017 (USFWS 2017), and 2019 marked the second year of its implementation. The 2017 BO provides the Bureau of Reclamation (Reclamation) with a comprehensive and flexible water operations framework that supports both the Carlsbad Project and Reclamation's ESA responsibilities.

As defined in the 2017 BO, *Critically Dry* conditions did not exist in 2019 (January through June); however, uncertainty regarding the year's snowpack dictated a more conservative approach to water management. The Service therefore concurred with a request by Reclamation to suspend the Taiban target flow (as further defined in the 2017 BO) and manage the river for connectivity – thus maintaining shiner habitat integrity and stability while conserving potentially limited water resources. This approach proactively anticipates possible drought conditions during the summer monsoon period and attempts to avoid or at least mitigate late-season river drying.

The Service continued to participate in weekly water operations conference calls with the basin's stakeholders. We also attended the annual stakeholders meeting in which water operations for the coming year were discussed, and provided an annual report to the Pecos River Commission and attended the annual Engineers Advisors and Commission meetings.

The added flexibility of the 2017 BO and close coordination of basin stakeholders continues to work well, and the Service greatly appreciates the thoughtful planning and resource stewardship by Reclamation. We also acknowledge and offer our sincere thanks to all of the Pecos stakeholders for their continued support of our unique basin and its diverse ecosystems.

Listed Species Updates

Pecos Bluntnose Shiner (*Notropis simus pecosensis*)

Monitoring Results and Status

The Service's New Mexico Fish and Wildlife Conservation Office (NMFWCO) continued long-term monitoring of the Pecos River, New Mexico fish community in 2019. Pecos River fish community monitoring data is used to estimate the percent abundance and population density of the federally threatened Pecos bluntnose shiner (shiner). These data assist the Service's New Mexico Ecological Services (NMESFO) field office in tracking Pecos bluntnose shiner population density relative to standards from the 2017 BO. Long-term, repeated measurement sampling has provided information on the spatial and temporal distribution and species detection probability for the Pecos bluntnose shiner, and has documented dramatic decreases in population density associated with periods of surface flow intermittence and subsequent increases in catch rates after continuous flow returned. The Pecos River has experienced essentially continuous surface flow since 2014.

In 2019, we monitored Pecos bluntnose shiner at 12 long-term, standardized monitoring sites (Table 1). We did not visit sites between the Fort Sumner Irrigation District Diversion Dam and Taiban Creek confluence (Tailwater section). We visited seven sites within the core population (Rangeland section; approximately De Baca/Chaves County line to Bitter Lake National Wildlife Refuge (BLNWR) and five sites within the lower, poor habitat quality Farmland section (BLNWR to the inflow to Brantley Reservoir). We monitored Rangeland and Farmland sites in March, April, June, July/August, September, and October.

We made six collecting trips in 2019 and sampled 17,765.5 m^2 of habitat (Table 2), with more area sampled in the Rangeland section than in the Farmland section. All sites had surface flow. We collected 23 species and 14,704 individual fish. We collected less total fish in 2019 than in 2018. Red shiner (*Cyprinella lutrensis*) was the most abundant fish, and Pecos bluntnose shiner was second most abundant. We collected 3,090 Pecos bluntnose shiner in 71 site visits. Similar to previous years, small bodied cyprinid species dominated collections, with red shiner, plains minnow, speckled chub, Rio Grande shiner, and Pecos bluntnose shiner collectively accounting for 94% of all fish collected.

Table 1. Pecos bluntnose shiner metrics by site: number of samples, mean percent abundance, mean catch rate, standard error (SE) total number (N), percent occurrence and effort for 2019. ns = not sampled

Site	No. of Samples	$\bar{x}$ Percent abundance	SE	$\bar{x}$ shiner/100m^2	SE	N	Percent Occurrence	Effort (m^2)
Hwy 60	ns	--	--	--	--	0	--	0
Old Fort	ns	--	--	--	--	0	--	0
Tailwater								
Willow	6	15.5	4.9	16.4	6.5	235	83.3	1,546.5
Six Mile	5	21.5	4.6	21.5	5.4	269	100	1,288
Crockett	6	26.3	4.3	24.9	4.1	379	100	1,536
Bosque	6	31.9	6.1	47.5	18.0	737	100	1,608.5
Gasline	6	27.4	4.6	25.9	15.2	381	100	1,469.5
Hwy 70	6	28.5	3.6	26.7	5.8	374	100	1,450.5
Scout Camp	6	21.1	4.9	16.4	3.1	264	100	1,648
Rangeland	*41*	*24.7*	*1.8*	*25.7*	*3.3*	2,639	*97.6*	10,547
Hwy 380	6	12.4	2.1	10.0	3.0	146	100	1,454
BLM ACEC	6	10.0	7.3	2.8	1.8	45	83.3	1,500.5
Dexter	6	14.2	3.3	6.4	1.3	86	100	1,355.5
Lake Arthur	6	15.6	4.2	8.5	3.9	135	100	1,587
Hwy 82	6	4.6	1.2	3.1	1.9	39	83.3	1,321.5
Brantley Inflow	ns	--	--	--	--	0	--	0
Farmland	*30*	*11.4*	*1.9*	*6.2*	*1.2*	*451*	*93.3*	7,218.5
Mean, SE	71	19.1	1.5	17.5	2.3	3,090	95.8	17,765.5

Table 2. Pecos bluntnose shiner monthly number of samples, mean percent abundance, catch rate, standard error (SE), total number (N), percent occurrence and effort for 2019, Pecos River, New Mexico. Dashed lines separate four month trimester. Mean percent occurrence is calculated for Rangeland and Farmland sites only.

Month	No. of Samples	$\bar{x}$ Percent abundance	SE	$\bar{x}$ fish/100m^2	SE	N	Percent Occurrence	Effort (m^2)
January								
February								
March	12	15.9	4.6	21.8	9.7	601	83.3	2,827
April	11	25.1	4.1	24.3	7.6	710	100	2,809
Totals/Means	23	20.3	3.2	23.0	6.1	1,311		5,636
May								
June	12	22.6	3.1	16.9	4.1	465	100	2,882
July								
August	12	20.6	3.5	14.8	2.5	449	100	2,898
Totals/Means	24	21.7	2.4	15.8	2.4	915	100	5,780
September	12	9.4	1.6	9.9	1.8	315	100	3,136
October	12	21.0	3.6	17.7	4.1	549	100	3,213.5
November								
December								
Totals/Means*	24	15.2	2.3	13.8	2.3	864	100	6,349.5
Total/Means	**71**	**19.1**	**1.5**	**17.5**	**2.3**	**3,090**	**95.8**	**17,765.5**

Pecos bluntnose shiner catch rate varied by site and by reach (Table 1). Catch rate was greatest in the Rangeland section at Bosque Draw, Gasline and New Mexico Highway 70 and at Lake Arthur in the Farmland section. Catch rates of Pecos bluntnose shiner greater than 35 millimeters (mm) standard length (SL) were greater than for the less than 35 mm SL class (Figure 1). In 2018, young of year shiner dominated collections. Pecos bluntnose shiner greater than 35 mm SL were collected primarily from the Rangeland section.

All metrics used to track the status of the shiner were similar to 2018 (Figure 2). Mean monthly percent abundance in 2019 ranged from 9.4 ± 1.6 to 25.1 ± 7.6% and mean catch rate ranged from 9.9 ± 1.8 to 24.3 ± 7.6.0 fish/100 m^2 (Figure 2). Annual mean percent abundance was 18.8 ± 1.5% and annual mean catch rate was 17.5 ± 2.3 fish/100 m^2 (Figure 2). Relative density of Pecos bluntnose shiner within the fish community in 2019 was at levels most similar to 2018 (Figure 2).

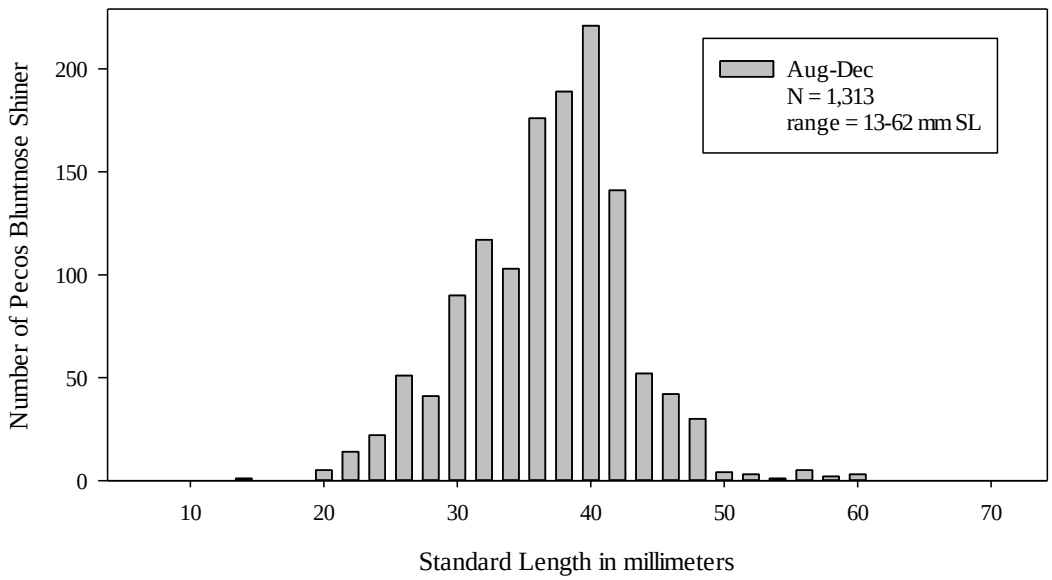

Figure 1. Standard length frequency distribution (2.0 mm length bins) of Pecos bluntnose shiner from the Pecos River, NM during August-December 2019.

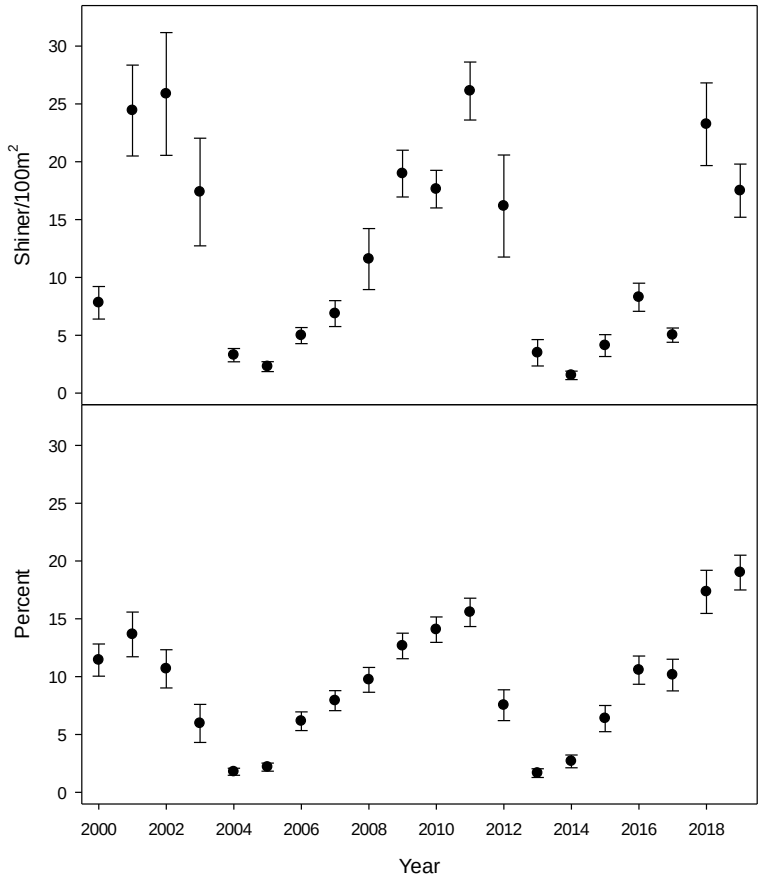

Figure 2. Pecos bluntnose shiner catch rate (top) and percent abundance (bottom), ± one standard error, 2000-2019 all river sections and all sampling months combined, Pecos River NM.

Pecos bluntnose shiner frequency of occurrence during site visits was 95.8%. We had unoccupied site visits during three March sampling trips, but thereafter all sites were occupied (Table 2). The March sampling trip produced 601 Pecos bluntnose shiner (Table 2). In contrast, the March 2018 trip produced only 22 shiner. We did not sample the Tailwater section, because these sites have been unoccupied since 1999, and are not included in the annual catch rate estimation.

In August through December we collected 1,313 Pecos bluntnose shiner, and 100% of the sites sampled had shiner present. ***Mean catch rate for August-October (Trimester three) was 14.1 ± 1.8 shiner/100 m^2*** and mean percent abundance was 17.1 ± 1.0%. Catch rate was variable by month and greatest catch rates were in October: 17.7 ± 4.0 shiner/100 m^2. Mean catch rate declined from the same period in the previous year; however, catch rates in trimester three of 2018 were among the greatest seen in the last 20 years.

The Pecos bluntnose shiner incidental take statement in the 2017 BO defines take to be calculated from trimester three site means in the Rangeland and Farmland sections only. To summarize:

- In non-Critically Dry years, if shiner density in the third trimester is increasing then take is not exceeded and no reconsultation is necessary.
- In non-Critically Dry years, if shiner density in the third trimester is above 12 fish/100 m^2 then take is not exceeded and no reconsultation is necessary.
- In non-Critically Dry years, if shiner density is decreasing AND density is below 12 fish/100 m^2 in the third trimester then take is exceeded and reconsultation is necessary.
- Under Critically Dry conditions no take from the Proposed Action occurs providing all water resources at Reclamation's disposal are being utilized to minimize river drying.

Since 2019 was not a Critically Dry year and mean density in the Rangeland and Farmland sections exceeded 12 fish/100 m^2 (see 2019 mean density value above), there was no take assessed and therefore no reconsultation was required.

Pecos Bluntnose Shiner Captive Population Management

The Service houses 447 Pecos bluntnose shiner in captivity at the Service's Southwestern Native Aquatic Resources and Recovery Center (SNARRC) in Dexter, New Mexico. These include 376 fish collected on April 24, 2019 from two sites (Bosque Draw and Gasline) and 71 fish held over from 2018 collections. These stocks are maintained to guard against catastrophic population collapse or other urgent need such as genetic augmentation of the wild population.

Pecos Geomorphology Study

Recent observations by Service personnel have noted a number of changes along the Pecos River that may signal a fundamental change in aquatic habitat quality. To evaluate current habitat conditions, and further estimate future trends, an in-depth and comprehensive study of the fluvial geomorphology and hydrology was initiated in 2018 through a contract between the Service and Tetra Tech.

Work in 2019 focused on the compilation and synthesis of past data and studies, and the collection of contemporary field data. Hydrographic data included cross-section surveys and sediment sampling. Results indicated that over the last 20 years, the Pecos River channel has narrowed, and the channel capacity has decreased as most areas have a bankfull capacity slightly larger than a typical block flow. Channel narrowing is the result of the river adjusting to changes to the hydrologic regime, including the addition of Santa Rosa and Sumner Dams and block flow releases. Previously completed flood frequency analyses (Tetra Tech 2000) show that the magnitudes of peak flows have decreased since the dams began operating. At the below Sumner gage, the 2-year peak flow pre-Sumner Dam was 9,150 cfs, after Sumner Dam it was 1,580 cfs, and post-Santa Rosa Dam it was 1,180 cfs. In addition, flows exceed 1,400 cfs (the block flow magnitude released from Sumner Dam) approximately 3% of the time (Tetra Tech 2020). Overall, there is less water in the river more of the time and vegetation encroachment has occurred in areas that are not inundated as frequently as a result of changes to the hydrology.

Not every reach of the river has responded to these changes in the same way. The channel is still dynamic in some reaches (Bosque Draw to East 2nd Street Bridge near Roswell) and has become more channelized (narrower, deeper, straighter) in others (East Second Street Bridge to Dexter) (Tetra Tech 2020). Because the intent of block flows is to efficiently convey water from Sumner Dam to Brantley Reservoir, the potential to convey shiner eggs and larvae downstream is also high, especially since the channel capacity is presently closer to the block flow discharge rate. Retention of eggs and juveniles could most reasonably be accomplished (without reducing conveyance to Brantley Reservoir) in areas where the floodplain is wider. Locations where meander bends have been cut off are potential candidates to reconnect during block flows because an old channel already exists.

Future phases of this effort will include surveys to provide the basis for 2-D hydraulic modelling and assessment of options for improving retention of eggs and juvenile shiners in upstream reaches. These options could include partial hydraulic reconnection during block flows of cut-off river bends. The best candidates are those in the lower portions of occupied shiner habitat where large meanders were recently cut off. Exploring possible restoration sites in a downstream areas could provide valuable information for future projects in areas that currently have less habitat.

Pecos Bluntnose Shiner Egg/Larval Displacement Study

The main goal of this study is better understand the nature and patterns by which shiner egg and larvae are displaced as a function of discharge magnitude and duration. This effort specifically addresses Recovery Goals and Objectives listed in the Pecos Bluntnose Shiner Recovery Plan (USFWS 1992), and the 2017 BO. The primary objective outlined in the recovery plan is to secure shiner survival in its current range and to reestablish the species in areas of its historic range. Specifically, we are addressing Recovery Plan Objective 1.3: Determine relationship

between current distributional patterns and human modification of the Pecos River, and Objective 1.31: Determine distributional and abundance patterns in relation to impoundments. We are also addressing the 2017 BO's Conservation Recommendations: Formulate an appropriate experimental design and subsequently implement a study on the effects of block releases on the shiner.

This cooperative project utilizes joint expertise of Federal, State and educational institutions to aid in monitoring populations of the shiner within its historic range in the Pecos River, New Mexico. The lead agencies are Reclamation and the Service. The facilities contributing to the effort are the SNARRC and the NMFWCO.

Interior Least Tern (*Sterna antillarum*)

Monitoring Results and Status

Reclamation monitored interior least terns at Brantley Reservoir and will provide a report for that location. Briefly, there were only two birds observed at Brantley Reservoir on June 12, 2019 north of Champion Cove. These birds appeared to be paired and were foraging but were not seen again. There were no nests observed from May 29 through August 1, 2019 on 19 total surveys.

On BLNWR, seven adults were observed in 2019 resulting in five nesting attempts. Of those attempts, two birds were observed to have fledged. The successful nesting attempts were located on the salt flats in Unit 16.

On October 24, 2019 the Service published a Proposed Rule to delist the interior least tern (USFWS 2019). When listed under the ESA in 1985, there were fewer than 2,000 birds and only a few dozen nesting sites scattered across a once-expansive range that covered America's Great Plains and Lower Mississippi Valley. Today there are more than 18,000 interior least terns at more than 480 nesting sites in 18 states, thanks to decades of innovative conservation efforts and diverse partnerships among local, state and federal stakeholders. The comment period for delisting closed on December 23, 2019 and comments are currently being reviewed.

Aquatic Invertebrates

The Service's NMESFO, BLNWR, Inventory and Monitoring (I&M) staff, and partners continued monitoring the federally endangered Noel's amphipod (*Gammarus desperatus*), Koster's springsnail (*Juturnia kosteri*), Roswell springsnail (*Pyrgulopsis roswellensis*), and Pecos assiminea snail (*Assiminea pecos*) in 2019, with all known populations persisting. This effort included intensive monitoring targeting population density estimates, presence-absence surveys and linking population and hydrologic parameters.

In March 2019, BLNWR and I&M staff collected and moved approximately 4,000 Roswell and Koster's springsnails from the Middle Tract to the South Tract as part of the Rio Hondo

restoration. Spring run habitat is similar on the South Tract to areas on the Middle Tract, and the refuge is optimistic about the continued establishment of a new population to increase both the resiliency and redundancy of these springsnail species.

Ongoing monitoring on the Rio Hondo, where both springsnails (Roswell and Koster's) have been translocated, continued in 2019. Preliminary results are encouraging, with densities at the Rio Hondo approaching, and sometimes exceeding, densities at source populations on the Middle Tract. Multiple size classes of both snails were detected during monitoring in the Rio Hondo indicating that breeding is likely occurring in this new population. In addition, results from a comprehensive environmental DNA (eDNA) project are currently being analyzed. Preliminary results indicated an increase in the distribution of Roswell springsnail, Koster's springsnail, Pecos gambusia (see below) and Noel's amphipod. Continued monitoring is planned for 2020.

Pecos Gambusia (*Gambusia nobilis*)

Pecos gambusia continue to occupy springs and wetlands throughout BLNWR. Healthy populations of other native fishes, including the state threatened Pecos pupfish (*Cyprinodon pecosensis*), Mexican tetra (*Astyanax mexicanus*), and greenthroat darter (*Etheostoma lepidum*) also inhabit refuge impoundments, springs, spring runs, ditches and other wetlands. Refuge staff continued to monitor fish in Bitter Creek at established invertebrate sampling locations in order to understand relationships among invertebrate densities, environmental parameters and fish abundances.

Pecos Sunflower (*Helianthus paradoxus*)

On BLNWR, Pecos sunflower germination in 2019 was extensive on the Middle Tract, most likely due to the late winter rains and mild spring, although an exceptionally dry and hot summer caused some sunflowers in suboptimal habitat to senesce. Wetland drawdowns on the Middle Tract helped sunflowers in some of the suboptimal habitat remain viable throughout the dry summer. New Mexico fire personnel burned Unit 5 during winter of 2019 to provide additional habitat for Pecos sunflowers.

Restoration work continues on the Rio Hondo and Bitter Creek. Russian knapweed (*Acroptilon repens*) and perennial pepperweed *(Lepidium latifolium*) infestations within occupied Pecos sunflower designated critical habitat remain a threat to Pecos sunflower, and known populations of these invasive species were treated during the spring and summer months. Phragmites (*Phragmites australis*) has displaced Pecos sunflower and occupies designated critical habitat in some areas on the refuge. Follow-up treatments along Bitter Creek and the Rio Hondo continue and BLNWR staff expect to continue treatments to achieve maximum control. In 2019 Bitter Lake NWR, NM Strike Team members, and American Conservation Experience staff treated phragmites in Unit 7 to prepare for a prescribed burn scheduled for the winter of 2020 to provide additional habitat for Pecos sunflower.

Texas Hornshell (*Popenaias popeii*)

The Texas hornshell, a freshwater mussel, inhabits the Black and Delaware Rivers (New Mexico) in the Pecos River Basin. Additional populations are found in the Devils River and

Rio Grande. The Texas hornshell was listed as endangered effective March 12, 2018 (USFWS 2018). A Candidate Conservation Agreement (CCA) was implemented with Bureau of Land Management (BLM) to protect populations on Federal lands on the Black and Delaware Rivers (BLM 2017), and a Candidate Conservation Agreement with Assurances (CCAA) for private and state lands was also implemented (Center for Excellence 2017; New Mexico State Land Office 2017).

The CCA for the Black and Delaware Rivers is in its early years of implementation. CCAs are voluntary conservation agreements that facilitate a long-term landscape-based approach to eliminate or reduce threats to the covered species. The CCAs cover the following species: Texas hornshell (ESA endangered), blue sucker (*Cycleptus elongates*; not listed), gray redhorse (*Moxostoma congestum*; not listed), Pecos springsnail (*Pyrgulopsis pecosensis*; not listed), and the Rio Grande cooter (*Pseudemys gorzugi*; petitioned in 2015, currently completing a Species Status Assessment). The blue sucker and gray redhorse are important host species for the Texas hornshell lifecycle. The primary purposes of the CCAs are as follows.

- Most significantly, they are guiding and funding Conservation Actions (e.g., revegetation with native species along rivers, land or water acquisition, etc.) for the Covered Species in order to improve their status within New Mexico and Texas;
- Development, coordination, and implementation of Conservation Measures to reduce or eliminate potential threats to the Covered Species in New Mexico and Texas;
- Maintain viable populations of the Covered Species in Occupied Habitat;
- Support ongoing efforts to re-establish populations of the Covered Species in currently unoccupied but historic, suitable habitats (i.e., Delaware River);
- Serve as a landscape-scale umbrella document for Conservation Measures implemented by Participants;
- Encourage development and protection of suitable habitat for Covered Species by giving Participants incentives to implement specific Conservation Measures and;
- Allow industrial and agricultural development to continue while protecting and improving habitat conditions for the Covered Species.

Current CCA/CCAA enrollment status is as follows.

- Participants holding Certificate of Inclusion on private land = 43
- Participants holding Certificate of Inclusion on state land = 28
- Participants holding Certificate of Inclusion on Federal land = 33
- Acres enrolled on private land = 322,111.7
- Acres enrolled on state land = 132,773.6
- Acres enrolled on Federal land = 176,995.5

Candidate and Other Species Updates

Wright's Marsh Thistle (*Cirsium wrightii*) and Leoncita False-foxglove (*Agalinis calycina*)

Wright's marsh thistle is a Federal candidate species that occurs in wet meadows associated with alkaline springs and seeps or cienegas (Figure 3; Sivinski 2012). It was historically known to occur in Arizona and New Mexico in the United States, and Chihuahua and Sonora in Mexico. It is currently known from Chaves, Eddy, Guadalupe, Otero, and Socorro Counties in New Mexico. A Species Status Assessment was completed in February 2018 to inform a listing decision, which is pending.

Leoncita false-foxglove is another wetland plant that can be found in habitats with Pecos sunflower and Wright's marsh thistle. The Service was petitioned to list the species as endangered in 2012. It historically occurred in New Mexico, Texas, and Mexico; however, the only known extant populations are in the Pecos River Basin at BLNWR and Diamond Y Spring in Texas. The Service made a substantial 90-day finding in 2016 (USFWS 2016b). A Species Status Assessment to inform and help determine its potential listing status is pending.

BLNWR staff continued monitoring both Wright's marsh thistle and Leoncita false-foxglove. Due to the extremely hot and long summer, two populations of Leoncita false-foxglove in Unit 3 and Unit 5 either senesced or retreated to their rhizomes. The large population of Leoncita false-foxglove on Unit 6 remained viable, with most plants completing the seed producing stage. Refuge staff also monitored Wright's marsh thistle in Unit 5 throughout the growing season following the prescribed burn conducted during winter 2019. All 30 randomly selected plants (of approximately 500 total) that were observed before the burn survived, with about half showing signs of stress. Interestingly, the plants that showed stress following the burn grew larger than the plants that were not stressed from the burn.

Figure 3. Black swallowtail (*Papilo polyxenes*) foraging on Wright's marsh thistle at Bitter Lake National Wildlife Refuge. Photo courtesy of Jeff Beauchamp, Wildlife Biologist, BLNWR.

Pecos Pupfish (*Cyprinodon pecosensis*)

The Pecos pupfish is not currently federally listed, but is listed as state threatened in New Mexico and Texas. The Pecos Pupfish Conservation Agreement continues to be implemented and helps coordinate conservation and monitoring activities among multiple agencies: New Mexico Department of Game and Fish (NMDGF), BLM, New Mexico Environment Department, New Mexico Energy, Minerals, and Natural Resources Department, New Mexico Office of the State Engineer, and the New Mexico State Land Office. As part of this agreement, monitoring to evaluate the status of the Pecos pupfish is ongoing in New Mexico and Texas.

The New Mexico Department of Game and Fish trapped Pecos pupfish at 12 sites in the Pecos River drainage of New Mexico from April 8–12, 2019 during annual monitoring (Hatt 2019). Trends in Pecos Pupfish catch rates since 2011 suggested variable, but stable, populations at most sites. Monitoring data from the Bitter Creek and Bottomless Lakes State Park sites exhibited varying trends. Pupfish populations at Sinkhole #7 and Bitter Creek appear stable, while Sinkhole #9 populations appear to be increasing. Catch rates in Lazy Lagoon declined to the lowest level recorded, though strong winds likely affected trap efficiency. After two years of decreasing abundance in 2015 and 2016, the Figure Eight Lake pupfish population increased in 2019. For the fourth year since monitoring began, the Department did not capture pupfish at the

Upper Fish Barrier site on the BLM Overflow Wetlands, though Middle Wetland catch rates remained high. Excepting the Middle Wetland site, catch rates at Middle Tract Spring and Impoundments and BLM Overflow Wetlands sites remain stable, but low. Habitat changes and competition with other species may explain consistently low abundances, while weather events may have affected catch rates and our understanding of site-specific population trends. The Pecos Pupfish Conservation Team should explore sampling methodology to better incorporate these factors, and consider habitat restoration of these sites for pupfish if needed.

Rio Grande Chub (*Gila pandora*)

Rio Grande chub populations are reported primarily from headwater tributaries of the Pecos River, and the mainstem Pecos River above Sumner Reservoir (Sublette et al. 1990). In 2013, we received a petition requesting the Rio Grande chub be listed under the ESA. A substantial 90-day finding determined that the petitioned action may be warranted, and requires the Service make a more in-depth review (12-month finding) of the species (Service 2016a). This detailed review is pending.

Rio Grande Cooter (*Pseudemys gorzugi*)

The Rio Grande cooter, an aquatic turtle, is primarily found in high flow areas with deep pools, and in springs that contain aquatic vegetation for foraging and shelter (Degenhardt et al. 1996). It is found in the Black, Delaware, and mainstem Pecos Rivers below Brantley Reservoir down to Pecos County, Texas. It is also found in the Pecos River in Terrell County, Texas (Bailey et al. 2014). Additional populations are found in the Devils River and Rio Grande. In 2012, we received a petition to list the Rio Grande Cooter under the ESA. In 2015 the Service determined that the petitioned action may be warranted and requires we make a more in-depth review (12-month finding) of the species (USFWS 2015b). This Species Status Assessment will be completed by the end of 2020, and Federal Register publication with recommendation to list or not list the species in expected in 2021.

National Wildlife Refuge System

The National Wildlife Refuge system is a unique system of lands dedicated to preserving a rich quality of life for Americans by protecting their wildlife heritage. In the Pecos River Basin, there is one national wildlife refuge (Bitter Lake) that protects some of the most varied wildlife and spectacular landscapes found in the southwestern United States.

Bitter Lake National Wildlife Refuge

Bitter Lake National Wildlife Refuge is located 9.6 kilometers (6 miles) northeast of Roswell, New Mexico, and includes a unique system of springs and floodplain impoundments that are managed to provide winter habitat for migratory waterbirds. Located where the Chihuahuan Desert meets the Southern Plains, BLNWR is one of the more biologically significant wetland areas of the Pecos River watershed. More than 110 species of dragonflies and damselflies (Odonates) have been documented on BLNWR, making it one of the most diverse populations of odonates in North America. Bitter Lake National Wildlife Refuge is part of the Ramsar (Ramsar 2010) Roswell Artesian Wetlands of International Importance.

The following activities were conducted in 2019.

- Habitat Management and Restoration: Throughout the early spring months, gradual drawdowns of water levels within wetland units 3, 5, 6, 7, 15, 16, Hunter Marsh, Oxbow 3, and Hunter Oxbow were implemented.

- As was the case from 2005-2018, there was good available roosting habitat for lesser sandhill cranes (*Grus canadensis canadensis*) at BLNWR. Crane migration peak numbers were approximately 23,000 birds in 2019.

- In 2009, the refuge began native plant restoration efforts within the upland moist soil units on the Middle Tract. These efforts continued into 2019. Several units were inundated with water during the late monsoon season, mimicking natural precipitation events within the area.

- In 2013, a cooperated effort between BLNWR, NMESFO, NMFWCO, Refuge Water Resources Office, Refuge I&M division, and NMDGF applied for and received a Cooperative Recovery Initiative grant to 1) reroute the Rio Hondo River, 2) isolate natural spring runs occupied by the Noel's amphipod, and 3) create additional habitat for seven of the eight federally listed species on BLNWR. The major construction work for this large-scale restoration project was completed in the fall of 2014 with some minor follow-up work in 2015. Restoration, primarily invasive species control, continued in the Rio Hondo in 2019, and monitoring efforts indicate positive responses to these restoration efforts.

- Invasive species control continued in 2019 with a focus on the maintenance of several large-scale restoration projects and preparing wetland units for winter prescribed burns. These projects included the use of American Conservation Experience (ACE) crews, BLNWR personnel, and New Mexico Invasive Species Strike Team staff to treat invasive species along portions of the Pecos River corridor. These crews treated approximately 55 acres of phragmites (a large wetland grass) along the banks of the restored Rio Hondo, Bitter Creek, Unit 5 and Unit 7. Just under one acre of Russian knapweed and perennial pepperweed was treated on the Middle Tract and Rio Hondo.

- Pecos River restoration efforts continued along the river corridor with emphasis on invasive Ravenna grass mapping. All riparian habitat along the Pecos River corridor was mapped by New Mexico Invasive Species Strike Team members. Ravenna grass treatments along the entire corridor will be a priority for BLNWR in the coming years, and refuge staff are developing a treatment plan.

- In 2013, the saltcedar leaf beetle (*Diorhabda* spp.) was discovered on BLNWR for the first time, and infestation quickly spread throughout the Pecos River Valley in 2014. Saltcedar defoliation occurred throughout BLNWR in 2019, although most of the defoliation appeared to occur later in the season, similar to the prior year. Saltcedar beetles were observed on all three tracts of the refuge. Future salt cedar management will continue to have a reduced focus because of the beetles' presence, although BLNWR staff have noticed an increase in smaller-sized plants.

- Within the wetland impoundments, BLNWR staff treated phragmites and cattail infestations focusing on Unit 5 and Unit 7. A prescribed burn in Unit 7 is planned for early 2020 to aid in invasive species removal. Since leaf beetles were discovered, BLNWR has backed away from saltcedar treatments within the impoundments and shifted efforts towards the large- scale restoration projects currently in progress. At this time, approximately 98 percent of the saltcedar within the wetland impoundments has been successfully removed. However, BLNWR staff noticed more resprouts on the refuge in 2019, and will be tracking success of the beetle and may initiate targeted saltcedar removal in 2020 within the wetland impoundments.

- Phragmites infested approximately 80 percent of Bitter Creek as a result of a human caused wildfire in 2000. Prior to this wildfire, stream banks of Bitter Creek consisted of a stable mosaic of native riparian plants. In the following 13 years after the fire, phragmites infested more than 3 hectares (7 acres) along the creek. Phragmites covered over 1,220 m (4,000 ft.) of stream bank with stands 1.5 to 6 m (5 to 20 ft.) wide. In addition, rampant in-channel growth degraded the active spring channels that formerly included open water spring runs. As a result, spring velocity decreased, water quality deteriorated, and excessive shading decreased water temperatures. Phragmites utilizes more water than native plant communities, which may have stressed endangered species that occupy Bitter Creek. Additionally, phragmites infestations along Bitter Creek displaced Pecos sunflowers and occupied habitat within sunflower designated critical habitat. BLNWR staff, ACE crews, and volunteers targeted the last degraded sections of Bitter Creek in 2019 and expect follow-up maintenance treatments for the next few years. In 2019, BLNWR also planted saltgrass, alkali sacaton and sunflower along previously treated areas and conducted two small prescribed burns in small sections along Bitter Creek that were treated in 2018.

- BLNWR staff continued to trap and remove common carp (*Cyprinus carpio*) from the restored section of the Rio Hondo, and have removed over 170 carp to date. Staff have noticed positive responses from important submerged aquatic vegetation (primarily *Ruppia* spp.) following removal of carp.

- BLNWR held its seventeenth annual Dragonfly Festival in 2019. Approximately 1,500 people attended the weekend-long event. Families were treated to dragonfly/wildlife tours, reptile shows, vendors, wildlife displays, kid's arts and crafts activities, auditorium presentations, and a children's scavenger hunt. Once again, the NMDGF fishing tank and archery activities were a big success.

Consultations

There were two intra-Service consultations in 2019.

- *Consultation Number:* 02ENNM00-2019-F-0018

  Consultation Name: Prescribed Burns at Bitter Lake National Wildlife Refuge

Project Description: The Proposed Action is to remove treated patches of common reed (*Phragmites*) long Bitter Creek and provide additional habitat, through invasive species control and canopy removal, to Pecos sunflower (*Helianthus paradoxus*) and Wright's marsh thistle (*Cirsium wrightii*) by a series of prescribed burns.

Consultation concluded on February 1, 2019.

- *Consultation Number:* 02ENNM00-2019-F-1064

  Consultation Name: Pecos Sunflower and Wright's Marsh Thistle Seed Collection and Germination Project

  Project Description: Staff from Bitter Lake National Wildlife Refuge (along with USGS Co-op staff) proposed to collect 2,000 Pecos sunflower seeds distributed across the Middle Tract of the refuge in Chaves County, New Mexico. These seeds will be transported to a research facility in Louisiana and used in laboratory experiments designed to 1) evaluate the effects of soil moisture and salinity on Pecos sunflower seed germination, 2) determine germination rates of Pecos sunflower seeds, and 3) identify the physiological dormancy requirements of Pecos sunflower. The results of these laboratory studies will increase our understanding of Pecos sunflower seed germination requirements and thereby inform the refuge's timing and duration of water application for managing wetlands to improve the germination success of Pecos sunflower and other wetland species.

  Consultation concluded on August 28, 2019.

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