FEDERAL AID JOB PROGRESS REPORT

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2018

LAHONTAN CUTTHROAT TROUT STUDY
WESTERN REGION
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SUMMARY

Lahontan cutthroat trout (LCT, *Oncorhynchus clarkii henshawi*) population monitoring and riparian habitat surveys were completed in the Montana Mountains (Washburn Creek, Crowley Creek, and Riser Creek), Snowstorm Mountains (South Fork Little Humboldt River, First Creek, Snowstorm Creek, Sheep Creek, Secret Creek, and Oregon Canyon Creek), and the Santa Rosa Range (Threemile Creek and Long Canyon Creek).

Riparian habitat assessments and livestock monitoring occurred in coordination with Bureau of Land Management, Winnemucca District and US Forest Service, Santa Rosa Ranger District regularly during the spring, summer, and fall grazing seasons. These efforts occurred on LCT occupied and recovery streams within historic habitat.

A chemical treatment was completed on lower Falls Canyon Creek to eradicate non-native brook trout. LCT occurs in the upper reach above the falls.

BACKGROUND

LCT is the only native trout occurring in the Lahontan Basin. It was distributed in the drainages of ancient Lake Lahontan and as conditions became more arid during the last 5,000 to 12,000 years, it survived in small populations of isolated headwater streams throughout many mountain ranges in Nevada, Oregon, and California.

The settlement of the Great Basin brought urban development, livestock grazing, mining, water diversions, and introduction of non-native trout resulting in hybridization and competition. All this led to significant declines in the range and numbers of this unique cutthroat trout subspecies. In response to these declines, LCT was listed as endangered in 1970, but reclassified as threatened in 1975. In January 1995, the USFWS released a recovery plan for the Lahontan cutthroat trout.

LCT was historically common in the Quinn River, Black Rock, and Little Humboldt River sub-basins of the Humboldt River system. Black Rock drainages could have had as many as 46 streams occupied by LCT. Presently, LCT is thought to occupy only 15% of its historic stream habitat in the Quinn River-Black Rock drainages. Populations have suffered from habitat loss, hybridization with nonnative salmonids, and extended droughts. Recovery action in the Quinn River drainage is a priority listed in the 1995 USFWS Lahontan Cutthroat Trout Recovery Plan.

The final draft of the Lahontan Cutthroat Trout Species Management Plan for the Quinn/Black Rock Basins and North Fork of the Little Humboldt River Sub-basin was completed in 1999. This plan was written under the umbrella of the U.S. Fish and Wildlife LCT Recovery Plan and the Nevada Department of Wildlife (NDOW) and the Northwest
Geographic Management Unit (NWGMU) Team have used the management strategies and objectives to guide recovery efforts.

**OBJECTIVES**

- Coordinate with Oregon Department of Fish and Wildlife and NWGMU team during regularly scheduled meetings to identify actions needed to reestablish LCT into the McDermitt Creek system.
- Coordinate with staff from BLM Winnemucca District and USFS Santa Rosa Ranger District to complete regular monitoring on grazing allotments which contain LCT recovery streams to ensure land use practices are occurring as permitted.
- Coordinate with Eastern Region Fisheries Biologist to complete riparian habitat assessments and fish population surveys on streams within the South Fork Little Humboldt River system.
- Complete riparian habitat assessments and fish population surveys on Riser Creek, Crowley Creek, and Washburn Creek.
- Conduct population monitoring on LCT populations in Threemile Creek (Santa Rosa Range, approximately 4 miles), Eightmile Creek (Santa Rosa Range, approximately 4 miles), Long Canyon Creek (Santa Rosa Range, approximately 5 miles) and South Fork Indian Creek (Santa Rosa Range, approximately 4 miles).
- Conduct riparian habitat assessment and fish population monitoring on Flat Creek (Santa Rosa Range, approximately 5 miles) and South Fork Flat Creek (Santa Rosa Range, approximately 3 miles).
- Coordinate with Trout Unlimited to complete eDNA sampling on Riser Creek (Montana Mountains), Pole Creek (Montana Mountains), and Eightmile Creek to sample for the presence of LCT.
- Complete a chemical treatment on the lower section of Falls Canyon Creek (Santa Rosa Range) downstream of the waterfall fish barrier to remove nonnative brook trout.
- Coordinate with the two private land owners along Big Creek (Pine Forest Range) to complete safe harbor agreements. Complete a chemical treatment on Big Creek to remove nonnative brown trout.
- Conduct mechanical eradication of nonnative brook trout on Abel Creek in the upper one mile of stream habitat, and examine the possibility of reestablishing Abel Creek LCT in the North Fork Abel Creek.
- Augment the Andorno Creek population of LCT with either LCT from lower in the stream or from suitable LCT source stock that will be identified through population monitoring and genetic analysis.
- Reintroduce LCT into Happy Creek in the Jackson Mountains.
- Conduct General Aquatic Wildlife Surveys (GAWS) Level III stream surveys on streams as needed and identified to assist in LCT recovery efforts.
PROCEDURES

Coordinate with Oregon Department of Fish and Wildlife and NWGMU team during regularly scheduled meetings to identify actions needed to reestablish LCT into the McDermitt Creek system. On August 9, 2018, NDOW, FWS, BLM Vale District, ODFW, private landowners, and livestock grazing lessees participated in a field visit to BLM’s Corral Canyon Creek monitoring site. Stakeholders discussed experiences with the recovery of nearby riparian and upland habitats since the Holloway Fire, livestock use along Corral Canyon Creek, a recent small wildfire in the area, observations of LCT populations in the stream, and ways to improve and maximize future monitoring efforts. There was no Trout Creek Working Group meeting held in fall of 2018.

Coordinate with staff from BLM Winnemucca District and USFS Santa Rosa Ranger District to complete regular monitoring on grazing allotments which contain LCT recovery streams to ensure land use practices are occurring as permitted. Throughout 2018, NDOW participated in monthly conference calls with BLM and FWS to provide updates on riparian monitoring results, monitoring needs, and other observations. On February 13, 2018, a meeting was attended along with BLM and FWS to discuss results of riparian monitoring in 2017 and what adjustments and improvements could be made to improve conditions during the 2018 grazing season on allotments having LCT recovery streams.

On February 13 and 14, March 1, March 5, 8, and 23, June 5, July 26, and November 6 and 7, 2018, NDOW participated in Jordan Meadows Working Group meetings and field tours. Topics included discussion of the current grazing system and approaches for improving the 2018 season, response of LCT populations to changes in habitat conditions, infrastructure to reduce dependency on streams for livestock water resources, current fences and maintenance needs, and multiple other aspects of improving the overall management of the allotment. There were also smaller subcommittees with representatives who are familiar with current livestock and wildlife management.

Throughout the 2018 grazing season, there was semi-regular correspondence between the BLM Winnemucca District Humboldt River and Black Rock Field Offices regarding monitoring and field observations. NDOW did not participate in BLM’s 2018 monitoring associated with LCT recovery.

Regular scheduled meetings with the Santa Rosa Ranger District of the USFS did not occur in 2018, but there was correspondence regarding the Falls Canyon Treatment Project. NDOW provided updates on LCT recovery activities occurring on the Santa Rosa Ranger District and included brook trout removal in Abel Creek.

Coordinate with Eastern Region Fisheries Biologist to complete riparian habitat assessments and fish population surveys on streams within the South Fork Little Humboldt River system. The Eastern Region was assisted with riparian habitat assessments and fish population surveys on the South Fork Little Humboldt River (August
and September), Snowstorm Creek (August 7), First Creek (August 8 and 14), Winters Creek (August 2018), Sheep Creek (September 17), Secret Creek (September 19), and Oregon Canyon Creek (October 9).

A General Aquatic Wildlife System (GAWS) survey was used at previously established stations. Stations were 50 m (164 ft) long and consisted of three habitat transects placed at 0, 25, and 50 m. GPS location, temperature (air and water), flow (float method), riparian and upland vegetation types, general conditions, and aquatic habitats were noted. Undercut banks visually estimated the percentage of banks that were undercut throughout the station length. Random aquatic macroinvertebrate samples were collected to examine major species present. Three photos were taken at the first transect of each station, one looking upstream, one looking downstream, and one looking across stream. Habitat sampling was not intended to serve as a full habitat survey, but rather to capture stream conditions in the area where fish populations were assessed.

At each stations where suitable water conditions persisted, a Smith Root LR-20B backpack electroshocker was used to survey fish. LCT captured were measured, a small fin clip collected, and were temporarily placed in holding containers while electroshocking was completed. After the survey, LCT were released unharmed back into the stream. YOY LCT were only measured and no fin clips were collected.

**Complete riparian habitat assessments and fish population surveys on Riser Creek, Crowley Creek, and Washburn Creek.** GAWS and electroshocking surveys were completed on Washburn Creek (July 2018), Crowley Creek (July 2018), and Riser Creek (July, September, and October 2018). All stations were established during previous stream surveys. Three transects at 0, 50, and 100 ft were sampled at each station. Data collected followed procedures outlined by USFS GAWS methodology.

Habitat condition index (HCI) is a means to express the assessment of riparian habitat based on pool measure (riffle to pool ratio), pool structure (quantity of quality pools), desirable stream bottom substrates (gravel and rubble), bank cover, bank vegetation stability, and bank soil stability. This index is used to help determine which parameter(s) could have the greatest effect on improving the riparian habitat of a stream reach or an entire stream. HCI scores are rated as follows: 0-49% poor, 50-59% fair, 60-69% good, and 70-100% excellent. Scores less than 100% reflects the need for potential improvement of riparian habitat conditions. Streams or stream reaches scoring above 70% are generally considered suitable to sustaining trout populations.

Each station having suitable water conditions was sampled with Smith Root LR-20B backpack electroshockers. Stations where water temperatures exceeded 18.3°C (65°F) or with low water flows were not electroshocked for the safety of the fish. LCT captured were measured, a small fin clip collected, location recorded where captured, and were temporarily placed in holding containers until electroshocking was completed. After electroshocking, LCT were released unharmed back into the stream. YOY LCT were only measured and no fin clips were collected.
Conduct population monitoring on LCT populations in Threemile Creek (Santa Rosa Range, approximately 4 miles), Eightmile Creek (Santa Rosa Range, approximately 4 miles), Long Canyon Creek (Santa Rosa Range, approximately 5 miles) and South Fork Indian Creek (Santa Rosa Range, approximately 4 miles). Single-pass electroshocking surveys with 30.5 m (100 ft) transects at established survey locations were completed on Threemile Creek (August 29) and Long Canyon Creek (September 5). A clip from the caudal fin of LCT caught was collected for genetic analysis, total length was measured, and UTM coordinates of the capture location was recorded before releasing the fish unharmed back into the water where it was captured. Smith-Root LR-20B backpack electroshockers were used during fish surveys. For the safety of the fish, no electroshocking was completed when water temperature reached or exceeded 18.3°C (65°F) or when flow was low.

Eightmile Creek and South Fork Indian Creek were not surveyed in 2018 due to time constraints and shortage of personnel.

Conduct riparian habitat assessment and fish population monitoring on Flat Creek (Santa Rosa Range, approximately 5 miles) and South Fork Flat Creek (Santa Rosa Range, approximately 3 miles). Due to time constraints and a shortage of personnel, Flat Creek and South Fork Flat Creek riparian habitat assessments and fish population monitoring were not completed.

Coordinate with Trout Unlimited to complete eDNA sampling on Riser Creek (Montana Mountains), Pole Creek (Montana Mountains), and Eightmile Creek to sample for the presence of LCT. No eDNA sampling occurred at Riser, Pole, and Eightmile creeks. However, a fish population survey was completed at Riser Creek using backpack electroshockers.

Coordinate with Trout Unlimited to complete eDNA sampling on Long Canyon Creek (Santa Rosa Range). No eDNA sampling occurred at Long Canyon Creek. However, a fish population survey was completed using backpack electroshockers.

Complete a chemical treatment on the lower section of Falls Canyon Creek (Santa Rosa Range) downstream of the waterfall fish barrier to remove nonnative brook trout. NDOW, BLM, USFS, and livestock operators met regarding the Falls Canyon Creek treatment. On July 16, 2018, there was a site visit to Falls Canyon Creek to look at the diversion point and the irrigation ditch and discuss upcoming plans to breach the earthen diversion structure.

The rotenone treatment on Falls Canyon Creek downstream of the waterfall was completed on August 21 and 22, 2018. A detailed overview of the treatment project is covered in the September 6, 2018 Falls Canyon Creek Treatment Project Field Trip Report.
Coordinate with the two private landowners along Big Creek (Pine Forest Range) to complete safe harbor agreements. Complete a chemical treatment on Big Creek to remove nonnative brown trout. During 2018, no meeting occurred with private landowners to discuss LCT management activities at Big Creek. BLM stated they initiated conversations with the livestock grazing permittee on the possibility of future LCT reintroduction efforts. No discussions of a safe harbor agreement or chemical treatment on Big Creek in 2018 were initiated.

Conduct mechanical eradication of nonnative brook trout on Abel Creek in the upper one mile of stream habitat, and examine the possibility of reestablishing Abel Creek LCT in the North Fork Abel Creek. On July 24 and 25, the upper one mile of Abel Creek in the Santa Rosa Range was intensively electroshocked with Smith-Root LR-20B backpack electroshockers. During the first day, the lowermost crew began downstream of a seasonal fish barrier and began working upstream to remove all brook trout captured. During the second day, crews began approximately 0.1 mi downstream of where they finished removal efforts the prior day. The first fifty brook trout were measured. All LCT were measured and returned where they were caught. Extra care was taken not to injure sampled LCT. Efforts to reestablish LCT in Nork Fork Abel Creek were not pursued.

Augment the Andorno Creek population of LCT with either LCT from lower in the stream or from suitable LCT source stock that will be identified through population monitoring and genetic analysis. LCT was reestablished in Andorno Creek in 1999 and, during fish population monitoring in 2016, multiple size classes were observed. However, during 2016, LCT only occupied a relatively short section of stream from the intake pipe upstream to approximately the US Forest Service wilderness boundary. Fin clips for genetic analysis were collected in July 2016. Since an adequate donor population was not available in the immediate area, it was decided to capture LCT in lower Andorno Creek for relocation upstream where suitable habitat had been identified.

On October 2, 2018, NDOW and USFWS travelled to Andorno Creek to capture LCT using a Smith-Root LR-20B backpack electroshocker. LCT to be relocated were placed in covered buckets with aerators attached. This process was completed twice, each time covering a section of stream approximately 200 m (656 ft). When 15-20 LCT had been captured, they were transferred to a silicone dry bag inside a backpack filled with stream water and an aerator. LCT were released at two locations approximately 1.0 and 1.5 mi upstream of the highest section that LCT were encountered during previous survey efforts. The release area on Andorno Creek had deeper pool habitats available and the fish could move freely down- and upstream.

Reintroduce LCT into Happy Creek in the Jackson Mountains. No LCT reintroduction occurred in Happy Creek during 2018 due to inconsistent water flows.

Conduct General Aquatic Wildlife Surveys (GAWS) Level III stream surveys on streams as needed and identified to assist in LCT recovery efforts. No additional
streams were identified for sampling in 2018.

**FINDINGS**

**Coordinate with Oregon Department of Fish and Wildlife and NWGMU team during regularly scheduled meetings to identify actions needed to reestablish LCT into the McDermitt Creek system.** No surveys or management actions were completed in 2018 to assist in reestablishing LCT into the McDermitt Creek system.

During the August 9 site visit to Corral Canyon Creek, various stakeholders expressed their observations and experiences on the impacts of livestock grazing on LCT streams. The location visited was at the BLM Vale District post-season monitoring site on Corral Canyon Creek. At the time of the visit, this section of the stream was dry and LCT habitat was isolated to upper stream reaches. The results from BLM’s 2018 monitoring have not yet been shared with NDOW.

**Coordinate with staff from BLM Winnemucca District and USFS Santa Rosa Ranger District to complete regular monitoring on grazing allotments which contain LCT recovery streams to ensure land use practices are occurring as permitted.** During the February 13 LCT meeting, the BLM Winnemucca District shared that several allotments were not in compliance based on monitoring results. All allotments discussed contained either LCT occupied streams or LCT recovery streams. NDOW, BLM, and FWS made management recommendations on how to improve riparian habitat conditions and strive for compliance with livestock grazing permits.

Throughout 2018, coordination and participation with the working group continued. The Jordan Meadows working group met multiple times during the year and the Kings River working group held its first meeting. The National Riparian Service Team facilitated and provided guidance and management recommendations.

On February 14-15, 2018, June 5, 2018, July 26, 2018, and November 6-7, 2018 NDOW participated in the Jordan Meadows collaborative working group meetings. The results of these meetings included a list of action items and committees that focused their time on specific tasks which were reported on at later meetings. NDOW staff participated in further discussions regarding water developments and water gap infrastructure on Jordan Meadows Allotment. Due to scheduling conflicts a field visit could not be completed to visit the water gaps in 2018.

December 13-14 was the first meeting for the Kings River working group, which focuses on improving understanding and management of the Kings River Allotment. During this meeting, baseline information on the resources present and how Kings River Ranch uses the allotment were shared to familiarize all members of the working group with the area. Kings River, Cold Springs Creek, Log Cabin Creek, Raster Creek, Rodeo Creek, and House Creek are LCT recovery streams that flow within the Kings River Allotment. Currently, these streams are occupied by LCT/rainbow trout hybrids and non-native trout, but the streams offer varying habitats suitable for LCT reintroduction efforts.
Coordinate with Eastern Region Fisheries Biologist to complete riparian habitat assessments and fish population surveys on streams within the South Fork Little Humboldt River system. Riparian habitat assessments and fish population surveys were completed on South Fork Little Humboldt River, First Creek, Snowstorm Creek, Winters Creek, Sheep Creek, Secret Creek, and Oregon Canyon Creek. Detailed information regarding findings and observations can be found in the 2018 field trip reports prepared by the Eastern Region.

**Complete riparian habitat assessments and fish population surveys on Riser Creek, Crowley Creek, and Washburn Creek.** Thirteen stations were surveyed on Riser Creek, 23 on Crowley Creek, and 21 on Washburn Creek. On Riser Creek, 5 of the 13 stations were wetted, and two of these had suitable water conditions to complete an electroshocking survey. However, no LCT was found. The average HCI for wetted stations was 83% (excellent).

During the July survey on Crowley Creek, 10 of the 23 stations were wetted, and five of these had suitable conditions to complete an electroshocking survey. No LCT was observed while electroshocking. The average HCI for wetted stations was 60% (good).

On Washburn Creek, 8 of the 21 stations surveyed were wetted and three had suitable water conditions suitable for electroshocking. Eight LCT were captured and an additional two were captured downstream of a station on the West Fork Washburn Creek. The LCT averaged 118 mm (4.65 in) and a caudal fin clip was collected from all ten LCT. LCT was also observed in small isolated pools outside of electroshocking transects. The average HCI for the eight wetted stations was 58% (fair).

Further information regarding surveys and sampling results for these streams is found in the Riser Creek (November 19, 2018), Crowley Creek (December 12, 2018), and Washburn Creek (November 20, 2018) GAWS Field Trip Reports.

**Conduct population monitoring on LCT populations in Threemile Creek (Santa Rosa Range, approximately 4 miles), Eightmile Creek (Santa Rosa Range, approximately 4 miles), Long Canyon Creek (Santa Rosa Range, approximately 5 miles) and South Fork Indian Creek (Santa Rosa Range, approximately 4 miles).** Eightmile Creek and Long Canyon Creek were not surveyed in 2018.

The fish population survey on Threemile Creek was completed on August 29 and only the top three stations (880, 848, and 798) had flowing water. LCT was found at all sites sampled, 12 averaging 103 mm (4.07 in). Fin clips were collected from the largest nine LCT and will be delivered to University of Nevada, Reno for genetic analysis. The population abundance was estimated at 316.

The Long Canyon Creek population survey was completed on September 5 and the upper three stations (570, 715, and 840) had suitable water flows for electroshocking. LCT were observed at all three stations. At station 840, several YOY were visually observed, but because of low water flow, no electroshocking was not completed to

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prevent injuring fish. Eight LCT were captured at stations 570 and 715, which averaged 107 mm (4.21 in) TL. The LCT population size for the section of stream that was surveyed was estimated at 264. Fin clips were collected from all fish for genetic analysis by Dr. Mary Peacock, University of Nevada, Reno.

**Conduct riparian habitat assessment and fish population monitoring on Flat Creek (Santa Rosa Range, approximately 5 miles) and South Fork Flat Creek (Santa Rosa Range, approximately 3 miles).** This management objective was not completed in 2018 due to other fisheries management activities taking priority.

**Coordinate with Trout Unlimited to complete eDNA sampling on Riser Creek (Montana Mountains), Pole Creek (Montana Mountains), and Eightmile Creek to sample for the presence of LCT.** This management objective was not completed in 2018 due to a shortage of time for making the necessary arrangements and other fisheries management activities taking priority.

**Coordinate with Trout Unlimited to complete eDNA sampling on Long Canyon Creek (Santa Rosa Range).** This management objective was not completed since the section of stream where analysis would be helpful was mostly dry in late summer and fall. Consequently, the fishery was surveyed using a backpack electroshocking in the upper stream sections.

**Complete a chemical treatment on the lower section of Falls Canyon Creek (Santa Rosa Range) downstream of the waterfall fish barrier to remove nonnative brook trout.** The rotenone treatment downstream of the waterfall was completed on August 21 and 22. A detailed overview of the treatment project is covered in the September 6, 2018 Falls Canyon Creek Treatment Project Field Trip Report. Detailed information on quantity of chemical applied, application periods, and application methods are provided in this report.

Prior to eliminating brook trout, an LCT salvage was completed on the section of stream to be treated. Four LCT averaging 227 mm (8.9 in) TL were captured and relocated upstream of the waterfall on Falls Canyon Creek. During the actual treatment, fish carcasses were removed from the stream, finding 150 brook trout and 6 LCT. Brook trout averaged 162 mm (6.4 in) TL and LCT averaged 153 mm (6.0 in) TL. Fin clips were collected from the LCT carcasses and will be provided to University of Nevada, Reno for genetic analysis.

**Coordinate with the two private land owners along Big Creek (Pine Forest Range) to complete safe harbor agreements. Complete a chemical treatment on Big Creek to remove nonnative brown trout.** No coordination occurred with private landowners along Big Creek for establishing safe harbor agreements. No chemical treatment project was completed to extirpate brown trout.
Conduct mechanical eradication of nonnative brook trout on Abel Creek in the upper one mile of stream habitat, and examine the possibility of reestablishing Abel Creek LCT in the North Fork Abel Creek. NDOW and USFWS used backpack electroshockers to remove 390 brook trout from the upper reaches of Abel Creek on July 24 and 25. The section where brook trout were removed started at E443527 N4588464 and extended upstream to E442913 N4588126. Based on the first 50 brook trout captured, the average was 145 mm (5.71 in) TL. Twenty-nine LCT were also captured, averaging 158 mm (6.22 in) TL. A small fin clip was collected from 21 LCT, which will be delivered to University of Nevada, Reno for genetic analysis. All LCT were released unharmed back into Abel Creek. Due to other priorities, the possibility of reestablishing LCT in the north fork was not evaluated.

Augment the Andorno Creek population of LCT with either LCT from lower in the stream or from suitable LCT source stock that will be identified through population monitoring and genetic analysis. On October 2, 34 LCT were relocated from lower in Andorno Creek to the upper reaches where LCT was not present. The average size of 20 YOY was 61 mm (2.4 in) TL and 14 subadult/adult LCT averaged 167 mm (6.57 in) TL. Fin clips were collected from the larger LCT for later genetic analysis.

Reintroduce LCT into Happy Creek in the Jackson Mountains. This management objective was not completed in 2018 due to inconsistent water conditions in Happy Creek.

Conduct General Aquatic Wildlife Surveys (GAWS) Level III stream surveys on streams as needed and identified to assist in LCT recovery efforts. No additional GAWS surveys were identified and completed during the reporting period.

MANAGEMENT REVIEW

Coordinate with Oregon Department of Fish and Wildlife and NWGMU team during regularly scheduled meetings to identify actions needed to reestablish LCT into the McDermitt Creek system. While no surveys were completed in the McDermitt Creek system, this watershed remains a priority for the long-term recovery of NWGMU LCT populations. Until a management plan can be developed for removing non-native fishes and reintroducing LCT into upper stream reaches in Oregon, fisheries management efforts in Nevada will remain focused on ensuring LCT populations continue to persist in Sage Creek, Corral Canyon Creek, and Line Canyon Creek. Managing land uses and continued post-fire habitat recovery in Corral Canyon Creek and Line Canyon Creek drainages is essential for providing functioning riparian habitats to support self-sustaining LCT populations.

Currently, LCT populations in Corral Canyon and Line Canyon creeks appear to be secure with due a temporary barrier on Sage Creek. Follow-up population monitoring and genetic analysis during the next 2 to 3 years will be necessary to verify that temporary fish barriers are still functioning to protect LCT. Monitoring riparian habitats also should continue annually when livestock are present in order to prevent them from exceeding the
grazing standards.

Coordinate with staff from BLM Winnemucca District and USFS Santa Rosa Ranger District to complete regular monitoring on grazing allotments which contain LCT recovery streams to ensure land use practices are occurring as permitted. Livestock grazing is a major land use that occurs in many LCT recovery drainages of the NWGMU. Monthly scheduled conversations and updates between agencies regarding field observations will continue to assist with improving and understanding current livestock use. Unmanaged livestock grazing typically damages riparian habitat, an impact that depends on grazing frequency and duration. Damage from bank trampling causes bank failures that increases sedimentation, removes vegetation, and widens streams, which generally result in increasing water temperatures. Reducing the dependency of livestock on stream for extended periods, especially in the summer, can minimize the impacts in LCT recovery drainages.

To improve the public perception of LCT recovery efforts, the land management agencies and wildlife management agencies need to effectively communicate with stakeholders (primarily livestock grazing permittees) on what, if any, changes would occur with establishing LCT to their historic range. Oftentimes, on allotments administered by the BLM, reestablishing LCT in a stream would not result in more stringent grazing or monitoring standards since the stream was likely previously managed as a fish bearing stream.

The riparian monitoring program for the Santa Rosa Ranger District only occurs on streams that currently support LCT populations. Habitat conditions for recovery streams within historic LCT ranges are not monitored and these streams are generally visited by USFS on a limited basis for grazing compliance checks.

Due to limitations by the USFS to complete on the ground monitoring, NDOW will continue to work closely with them to maximize monitoring efficiency that aid in LCT recovery. It is recommended that monitoring sites be reevaluated regarding their importance in providing suitable LCT habitat. Since a limited number of monitoring locations can be visited annually, sites should reflect current habitat conditions and potential impacts from land uses.

Coordinate with Eastern Region Fisheries Biologist to complete riparian habitat assessments and fish population surveys on streams within the South Fork Little Humboldt River system. Riparian habitat assessments and fish population surveys have been completed on the South Fork Little Humboldt River every few years since 1988. This area has a combination of privately owned lands and lands administered by BLM Winnemucca and Elko Districts. During population surveys within several streams, multiple LCT age classes were documented along with numerous YOY from a successful 2018 spawn.

Streams on the east side of the Santa Rosa Range drain into the Little Humboldt River watershed, with some offering high quality habitats for reintroducing LCT.
Currently, there are no LCT populations in the Santa Rosa Range large enough to be used as a donor stock. Alternatively, based on 2018 survey results, there are suitable numbers of LCT available in South Fork Little Humboldt River streams to use for reintroduction efforts. Existing LCT populations in Abel Creek, South Fork Indian Creek, and Long Canyon Creek would benefit from LCT augmentations from streams in the Little Humboldt River system to increase genetic diversity in these isolated and extremely small populations.

Snowstorm Creek appears to be susceptible to impacts from livestock grazing in stream reaches that have potential for supporting LCT. Ideally, minimal livestock grazing should occur from July through mid-September when LCT is highly vulnerable due to low water flows and higher temperatures. There appears to be potential for increasing LCT abundance and expand its distribution in Snowstorm Creek.

Moving forward, habitat management, especially lands encompassed by the Bullhead Allotment, will be coordinated with NDOW Eastern Region, BLM Winnemucca District, and the private landowner/permittee. Despite low water conditions, LCT were observed at many survey stations and future management should focus on continuing to maintain and improve the degraded riparian habitat conditions.

**Complete riparian habitat assessments and fish population surveys on Riser Creek, Crowley Creek, and Washburn Creek.** Results of routine riparian habitat assessments and fish population surveys become valuable to wildlife managers and land management agencies for assessing LCT responses to changes in habitat conditions. Currently, management actions and decisions that influence these three streams are developed through the Jordan Meadows Working Group. Working group members include NDOW, USFWS, BLM, University of Nevada Reno, and the livestock grazing permittee.


Since LCT was reintroduced in 2009, Riser Creek has experienced extended periods of low flow and recent surveys have failed to document LCT. During years with low flow, less than one mile of stream has suitable water flow and an increase in water temperature becomes the issue throughout the rest of the stream. Before augmenting the LCT population in Riser Creek, monitoring water temperature with thermographs should be completed for at least a year. This will examine the duration that water temperatures reach or exceed lethal limits or if thermal refuges occur.

LCT populations in Crowley and Washburn creeks have experienced dramatic reduction in sizes and distributions because of low water conditions resulting in a loss of
habitats. Historically, these streams once supported some of the highest LCT abundances and were once the source stock for reintroduction efforts elsewhere in the NWGMU. The 2012 chemical treatment in lower Crowley Creek to remove LCT/rainbow trout hybrids was successful. Low water conditions occurring since 2014 have limited the success of LCT, however, fish have moved downstream and recolonized the area that was treated. Improving and securing stream flows in Riser, Crowley, and Washburn creeks will be essential for the long-term persistence of LCT.

Conduct population monitoring on LCT populations in Threemile Creek (Santa Rosa Range, approximately 4 miles), Eightmile Creek (Santa Rosa Range, approximately 4 miles), Long Canyon Creek (Santa Rosa Range, approximately 5 miles) and South Fork Indian Creek (Santa Rosa Range, approximately 4 miles). Similar to the 2016 survey in Threemile Creek, LCT were only observed at the uppermost three stations during 2018. In recent years, Threemile Creek continues to be dry downstream from the Radiator Hill access road, which limits available LCT habitat. The LCT population size was approximately 210 fish in 2016 and in 2018, it was estimated at 316 fish. However, population size estimates were based on a relatively small number of fish encountered while electroshocking. The upper sites surveyed on Threemile Creek had dense woody vegetation, which limited access to sampling. Fewer fish are usually encountered at stations 760 and 798 and the habitat conditions present in this section of stream might be at the threshold for LCT based on water temperature and flow. Station 760 was dry during 2015 and 2018 surveys, but it is usually dry downstream of this.

Genetic analysis results are still pending for LCT samples collected during 2015 in Threemile Creek. Earlier samples revealed there are possibly Yellowstone cutthroat trout genes in fish from Threemile Creek. As opportunities arise in drought years when flows diminish, possible Yellowstone cutthroat trout hybrids should be removed from Threemile Creek in order to protect the remaining pure LCT.

The possibility of mining exploration continues to threaten the Eightmile Creek, Threemile Creek, and National Canyon drainages. Mining development should be closely monitored to prevent damage or alteration of stream systems and associated riparian habitats.

LCT were documented only in the upper transects of Long Canyon Creek during 2018. This is likely due to the ongoing drought causing lower stream reaches to become dry. Young-of-the-year LCT was observed despite low water conditions indicating there was successful spawning during the spring. Low flows appeared to have reduced or eliminated non-native trout in Long Canyon Creek as none have been identified in recent surveys.

USFWS reported observing LCT in South Fork Indian Creek during the summer of 2018. Water conditions were low, which limited the amount of available habitat. Eightmile Creek and South Fork Indian Creek will be identified for population monitoring in 2019.
Conduct riparian habitat assessment and fish population monitoring on Flat Creek (Santa Rosa Range, approximately 5 miles) and South Fork Flat Creek (Santa Rosa Range, approximately 3 miles). Due to other fisheries management priorities, there were no surveys completed on these streams in 2018 and surveys will be rescheduled for early summer 2019. Neither Flat Creek nor South Fork Flat Creek have been surveyed in recent years, but from historical data, streams offer suitable habitat for supporting self-sustaining trout populations. Survey results from 1982 indicate that the system once supported an LCT population. Securing higher elevation habitats that have suitable water quality and quantity will be essential for the long-term persistence of LCT in the NWGMU.

Coordinate with Trout Unlimited to complete eDNA sampling on Riser Creek (Montana Mountains), Pole Creek (Montana Mountains), and Eightmile Creek to sample for the presence of LCT. Backpack electroshocking is the primary sampling method used for completing population monitoring on streams in the NWGMU. However, at times due to factors such as dense vegetation and low populations, electroshocking may fail to a good estimate of the fish population in a stream. In recent years, Riser, Pole, and Eightmile creeks are characterized as having intermittent stream flows and low LCT populations. The last several attempts to sample Riser Creek and Pole Creek with backpack electroshockers have failed to locate any LCT.

High water temperatures and low flows have been identified as major limiting factors for LCT persistence within the NWGMU. During July 2018, nearby Crowley Creek (elevation 6,400 ft) in the Montana Mountains had water temperatures that reached 26°C (79°F). As a result of these harsh conditions, the LCT population has declined to such a low number that either the fish were missed while electroshocking or they no longer occupied the stream. Using eDNA sampling is an additional method to determine presence and increase our understanding of fish distribution and populations changes in response to changing habitat conditions.

Coordinate with Trout Unlimited to complete eDNA sampling on Long Canyon Creek (Santa Rosa Range). LCT and non-native trout have been observed in Long Canyon Creek. Typically, LCT is isolated to the upper stream sections, separated from non-native trout by a series of beaver dams and a seasonally dry stream channel. Since summer 2015, Long Canyon Creek has been regularly dry downstream of the beaver dam complex to its confluence with the North Fork Little Humboldt River. The upper reaches of the North Fork Little Humboldt River, which support non-native trout, have been typically characterized by having intermittent flow patterns.

The section of Long Canyon Creek within the beaver dam complex is traditionally difficult to sample with backpack electroshockers because of deep ponds and downed woody debris. Collecting eDNA samples throughout this section will assist in examining LCT and non-native trout presence and distribution. Low water conditions in Long Canyon Creek have greatly reduced the abundance of non-native trout, but there remains the potential for them to disperse from the North Fork Little Humboldt River into Long Canyon Creek.
Complete a chemical treatment on the lower section of Falls Canyon Creek (Santa Rosa Range) downstream of the waterfall fish barrier to remove nonnative brook trout. The rotenone application on Falls Canyon Creek was completed successfully on August 21 and 22, 2018 using a rotenone formulation in backpack sprayers and drip-buckets throughout the treatment area below the falls. There were no major obstacles encountered that would have limited the effectiveness of the treatment. By the second day, no fish were observed alive indicating the rotenone was being dispersed effectively throughout the waterway.

Post-treatment surveys using eDNA sampling and traditional backpack electroshockers will be necessary to determine if the treatment was successful in eradicating brook trout. Post-treatment surveys will occur in the treated area as well as upstream of the waterfall. Based on 2017 electroshocking results, the area upstream of the waterfall was only inhabited by LCT. To continue protecting LCT from further threats it will be essential to monitor the entire stream.

Coordinate with the two private landowners along Big Creek (Pine Forest Range) to complete safe harbor agreements. Complete a chemical treatment on Big Creek to remove nonnative brown trout. Big Creek, along with some streams in the Santa Rose and Bilk Creek ranges, offer some of the highest quality habitat (i.e., water quantity and quality) for LCT recovery. Currently, Big Creek supports a population of non-native brown trout (Salmo trutta). The stream system flows through privately owned lands, lands administered by the BLM Winnemucca District, the Pine Forest Range Wilderness Area. Big Creek should be identified for reestablishing LCT once brown trout have been removed. Pursuing a safe harbor agreement with the private landowner will also facilitate reintroduction efforts. Establishing resilient self-sustaining LCT populations in systems such as Big Creek will be essential for recovering LCT in the NWGMY.

Conduct mechanical eradication of nonnative brook trout on Abel Creek in the upper one mile of stream habitat and examine the possibility of reestablishing Abel Creek LCT in the North Fork Abel Creek. Despite only occupying a relatively short section of Abel Creek, LCT continues to persist in low numbers despite competing with brook trout for forage and habitat. Mechanical removal using backpack electroshockers continue to be used to remove brook trout occupying the upper stream reaches where LCT is most often encountered.

Since 2014, there have been 2,651 brook trout removed from Abel Creek along the same section each year. Brook trout are successfully spawned each fall since the project finds fingerling-sized brook trout each year. Mature adults of a variety of sizes and age classes are also represented annually. Figure 1 displays the year-to-year variation in number of brook trout removed from and number of LCT encountered during removal efforts.
Several NDOW crewmembers removing brook trout have worked on this project for multiple consecutive years and there was consensus that a higher number of YOY LCT was observed in 2018. Because of this, pools occupying multiple YOY LCT were minimally electroshocked to avoid injuring them.

Mechanical removal of brook trout only temporarily reduces numbers within a section electroshocked since it is impossible to capture all fish. Consequently, brook trout will continue to spawn each fall and compete with LCT. Abel Creek is difficult to access because of dense riparian vegetation and this further limits the effectiveness of electroshocking.

Prior to reestablishing LCT in North Fork Abel Creek, brook trout occupying the lower reaches of the stream must be removed with rotenone. Completing a thorough eradication will involve treating areas flowing through the Santa Rosa-Paradise Peak Wilderness Area. LCT in Abel Creek will not be completely secure until all the brook trout are removed.

Augment the Andorno Creek population of LCT with either LCT from lower in the stream or from suitable LCT source stock that will be identified through population monitoring and genetic analysis. Distributing LCT from lower in Andorno Creek to the middle reaches appeared to be successful. Occasionally during high streamflow, LCT will be washed into the outflow pipe and transported to the pond west of Highway 93 on the Wilson Ranch. There is no way for fish to pass back upstream into Andorno Creek.

Follow-up surveys should be completed in late summer or fall 2020 or 2021 to determine if the movement was successful in improving LCT distribution. Additional movement may be necessary depending on the results of this monitoring. Surveys suggest that there still is an abundance of LCT in the lower system for moving upstream.
**Reintroduce LCT into Happy Creek in the Jackson Mountains.** Though low water and inconsistent flow in Happy Creek prevented the reintroduction of LCT, this management objective still should be pursued as water flow improves. Happy Creek flows through sections of privately owned lands and a safe harbor agreement would need to be established to assist in recovery efforts. Limited correspondence has occurred with the ranch manager and a baseline survey has yet to be completed.

**Conduct General Aquatic Wildlife Surveys (GAWS) Level III stream surveys on streams as needed and identified to assist in LCT recovery efforts.** During 2018, no additional streams were identified for GAWS habitat surveys.

**RECOMMENDATIONS**

- Coordinate with ODFW to complete LCT recovery efforts in the McDermitt Creek system.
- Complete post-treatment monitoring using backpack electroshocking and eDNA sampling on Falls Canyon Creek.
- Complete fish population surveys and riparian habitat monitoring on Eightmile Creek, South Fork Indian, Flat Creek, and South Fork Flat Creek.
- Continue mechanical removal of brook trout in the upper one mile of Abel Creek.
- Attend NWGMU meetings and coordinate LCT recovery efforts.
- Collect fin clips from LCT populations throughout the NWGMU.
- Reestablish LCT populations within the NWMGU as opportunities arise.
- Coordinate with BLM and USFS to ensure land uses are not negatively impacting LCT populations and habitats.

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