Humboldt Management Unit Short-Term Action Plan for Lahontan Cutthroat Trout Recovery

July 1, 2023 through June 30, 2028

Updated: April 5, 2023

Humboldt Recovery Implementation Team:

Bureau of Land Management – Elko District, Tuscarora Field Office
Bureau of Land Management – Elko District, Wells Field Office
Bureau of Land Management – Winnemucca District, Humboldt River Field Office
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Nevada Department of Agriculture
Nevada Department of Conservation and Natural Resources – Conservation Districts Program
Nevada Department of Wildlife
Nevada Gold Mines
Trout Unlimited
US Fish and Wildlife Service – Reno Field Office, Ecological Services
US Forest Service – Mountain City, Jarbidge, Ruby Mountains, and Santa Rosa Ranger Districts

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July 1, 2023 through June 30, 2028
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SUMMARY

This Short-Term Action Plan (STAP) for the Humboldt Management Unit (HMU) represents the first version of a STAP to be completed by the Humboldt Recovery Implementation Team (RIT). Previously when the area was organized as a Geographic Management Unit (GMU), the GMU team would periodically produce a document summarizing short and long-term recovery actions for the Humboldt GMU. This document, last updated in 2020m included a table listing the past recovery actions implemented on priority streams within priority subbasins along with actions planned for 2020 through 2022.

The Coordinating Committee directed all RIT's to complete STAP's to identify priorities recovery actions for their management units or identify necessary steps and requirements to achieve recovery priority projects. The Humboldt RIT had a working list of several priority efforts that was reviewed and agreed to at the January 12, 2023 RIT meeting. This STAP describes the seven priority projects required to assist in recovering LCT within the HMU (Figure 1).

Projects discussed in the STAP are organized roughly from west to east and not in order of management priority. Annual prioritization may vary depending on opportunities, funding, and timing for LCT recovery partners.

Update of Humboldt Management Unit Priority Projects

Project		2023	2024	2025
Abel and Stonehouse YY Brook Trout	Status	Ongoing		
	Priority Need	Staff for fieldwork		
	Priority Action	Brook Trout removal and YY stocking		
South Fork Little Humboldt Habitat Restoration	Status	Ongoing		
	Priority Need	Complete known infrastructure maintenance		
	Priority Action	Identify restoration opportunities and prioritize		
Rock Subbasin Habitat Restoration	Status	Pending		
	Priority Need	Staff time for field visits		
	Priority Action	Identify restoration opportunities and prioritize		
Willow Creek Hybridization Management	Status	Ongoing		
	Priority Need	Analyze fin clips for hybridization		
	Priority Action	Review hybridization results		
North Fork Humboldt River Complex LCT Reintroduction and Augmentation	Status	Ongoing		
	Priority Need	Staff resources for updating BA/BO's and sampling		
	Priority Action	Complete post-treatment eDNA sampling		
Marys River Non-native Fish and Habitat Restoration	Status	Ongoing		
	Priority Need	Funding to implement sampling plan		
	Priority Action	Develop hybridization/ nonnative sampling plan		
Long Canyon Complex Project	Status	Ongoing		
	Priority Need	Staff resources for updating BA/BO's and complete Long Canyon complex surveys		
	Priority Action	Update BA/BO's and fieldwork		

Status – Ongoing, Pending, Completed, Inactive
Priority Need – What is the greatest need to complete the action item for that project for a given year (i.e. – analyze fin clips for hybridization)
Priority Action – Provide main action item that will be completed to continue forward progress on a given priority project (i.e. – complete EA for barrier construction)

BACKGROUND

Prior to the 2019 Updated Goals and Objectives for the Conservation of Lahontan Cutthroat Trout (LCT Coordinating Committee, 2019 UGO's), LCT management in the HMU was previously guided by the 1995 Recovery Plan for the Lahontan Cutthroat Trout (Service 1995) and the 2004 Lahontan Cutthroat Trout Species Management Plan for the Upper Humboldt River Drainage Basin (Elliot 2004). This Short-Term Action Plan describes seven management actions that have been identified and agreed to by members of the Humboldt RIT in January 2023 as priorities for meeting HMU objectives that are identified in the 2019 UGO's.

The HMU includes eight 8-digit USGS Hydrological Unit Code subbasins (Lower Humboldt, Little Humboldt, Rock, Middle Humboldt, Pine, North Fork Humboldt, South Fork Humboldt, and Upper Humboldt) that offer some of the most climate resilient and interconnected systems available range wide for LCT. There are currently no LCT populations in Lower Humboldt and Middle Humboldt subbasins since these areas did not offer sufficient habitat to support LCT populations and were not included in the 2019 UGO's. Management of LCT in the HMU is overseen by the Humboldt RIT with eight local teams comprised of agency partners and local stakeholders for the following subbasins or watersheds: Little Humboldt, Rock, Maggie, North Fork Humboldt, Sherman-Jackstone, Marys River, East Fork Humboldt, and South Fork Humboldt. The Humboldt RIT and the local teams are led by Nevada Department of Wildlife (NDOW) staff.

The Pine subbasin includes Birch Creek and Pete Hanson Creek which both currently support LCT. Under current conditions, the LCT population in Birch Creek is not likely to be resilient due to a shrinking population and poor genetic health metrics. The Pete Hanson Creek LCT population may be potentially resilient but also has poor genetic health metrics. Both populations are more closely related to LCT in the Reese Management Unit (RMU) than LCT in the HMU and should be managed to meet RMU objective 5 (2019 UGO's).

The Little Humboldt subbasin currently includes four LCT recovery populations: Abel Creek (Santa Rosa Range), South Fork Indian and Indian Creeks (Santa Rosa Range), Long Canyon Creek (Santa Rosa Range), and South Fork Little Humboldt River complex (Snowstorm Mountains). The South Fork Little Humboldt River complex is an interconnected system that includes First Creek, Snowstorm Creek, Winters Creek, Pole Creek, Sheep Creek, Secret Creek, Oregon Canyon Creek, and South Fork Little Humboldt River. Management actions are ongoing with habitat restoration in the South Fork Little Humboldt River watershed and a YY Brook Trout project in Abel Creek; both projects are discussed in more detail in the Description of Management and Recovery Actions. None of the Little Humboldt LCT populations are currently resilient due to threats from hybridization, presence of non-native trout, habitat degradation from prior and

existing land uses, and reductions in water quantity and quality likely attributed at least in part to climate change.

The Rock subbasin supports three LCT populations (Frazier Creek, Rock and Toe Jam complex, and Willow Creek complex). All populations are potentially resilient due to low effective population sizes (Service 2023). The two main threats are hybridization with Rainbow Trout from historic fish stocking and a 2019 fish stocking incident where fish were stocked into the incorrect reservoir and habitat degradation which has resulted in habitat fragmentation. The STAP includes two projects focused on addressing the management of hybridization in the Willow Creek complex and habitat restoration throughout the Rock subbasin. A subbasin wide survey was completed in 2022 where massive reductions in LCT numbers and distribution were documented along with miles of dry or unsuitable stream habitat. This is attributed to a combination of drought conditions persisting from 2018-2023 and current land uses which includes livestock grazing. Genetics collected throughout the Rock subbasin in 2022 and these results will inform future management actions.

The North Fork Humboldt River (NFHR) subbasin supports four LCT populations (North Fork Humboldt River complex, Foreman Creek, Pratt Creek, and Gance Creek complex) all along the east slope of the Independence Mountains. The LCT populations in California and Winters Creeks are suspected to have been extirpated based on NDOW staff walking the streams in 2021 and confirming dry stream channels. An ongoing multi-year eradication project of non-native trout in the North Fork Humboldt River complex is allowing LCT to be reestablished into Walker Creek, Dell Creek, McAfee Creek, Peterson Creek, and North Fork Humboldt River. Management efforts will be prioritized and focused on restoring LCT to the four identified systems which will likely require future genetic management, improving connectivity, and habitat restoration where needed. The pending LCT genetics management plan will help inform actions like assisted migration and other actions that may be beneficial for establishing resilient LCT populations.

The South Fork Humboldt subbasin currently contains nine LCT populations: Dixie Creek, Green Mountain Creek, McCutcheon Creek, Welch Creek, Brown Creek, Pearl Creek, Lee Creek, Smith Creek complex, and Long Canyon Creek complex. These populations vary from a high likelihood of extirpation to highly like to be resilient. Management efforts in this subbasin are focused on maintaining current LCT populations and limiting impacts from non-natives (i.e. – Pearl Creek) and restoring a new interconnected resilient LCT population in the Long Canyon Creek complex. Pearl Creek has been identified as one of five likely to be resilient LCT populations range wide though events like the Corta Fire can still impact the population. Additional, threats in this subbasin include projects like the South Railroad Mine project located in the Dixie Creek watershed. A priority recovery effort for the HMU is the Long Canyon Creek project which is discussed in detail in this STAP.

The Upper Humboldt is the largest and most complex subbasin within the HMU and has been further divided into the Maggie, Sherman-Jackstone, Marys River, and East Fork Humboldt watersheds for management purposes. The Maggie Creek complex and the Marys River complex are large interconnected systems with established LCT populations. The Marys River system has been identified as a priority to secure and maintain a resilient LCT population since new understandings of the system indicate non-natives and hybridization with Rainbow Trout are threatening the LCT population and severely degraded habitat is present on some of the tributaries to Marys River (i.e. – Hanks Creek). The STAP includes a large multi-agency and multiple landowner effort to address management of non-natives and restoring habitat function and condition throughout the Marys River watershed. The LCT population in the Maggie Creek watershed appears to be secure but lower streamflows, low elevation, and the potential of non-natives may threaten this population in the future. A system-wide survey to assess habitat and LCT demographics is scheduled for 2024.

MANAGEMENT UNIT OBJECTIVES

The updated objectives for LCT in the HMU identified in the 2019 UGO's include:

Unit Wide

HU 1) Remove threats (*i.e.,* competition, predation, hybridization) associated with non-native trout species to allow for the formation and/or maintenance of HU LCT populations identified in HU objectives 3–13; and

HU 2) Ensure all habitats required to meet HU objectives 3–13 function ecologically. In some cases, this may require restoration and/or management changes; and

HU 3) Maintain existing, isolated populations that cannot individually meet the recovery population benchmarks provided in this document. Actively manage those populations based on guidance provided in the pending LCT Genetics Management Plan; and

Little Humboldt hydrologic unit

HU 4) Maintain meta-population dynamics in 1, and establish meta-population dynamics in at least 1 additional, recovery population; and

HU 5) Establish at least 1 additional recovery population that is spatially separated from the meta-populations required by HU objective 4; and

North Fork Humboldt hydrologic unit

HU 6) Establish meta-population dynamics in at least 1 recovery population; and

HU 7) Maintain (or establish if necessary) at least 1 additional recovery population that is spatially separated from the meta-population required by HU objective 6; and

Rock hydrologic unit

HU 8) Maintain meta-population dynamics in at least 1 recovery population; and

HU 9) Maintain (or establish if necessary) at least 1 additional recovery population that is spatially separated from the meta-population required by HU objective 8; and

South Fork Humboldt hydrologic unit

HU 10) Establish meta-population dynamics in at least 1 recovery population; and

HU 11) Maintain (or establish if necessary) at least 2 additional recovery populations that are spatially separated from each other and the meta-population required by HU objective 10; and

Upper Humboldt hydrologic unit

HU 12) Maintain meta-population dynamics in 2, and establish meta-population dynamics in at least 1 additional, recovery population(s); and

HU 13) Maintain (or establish if necessary) at least 3 additional recovery populations that are spatially separated from each other and the meta-populations required by HU objective 12.

DESCRIPTION OF PRIORITY RECOVERY PROJECTS

Abel and Stonehouse YY Brook Trout Project

Project summary

Abel, North Fork Abel, and Stonehouse Creeks are located on the east side of the Santa Rosa Mountain Range (Figure 1). Abel Creek flows for roughly 7.25km (4.5mi) until converging with Stonehouse Creek. Following convergence, the remaining watershed is named Stonehouse Creek, however, Abel Creek is the larger of the two streams and annually contributes more water to the watershed. Additionally, Abel Creek has one main tributary, known as the North Fork of Abel Creek (NF Abel hereafter).

The headwaters of Abel and NF Abel Creeks originate in the Santa Rosa-Paradise Peak Wilderness Area in the Santa Rosa Ranger District of the Humboldt-Toiyabe National Forest. Abel and Stonehouse Creeks flow through lands administered by the US Forest Service (USFS) and Bureau of Land Management (BLM), while NF Abel Creek remains entirely on USFS lands. Stonehouse Creek terminates on private lands nearly 1.6km (1mi) after the Abel/Stonehouse Creek confluence.

LCT historically occupied all available habitat in Abel, NF Abel, and Stonehouse Creeks (Abel Creek watershed hereafter). LCT are now isolated to approximately 2.4km of the 7.25km of available habitat in the uppermost sections of Abel Creek and no longer persist in NF Abel or Stonehouse due to competition with nonnative Brook Trout (*Salvelinus fontinalis*; Brook Trout), habitat degradation, and changing environmental conditions. Conversely, Brook Trout currently occupy all available habitat in Abel Creek (occurring sympatrically with LCT in upper reaches), 1.6km in lower NF Abel Creek, and 1.6km in lower Stonehouse Creek. In total, Brook Trout currently occupy approximately 12.1km (7.5mi) of available habitat among the three streams. However, habitat availability and Brook Trout occupancy fluctuate spatially and temporally due to extreme environmental variability (i.e., drought and snowpack conditions).

Abel Creek supports one of three remaining LCT populations on the eastside of the Santa Rosa Mountains (i.e., Abel, Indian, and SF Indian LCT populations). Therefore, conserving Abel Creek LCT is considered a conservation priority to meet the long-term conservation goals of representation, resiliency, and redundancy in the Little Humboldt River basin (HU 1, 3, and 4; outlined in the LCT updated goals and objectives; UGOs). Previous conservation efforts have focused on mechanically removing Brook Trout to expand and increase LCT abundances throughout Abel Creek. Although >9,000 Brook Trout have been removed from Abel Creek since 2008, LCT are still relegated to the upper 2.4km of habitat, primarily due to continued competition with high Brook Trout densities in lower stream reaches.

Former biologists proposed eradicating Brook Trout from Abel Creek via rotenone treatment to improve LCT abundances and distribution, however, this conservation action was deemed not feasible due to Wilderness Area restrictions and USFS direction. As an alternative conservation strategy, NDOW staff collaborated with US Fish & Wildlife Service (USFWS), Idaho Fish & Game (IDFG), and Fisheries Management Solutions (FMS) to begin implementing a Trojan Y-chromosome (TYC) approach, where non-feminized M_{YY} (YY hereafter) Brook Trout males are stocked into a wild Brook Trout population to eradicate Brook Trout (Schill et al. 2016). The stocked YY Brook Trout are progeny from Brook Trout exposed to the hormone Estradiol, which causes male fish to produce eggs (Schill et al. 2016). These fish are then crossed with male Brook Trout in the hatchery and the resulting progeny are the YY Brook Trout. In theory, stocked YY Brook Trout males will reproduce with wild females to produce only male offspring. Consecutive years of YY Brook Trout male stocking and reproduction with wild females would then saturate the population with male fish, and in-turn, drive the Brook Trout population to extinction (Schill et al. 2016). Simulation studies suggest time to Brook Trout eradication may be lessened when pairing YY Brook Trout stocking events with annual mechanical removals (Schill et al. 2017; Day et al. 2021). Furthermore, simulation studies predicted Brook Trout extirpation times of only 2-4 years when assuming high YY Brook Trout fitness and 5-15 years (or longer) if YY Brook Trout fitness is less than 20% of wild males (Schill et al. 2017; Day et al. 2021).

In 2016, IDFG initiated a field study in two Idaho Brook Trout streams to evaluate how wild Brook Trout populations respond to mechanical suppression and YY Brook Trout introductions (Schill et al. 2022). In this study, researchers performed manual Brook Trout suppression in 2016 and 2017. YY Brook Trout were then stocked in 2018 and 2019 at a stocking rate of 50% of the initial age 1+ population size in each stream. All YY Brook Trout were adipose fin-clipped prior to stocking to facilitate easy identification during subsequent suppression years. Results from Schill et al. (2022) described a 91% and 96% decline in female Brook Trout abundance in the two study streams by 2022 (i.e., six years of manual suppression paired with 3-4 years of YY Brook Trout stocking). Researchers also observed a 93% and 68% decrease in XY (i.e., wild male) Brook Trout abundance by 2022. Overall, the sex ratio of male Brook Trout in the two study streams surged to 88% and 95% by 2022, suggesting that wild Brook Trout reproduction

suppression efforts were successful and such approaches may be a viable option to eradicate wild Brook Trout.

In collaboration with IDFG and FMS, NDOW started the Abel Creek YY Brook Trout project to evaluate how mechanical removals and YY Brook Trout introductions affect wild Brook Trout populations, and to ultimately recover LCT throughout the Abel Creek watershed. In 2021, NDOW continued Brook Trout mechanical suppression efforts in upper Able Creek (Sections 6-9) and NF Able Creek (Sections 10-12), and estimated Brook Trout and LCT abundance throughout the Abel Creek Complex (Sections 1-19). Singas Creek, located on the east side of the Santa Rosa Mountain Range (i.e., northeast of Abel Creek), was selected as a control stream for the Abel Creek project. Brook Trout and Rainbow Trout (*Oncorhynchus mykiss*; Rainbow Trout) occupy approximately 3.5km of habitat within Singas Creek. NDOW staff completed population estimates in Singas Creek in 2021. These estimates will be compared to Abel Creek abundances to evaluate the effectiveness of YY stocking and mechanical removals. In 2022, NDOW started stocking YY Brook Trout throughout the Abel Creek watershed and continued mechanical removal efforts in upper Abel and NF Abel Creeks (Figure. 2). All YY Brook Trout were adipose clipped prior to stocking into the Abel Creek watershed to identify during future project implementation events. NDOW also completed Brook Trout and LCT population estimates throughout the Abel Creek watershed in 2022.

Objectives addressed

HU 1, HU 3, and HU 4

Action plan (2023-2028)

2023

- Complete mechanical wild Brook Trout removals in upper Abel and NF Abel Creeks.
- Stock YY Brook Trout throughout the Abel Creek watershed at 100-200% of the 2022 wild Brook Trout abundance.
- Count and return all YY Brook Trout captured during wild Brook Trout removal efforts that were stocked in 2022 to obtain a rough estimate of YY Brook Trout survival in upper Abel and NF Abel Creeks.
- Estimate wild Brook Trout and LCT population size throughout the Abel Creek watershed.
- Estimate Brook Trout and Rainbow Trout population size in Singas Creek.

2024

- Complete mechanical wild Brook Trout removals in upper Abel and NF Abel Creeks.
- Stock YY Brook Trout throughout the Abel Creek watershed at 100-200% of the 2023 wild Brook Trout abundance.

- Count and return all YY Brook Trout captured during wild Brook Trout removal efforts that were stocked in 2022 or 2023.
- Estimate wild Brook Trout and LCT population size throughout the Abel Creek watershed.
- Estimate Brook Trout and Rainbow Trout population size in Singas Creek.

2025

- Complete mechanical wild Brook Trout removals in upper Abel and NF Abel Creeks.
- Stock YY Brook Trout throughout the Abel Creek watershed at 100-200% of the 2024 wild Brook Trout abundance.
- Collect fin clips and/or manually sex all Brook Trout (with an adipose fin) captured during mechanical removal efforts.
- Complete two-pass electrofishing efforts in all stream sections in lower Abel Creek and collect fin clips and/or manually sex all Brook Trout (with an adipose fin) captured.
- Sample Stonehouse Creek to describe presence/absence of wild Brook Trout. Collect genetic samples and/or manually sex Brook Trout throughout Stonehouse if Brook Trout with an adipose fin are found.
- Count and return all YY Brook Trout captured during wild Brook Trout removal efforts that were stocked between 2022-2024.
- Estimate wild Brook Trout and LCT population size throughout the Abel Creek watershed.
- Estimate Brook Trout and Rainbow Trout population size in Singas Creek.
- Evaluate sex ratios throughout the Abel Creek watershed to describe the efficacy of this project.

2026

- Use 2025 sex ratio data and follow recommendations by Dan Schill and other YY collaborations to determine the efficacy of this project and whether NDOW should continue stocking YY Brook Trout and removing wild Brook Trout.

2027

- Actions are dependent on 2025 and 2026 results.

<u>Project needs</u>

The major funding needs for this project include staff time to complete wild Brook Trout removals and YY Brook Trout stocking, YY Brook Trout hatchery rearing and transportation costs, adipose fin clipping YY Brook Trout prior to stocking, and possibly funding to analyze sex ratios in 2025. Staff involvement is currently paid by each staff member's agency (e.g., NDOW, USFWS, USFS). The monitoring plan outlined below for 2023 and 2024 will require a minimum of 20 staff for four days. Genetic sampling or manually sexing Brook Trout will require an additional 4-5 days of sampling with approximately 8-10 staff members.

YY Brook Trout hatchery costs are included in the fish production grant that supports the Mason Valley Hatchery. Genetic funding for sex ratio analyses is still unclear, and therefore, not included. This project will be updated with genetic costs if necessary.

Monitoring plan

Wild Brook Trout eradication efforts in upper Abel and NF Abel Creeks will consist of two-pass removals. These removals will also be used to estimate Brook Trout and LCT abundances within removal sections. To estimate Brook Trout abundance among non-removal sections, 100-meter, three-pass depletions will be completed at all stations in lower Abel Creek. Spot-electrofishing will be conducted in Stonehouse Creek to describe Brook Trout presence/absence. 100-meter, three-pass depletions will also be completed annually or biannually at all occupied stations in Singas Creek to estimate population size. Adipose fins will be removed from all YY Brook Trout prior to stocking. All YY Brook Trout without an adipose fin that are captured during removals will be released back into the watershed. Staff will count all YY Brook Trout encountered during removals in 2023 to provide an approximate estimate of first year survival. In 2025, staff will evaluate sex ratios by completing two-pass electrofishing efforts throughout all Abel and NF Abel sections and collecting anal fin clips or manually sexing all Brook Trout captured with an adipose fin. Brook Trout removals will still occur in upper Abel and NF Abel Creeks in 2025.

Budget

Budget needs for staff are estimated using NDOW staff salaries. Staff involvement in 2023 and 2024 will require approximately $30,000 each year (i.e., NDOW biologist, hatchery technicians, and conservation aid salaries). Staff involvement in 2025 will require an additional ~$14,000 (total of $44,000). Hatchery costs to raise YY Brook Trout at Mason Valley Hatchery will cost roughly $2,500 per year (total of $7,500 through 2025). Total project costs through 2025 is approximately $111,500, all of which is currently funded by grants associated with current work programs. In 2023 and 2024, Sport Fish Restoration and Sport Fish Production grants will be funding this project. Genetic costs and needs have not been determined but will be provided in future project budget descriptions.

Justification as a priority

Abel Creek supports one of the few remaining, endemic LCT populations in the Little Humboldt River basin. Nonnative Brook Trout currently restrict LCT to the uppermost reaches of Abel Creek (2.4 km of habitat) and recent population estimates have described small LCT population sizes (n < 200). Such isolation and small population sizes are concerning given the potential for inbreeding depression, loss of genetic variation, and

ultimately population extirpation. The YY Brook Trout project and subsequent decline of Brook Trout may mitigate these effects by increasing LCT abundance and distribution. In recent years, the Abel Creek watershed has supported more than 3,000 Brook Trout. This suggests that the Abel Creek watershed could support a similar number of LCT, which would make it one of the more robust and resilient LCT populations in the Little Humboldt River basin. The YY Brook Trout project provides an opportunity to collaborate with stakeholders (BLM, USFS, Trout Unlimited, USFWS, FMS, IDFG, and permittees) to achieve LCT recovery objectives HU 1, 3, and 4. More broadly, this project will provide management direction by describing the efficacy of YY Brook Trout as an LCT conservation management tool.

South Fork Little Humboldt River Habitat Restoration

Project summary

The South Fork Little Humboldt River (SFLHR) system supports a historic interconnected LCT population that includes First Creek, Snowstorm Creek, Winters Creek, Pole Creek, Sheep Creek, Secret Creek, Oregon Canyon Creek, and SFLHR. All streams except for Oregon Canyon Creek are currently occupied by LCT though limited habitat is available in First Creek, Winters Creek, and Pole Creek in recent years due to low stream flows. The primary threat to LCT in the watershed is habitat degradation due to improper grazing management and reduced water quality and quantity that is also likely attributable in part to extended drought periods and climate change. The purpose of this project is to improve habitat conditions for LCT and other wildlife species throughout the SFLHR watershed on Bureau of Land Management administered lands, State of Nevada lands, and private lands.

Objectives addressed

HU 2 and HU 4

Action plan (2023 – 2028)

2023

- Secure funding and utilize existing contracts with Resource Concepts Inc. to improve understanding of existing water rights, pending applications, and the Little Humboldt River decree.
- Maintain fencing and other related infrastructure on State of Nevada lands.
- Treat noxious weeds and annual grasses on State of Nevada lands to improve wildlife habitats.
- Coordinate with BLM staff, permittees, and other partners on habitat restoration projects to improve habitat conditions throughout the SFLHR watershed.

2024

- Coordinate with the Elko and Winnemucca BLM District Office, permittees, private landowners, and other partners on livestock management improvements in the SFLHR subbasin.
- Continue to identify projects to improve habitat conditions throughout the SFLHR watershed and begin investigating and applying for funding for habitat improvement projects.

2023 – 2028
- Continue to maintain and improve existing land management and livestock management infrastructure throughout the SFLHR watershed including the Bullhead and Little Humboldt Allotments.
- Coordinate annually with BLM staff, permittees, and other partners to identify, initiate, and complete habitat restoration projects to improve riparian and aquatic habitats.
- Annually assess effectiveness of previous and upcoming habitat restoration actions.

Project needs

The short-term funding needs for this project is the cost of maintaining and installing livestock management infrastructure on BLM administered lands, private lands, and State of Nevada lands. Work related to maintaining state land fencing and other related infrastructure is being paid through current NDOW Fisheries and Habitat Division work programs.

Funding for future habitat improvement projects on private and BLM managed lands will need to be acquired and any projects on BLM managed lands will require additional NEPA analysis that will vary on a project specific basis. Commitments from partner agencies including staff capacity and funding to complete the NEPA analysis will need to occur as habitat restoration activities are identified and agreed to by the Little Humboldt subbasin team and the Humboldt RIT.

Monitoring plan

Monitor habitat conditions on State of Nevada lands will consist of photo points every 2 to 5 years at established locations. Currently, a minimum of one week of one NDOW biologist and three seasonal employees will be needed to maintain infrastructure on State of Nevada lands. Additionally, one week of combined time is currently spent by NDOW Fisheries and Habitat biologists to evaluate habitat conditions throughout the SFLHR watershed. This work does not currently require additional funding or manpower needs.

Budget

Four days of maintaining state land infrastructure will cost NDOW $5,000 annually (1 biologist and 4 seasonals) and 4 days of habitat condition monitoring and reporting will cost NDOW $2,000 annually (1 biologist). These costs are currently funded through the State Wildlife Grant and Sport Fish Restoration Grant NDOW receives annually.

Budgetary needs will be updated as the Humboldt STAP is revised annually and habitat restoration projects and livestock management improvements are identified. The proposals for these projects will include developing project specific budgets.

Justification as a priority

The SFLHR currently supports the only historic interconnected LCT population in the Little Humboldt subbasin. Maintaining and improving riparian and aquatic habitats throughout the watershed will result in conditions suitable for sustaining resilient LCT populations. Improvements in riparian habitats also benefit a variety of other wildlife species, improve forage availability for livestock, and functioning resilient habitats will better withstand the pressures from managed livestock grazing. This project will help ensure LCT habitats function ecologically (HU2) and will help achieve all three goals (representation, redundancy, and resiliency) outlined in the 2019 UGO's. Multiple partners such as two BLM district, private landowners, and the NDOW have interest in protecting resources in the SFLHR Subbasin.

The Bullhead Allotment (BLM, Winnemucca District) and Little Humboldt Allotment (BLM, Elko District) are active livestock grazing allotments within the watershed (Figure 3). The entire watershed is identified as priority sage grouse habitat and habitat restoration activities will benefit a wide variety of wildlife species beyond LCT (Figure 4). Riparian habitats including the headwater springs, seeps, and associated wet meadows are critical habitats for late-summer sage grouse brood rearing.

A variety of infrastructure is present throughout the SFLHR watershed to assist in livestock grazing management. Due to the location of these fences, cattle guards, and other infrastructure annual maintenance is required. Failures to maintain some of this infrastructure can lead to compliance issues with permitted livestock grazing.

Rock Subbasin Habitat Restoration

Project summary

The Rock Creek subbasin supports several historic LCT populations. Lewis Creek, Nelson Creek, upper Willow Creek, and Willow Creek Reservoir are one interconnected LCT population, Rock Creek and Toe Jam Creek are another interconnected population, and Frazer Creek is an isolated population. Based on sampling efforts in 2022, even though the Rock Creek subbasin encompasses a large area, LCT are typically only found

in the upper reaches of the streams in small sections of perennial water. For example, Frazer Creek is approximately 11.1 miles long; however, LCT were only found to be occupying about 1.6 of the 2.1 miles of perennial water in the middle stream reach. Rock Creek is the longest stream in the Rock Creek subbasin (75.0 miles long), but LCT were only found to be occupying the upper 3.7 miles of stream. Toe Jam Creek (approximately 14.0 miles long) contains the second largest LCT population in the subbasin, but like Rock Creek, LCT were only found to occupy approximately 3.3 miles of the upper watershed. The Willow Creek interconnected LCT population (Willow Creek upstream of the Willow Creek Reservoir is 23.7 miles long, Nelson Creek is 8.0 miles long, and Lewis Creek is 7 miles long) encompass a large area; however, LCT were found to be occupying very small sections of each stream. In Willow Creek, LCT were found to be occupying approximately 0.68 of the 4.0 miles of perennial water. In Lewis Creek, LCT were found to be only occupying 0.64 mile of the 1.2 miles of perennial water. Nelson Creek had the most perennial water of all three streams with LCT occupying about 3.6 miles of stream; however, there were numerous dry sections in between the wetted sections of the occupied area.

The primary threats to LCT in the watershed are hybridization with non-native trout and habitat degradation due to improper grazing management and reduced water quality and quantity that is likely attributable in part to extended drought periods and climate change. The purpose of this project is to improve habitat conditions for LCT and other wildlife species throughout the Rock Creek watershed on private land and BLM administered lands.

Objectives addressed

HU 2, HU 3, HU 8, and HU9

Action plan (2023 – 2028)

2023

- Coordinate with BLM staff, landowners, permittees, and other partners to identify habitat restoration projects to improve habitat conditions throughout the Rock Creek watershed.
- Conduct a field tour of the potential habitat restoration projects that were identified during the 2021 Rock Creek LCT population surveys. These projects included spring exclosures and improving water conveyance across roads.

2024

- Coordinate with the BLM, permittees, private landowners, and other partners on livestock management improvements in the Rock Creek subbasin.
- Prioritize, acquire funding, and implement habitat restoration projects that were identified during the 2021 field tour.

- Continue to identify projects to improve habitat conditions throughout the Rock Creek watershed and begin investigating and applying for funding for habitat improvement projects.

2025 – 2028

- Coordinate annually with BLM staff, permittees, and other partners to identify and pursue completing habitat restoration projects to improve riparian and aquatic habitats.
- Assess effectiveness of previous and upcoming habitat restoration actions.

Project needs

Funding for future habitat improvement projects on private and BLM managed lands will need to be acquired and any projects on BLM managed lands may require additional NEPA analysis that will vary on a project specific basis. Commitments from partner agencies including staff capacity and funding to complete the NEPA analysis will need to occur as habitat restoration activities are identified, prioritized, and agreed to by the Rock Creek subbasin team and the Humboldt RIT.

Monitoring plan

Monitoring the effectiveness of the habitat improvement projects will consists of photo points every 2 to 5 years at established locations. This work does not currently require additional funding or manpower needs. Individual habitat restoration projects may include additional monitoring that will be included with the project description along with identifying the responsible party for monitoring and

Budget

Budgetary needs will be updated as the Humboldt STAP is revised annually, and habitat restoration projects and livestock management improvements are identified. The proposals for these projects will include developing project specific budgets along with identifying potential funding sources. No current budget estimate is available.

Justification as a priority

The Rock Creek subbasin currently supports several historic interconnected and isolated LCT populations. Maintaining and improving riparian and aquatic habitats throughout the watershed will result in conditions suitable for sustaining resilient LCT populations. Improvements in riparian habitats also benefit a variety of other wildlife species, improve forage availability for livestock, and functioning resilient habitats will better withstand the pressures from managed livestock grazing. This project will help ensure LCT habitats function ecologically (HU2) and will help achieve all three goals (representation, redundancy, and resiliency) outlined in the 2019 UGO's. Multiple partners such as the

BLM, private landowners, and the NDOW have interest in protecting resources in the Rock Creek subbasin.

Even though LCT are typically only found in the upper portions of the streams in the Rock Creek Subbasin, it is still important to conduct habitat restoration throughout the entire watershed. LCT habitat restoration should occur on non-occupied or areas with no potential to occupy because these areas do provide connectivity between the different populations. If habitats are not healthy and functioning properly, fish movement can be impeded and, in some cases, poor habitat conditions act as a fish barrier preventing movement between populations. Because of the habitat restoration success that has already occurred in the subbasin, there is lots of evidence that shows that areas that were believed not to be able to support LCT (Willow Creek upstream of Willow Creek Reservoir) can support LCT if habitats are healthy and functioning properly.

The Squaw Valley and Twenty-Five Allotments are active livestock grazing allotments within the watershed (Figure 5). The entire watershed is identified as priority sage grouse habitat and habitat restoration activities will benefit a wide variety of wildlife species beyond LCT (Figure 6). Riparian habitats including the headwater springs, seeps, and associated wet meadows are critical habitats for late-summer sage grouse brood rearing. The Rock Creek Subbasin also has several important migration corridors and staging areas for mule deer. Habitat restoration in the subbasin will also result in better habitat conditions for mule deer, which will ultimately improve the condition of the mule as they pass through the Rock Creek Subbasin on their way to their summer and winter ranges. Multiple habitat restoration projects were identified during the LCT population surveys that were conducted in 2021.

Willow Creek Complex Hybridization Management

Project summary

The purpose of this project is to determine the presence and extent of hybridization between LCT and Rainbow Trout in the Willow Creek complex which includes Willow Creek Reservoir, Willow Creek, Nelson Creek, and Lewis Creek. Prior to 1972, Rainbow Trout and unknown Cutthroat Trout species were stocked in Willow Creek Reservoir to provide a fishing opportunity to anglers. In 2019, Willow Creek Reservoir was inadvertently stocked with 2,000 Rainbow Trout from Gallagher Fish Hatchery. Because of the historical stocking of Rainbow Trout and Cutthroat Trout in Willow Creek Reservoir, LCT hybridization with non-native trout is a significant threat to the interconnected LCT population in the Willow Creek complex. Figure 8 displays the distribution of LCT based on the 2022 surveys.

Objectives addressed

HU 1 and HU 8

Action plan (2023-2024)

2023

- Analyze 246 genetic samples (collected from the Willow Creek complex in 2020, 2021, and 2022) for hybridization with Rainbow Trout and Yellowstone Cutthroat Trout.
- Collect 10 eDNA samples from Willow Creek Reservoir and 20 samples from Willow Creek to determine the presence of Rainbow Trout.
- Conduct electrofishing, gillnetting, and frame netting surveys on Willow Creek Reservoir and Willow Creek to determine the presence of Rainbow Trout.

2024

- Create a hybridization management plan, if necessary, based on the 2022 and 2023 hybridization sampling results.

Project needs

The major funding needs for this project is the cost to analyze genetic samples for hybridization with Rainbow Trout and Cutthroat Trout and to analyze the eDNA samples for Rainbow Trout DNA. The total cost to analyze the 2022 genetic samples for hybridization will be approximately $4,000 (250 samples at $16 apiece through UC Davis) and to analyze all 30 eDNA will be approximately $6,000.

An accurate estimate cannot be made at this time to develop a hybridization management plan since the genetics results for the fin clips collected to date are not available yet. This project element will be evaluated once fin clips have been analyzed for introgression with Rainbow Trout and Yellowstone Cutthroat Trout.

Monitoring plan

Once all samples are analyzed and NDOW and FWS staff review results a management plan including future monitoring will be developed. It is expected this effort will be extended to the entire Rock subbasin in the future or as part of range wide genetic assessments. Future demographic and sampling for hybridization, genetic diversity, and effective population size will be guided by the pending genetics management plan which should be available to use by the 2025 field season.

Budget

Since this recovery effort was initiated in 2020 most of the expenses have already been incurred that were associated with a rotenone treatment and collecting fin clips. Approximately $10,000 is required to analyze LCT genetic samples for hybridization with Rainbow Trout and Yellowstone Cutthroat Trout and to analyze the eDNA samples for Rainbow Trout DNA. Funding has been identified through an assistance agreement with

the Reno FWS office and NDOW to complete the genetic analysis and process the pending eDNA samples.

Justification as a priority

Due to the historical stocking of Rainbow Trout and unknown Cutthroat Trout species in Willow Creek Reservoir, hybridization with non-native trout is a significant threat to the interconnected LCT population in the Willow Creek complex. This project will determine the extent of LCT hybridization and help direct future management actions. This project will allow for the formation and protection of an LCT population identified in HU 8. Effective partnerships between the NDOW, FWS, Humboldt Ranch, 25 Ranch, and Nevada Gold Mines have been established and will ensure this project be successful.

Figure 8 displays the distribution of LCT in 2022. When there is an improved understanding of the genetic purity of this LCT population there are opportunities to coordinate with other partners to improve riparian habitat conditions which will result in increased connectivity and LCT populations in the Willow Creek complex. Habitat restoration is captured in the Rock Creek subbasin habitat restoration description in this STAP.

North Fork Humboldt River Complex LCT Reintroduction and Augmentation

Project summary

The NFHR subbasin supports two historic LCT populations, the Gance Creek complex (includes Gance Creek, Warm Creek, and Road Canyon Creek) and the Foreman Creek populations. In addition to the historic populations, new LCT populations have been established in Pratt Creek and the upper NFHR. One of the primary threats to LCT in the NFHR subbasin are non-native trout which include Brook Trout, Yellowstone Cutthroat Trout, and Rainbow Trout. While information on LCT hybridization with Rainbow Trout and Yellowstone Cutthroat Trout is limited, the distribution of Brook Trout in the NFHR subbasin is well documented.

Multiple rotenone treatment projects have been conducted in the NFHR subbasin to remove Brook Trout from Pratt Creek, NFHR, Peterson Creek, McAfee Creek, Dell Creek, and Walker Creek. It is believed that these treatments have been successful, but some post-treatment surveys are ongoing to confirm that Brook Trout have been eradicated. The purpose of this project is to reestablish an interconnected LCT population in the NFHR system (Peterson Creek, McAfee Creek, Dell Creek, Walker Creek, and NFHR) to accomplish HU 6 in the 2019 UGOs. This will be accomplished by augmenting the LCT population in the NFHR, reintroducing LCT in Peterson Creek, McAfee Creek, Dell Creek, Walker Creek, and verifying hybridization with Rainbow Trout is not threatening existing LCT populations in Gance, Foreman, and Pratt Creeks.

Objectives addressed

HU 1, HU 3, and HU 6

Action plan (2023-2028)

2023

- Complete eDNA post-treatment surveys on the NFHR, McAfee, Dell, and Walker Creek.
- Initiate conversations with private landowners, the Humboldt-Toiyabe National Forest (USFS), permittees, the United States Fish and Wildlife Services (USFWS), and the Nevada Department of Wildlife (NDOW) on the feasibility of reintroducing LCT into McAfee, Dell, and Walker Creek .
- Coordinate with USFS and FWS staff on identifying and initiating next steps for reestablishing LCT populations in Peterson, McAfee, Dell, Walker Creek within the Mountain City Ranger District.
- Initiate discussions with the Holland Ranch about modifying irrigation diversions to become fish barriers.
- Initiate updating grazing related Section 7 consultations for Forest Service grazing allotments in the project area.
- Investigate potential LCT hybridization issues with Rainbow Trout and Yellowstone Cutthroat Trout in the Gance Creek complex and Foreman Creek populations.

2024

- Survey the NFHR upstream of the concrete fish barrier located at (short site description) as part of the Big Springs Mine fisheries monitoring program.
- Continue conversations with private landowners, the USFS, permittees, USFWS, and the NDOW on the feasibility of reintroducing LCT into Peterson, McAfee, Dell, Walker Creek.
- Continue allotment related Section 7 consultation for LCT reintroductions.

2025

- Design and implement a hybridization sampling plan for determining LCT hybridization issues with Rainbow Trout and Yellowstone Cutthroat Trout within the NFHR subbasin.
- Survey Pie Creek to verify that non-native trout are not present.

2026 -2028

- Reintroduce LCT into McAfee Creek and Peterson Creek.
- Augment the LCT and endemic fish populations in the NFHR, McAfee, Dell, and Walker Creek .

Project needs

The major funding needed for this project is the cost to analyze the initial genetic samples for hybridization with Rainbow Trout and Cutthroat Trout and to analyze the eDNA samples for Brook Trout DNA. The total cost to analyze the baseline genetic samples for hybridization will be $5,800 (360 samples (50 samples per stream and 60 samples from previous survey efforts) at $16 apiece) and to analyze all 114 eDNA samples will be $16,000.

Once the initial genetic analysis is completed, funding will be needed to collect and analyze genetic samples and write reports associated with results. This is expected to be nominal and not included in the 2023 budget.

Monitoring plan

For the post-treatment surveys, monitoring will consist of collecting and analyzing the remaining eDNA samples on the NFHR, McAfee, Dell, and Walker Creek in 2023.

For the genetic assessment, a genetic sampling plan will be created, samples will be collected, and once all samples are analyzed and NDOW and the USFWS staff review the results, a management plan including future monitoring will be developed using guidance from the upcoming LCT genetics management plan.

Once LCT populations are reintroduced/augmented, population monitoring will occur every five years to evaluate distribution and needs for further augmentation, ensuring fish remain genetically pure, and eventually abundance/population estimates will be needed once all available habitats are occupied.

Budget

To analyze the baseline LCT genetic samples for hybridization with Rainbow Trout and Yellowstone Cutthroat Trout and to analyze the remaining eDNA samples for Brook Trout DNA will cost $21,800. Collecting genetic samples will be funded through the existing State Wildlife Grant and the pending SFY24 Sport Fish Restoration Grant. The Humboldt-Toiyabe National Forest Service has coordinated with the National Genomics Center and at the Rocky Mountain Research Station to pay for the eDNA analysis in 2023.

Future LCT augmentations and population surveys are anticipated to be funded through NDOW's annual federal grants.

Budgetary needs will be updated as the Humboldt STAP is revised annually. This will include the cost to routinely analyze samples for hybridization.

Justification as a priority

Due to high elevation and cold-perennial flow, the upper NFHR, McAfee, Peterson, Dell, and Walker Creek are climate resilient and provide the ideal habitats for LCT. In addition to the stream supporting habitats that are beneficial to LCT, significant funding has already been spent on removing non-natives from these streams. This included the installation of a large fish barrier at the USFS boundary on the NFHR and two large rotenone treatment projects. Currently, the NFHR subbasin does not have a large interconnected LCT population. This project will establish a large, 20-mile climate resilient interconnected population needed to accomplish HU 6 in the 2019 UGOs. Once it is confirmed that Brook Trout have been eradicated and LCT are reintroduced in Peterson Creek and McAfee Creek, the NFHR meta-population will consist of LCT occupying and moving between the NFHR, McAfee, Peterson, Dell, and Walker Creek. This is the only feasible location for a large interconnect population in the NFHR subbasin. Effective partnerships between the NDOW, USFWS, private landowners, and the USFS have been established and their investments in the project will help it become successful.

Marys River Non-native Fish and Habitat Restoration

Project summary

The Marys River subbasin supports three historic, interconnected LCT populations and several isolated populations. The large, interconnected population includes the Marys River, Hanks Creek, Cutt Creek, Williams Basin Creek, Basin Creek, Unnamed Creek, Basin Creek, Marys River Basin Creek, East Fork Marys River, and the West Fork Marys River. The smaller interconnected populations includes the upper portion of the West Fork Marys River, Camp Draw Creek, and GAWS Creek and the even smaller T and Draw Creek population. The isolated populations include Currant Creek and Wildcat Creek. The primary threats to LCT in the subbasin are hybridization with non-native trout (Figure 10) and habitat degradation due to improper grazing management and reduced water quality and quantity that is likely attributable in part to extended drought periods and climate change. Currently, the Marys River subbasin has approximately 121 miles of occupied habitat; however, if all threats were removed there would be more than 200 miles of interconnected habitat available to LCT.

Addressing threats to LCT in the Marys River subbasin can be accomplished by multiple avenues. Potential options to address nonnative trout may consist of barriers, rotenone treatment projects, mechanical removal, and managing the population as a hybridized population. Determining which option or options to use will depend on where the non-native trout are found and the density of the non-native trout.

Options to improve habitat conditions for LCT in the Marys River subbasin include modifying grazing management to improve aquatic and riparian habitats conditions, create riparian pastures, building small exclosures, shrink and armor water gaps, and

create off-site water. In addition to modifying grazing management, low-tech process-based restoration techniques such as post assisted log structures and beaver dam analogs can be used to improve habitat conditions. Improving habitat conditions will create more habitat for LCT, which will result in an increased population size because the habitat can support more fish. In addition to supporting more individuals, improved habitat conditions will also improve stream connectivity. This will improve genetic flow and allow LCT to have access to habitats that are important to them at various life stages.

Objectives addressed

HU 1, HU 2, HU 3, HU 12, and HU 13

Action plan (2023-2028)

2023

- Design and implement a hybridization sampling plan for determining LCT hybridization issues with Rainbow Trout and Yellowstone Cutthroat Trout within the Marys River subbasin.
- Coordinate with BLM staff, USFS staff, landowners, permittees, and other partners on identifying habitat restoration projects in the Marys River subbasin.

2024

- Continue to implement hybridization sampling plan which will include evaluation of 2023 fieldwork and adjusting for 2024 fieldwork needs.
- Continue coordination efforts with BLM staff, USFS staff, landowners, permittees, and other partners on identifying and implementing habitat restoration projects in the Marys River subbasin.

2025 – 2028

- Assess results of hybridization sampling effort and begin creating hybridization management plan to secure existing and future LCT populations.
- Continue coordination efforts with BLM staff, USFS staff, landowners, permittees, and other partners on identifying and implementing habitat restoration projects in the Marys River subbasin.

Project needs

The major funding needs for this project are the cost of the field crews to collect the genetic samples and the cost to analyze genetic samples for hybridization with Rainbow Trout and Yellowstone Cutthroat Trout. Funding is also needed to run a 2-person crew for six months in 2023 and a 4-person crew for six months in 2024. It has been estimated that approximately 1,200 samples will need to be processed for the hybridization analysis. The hybridization management plan will identify the exact number of samples that will need to be processed. In addition to genetic analysis, funding will be needed to collect and analyze genetic samples and reports associated with results.

Funding for future habitat improvement projects on private, BLM, and USFS managed lands will need to be acquired and any projects on BLM and USFS managed lands will require additional NEPA analysis that will vary on a project specific basis. Commitments from partner agencies including staff capacity and funding to complete the NEPA analysis will need to occur as habitat restoration activities are identified and agreed to by the Marys subbasin team and the Humboldt RIT.

Monitoring plan

For the genetic assessment, a genetic sampling plan will be created, samples will be collected, and once all samples are analyzed and NDOW and the USFWS staff review the results, a management plan including future monitoring will be developed.

Monitoring hybridization in the LCT population will be a multi-phase approach. The first phase being initiated in 2023 will be a subbasin wide evaluation of the genetic purity of existing LCT populations. Depending on those results, management strategies will be developed for some or all the populations to minimize or eliminate the threat of hybridization. Monitoring strategies will be developed to determine the success of those techniques. As management actions are developed it will be essential that monitoring is correlated with specific management objectives of genetic purity, effective population size, and genetic diversity.

Details of effectiveness monitoring for specific habitat restoration actions will be developed as part of the project specific proposal. This will also include identifying the organization responsible for completing the monitoring, frequency, duration, and other relevant information developed by partners on the Marys River subbasin team.

Long-term success can be evaluated with guidance from the pending LCT range wide genetics management plan, updated understanding of sampling for demographics, and repeating the range wide habitat assessment which US Geological Survey completed in 2021-2022 for the Marys River subbasin.

Budget

Budgetary needs will be updated once a hybridization sampling plan is created and as habitat restoration projects and livestock management improvements are identified. The proposals for these projects will include developing project specific budgets and will be updated as the Humboldt STAP is revised annually.

At this time, NDOW Fisheries and Game Division staff are coordinating with a private landowner in the Marys River subbasin to develop a multiphase plan to protect springs, improve livestock management, remove fences in critical mule deer migration corridors,

and other habitat restoration activities. A BIL Sagebrush-steppe proposal is being drafted and will be incorporated into the Humboldt STAP if approved; the project is estimated at $242,000.

Justification as a priority

For LCT, the Marys River subbasin supports the largest interconnected population within its historic range. Due to high elevation, cold-perennial flow, and interconnected streams, the Marys River subbasin is climate resilient and provides the ideal habitats for LCT. Until recently, it was believed that LCT in the Marys River were pure. However, recent genetic analysis and eDNA sampling have detected Rainbow Trout genetics in the Marys River, Hanks Creek, and Marys River Basin Creek. To help achieve all three goals (representation, redundancy, and resiliency) outlined in the 2019 UGO's, a hybridization management plan must be in place to address the issue of LCT hybridization.

Maintaining and improving riparian and aquatic habitats throughout the Marys River subbasin will result in conditions suitable for sustaining resilient LCT populations. Improvements in riparian habitats also benefit a variety of other wildlife species, improve forage availability for livestock, and functioning resilient habitats will better withstand the pressures from managed livestock grazing. Habitat restoration activities throughout these allotments will benefit a wide variety of wildlife species beyond LCT (Figure 11). The Marys River subbasin supports a large mule deer herd that uses the subbasin as summer and winter ranges with multiple established migration corridors. Habitat restoration in the subbasin would improve available habitat and movement patterns through the migration corridors. In addition to mule deer habitat, the Marys River subbasin includes large areas identified as priority sage grouse habitat and is part of the O'Neil Population Management Unit. Riparian restoration will benefit sage grouse because headwater springs, seeps, and associated wet meadows are critical habitats for late-summer sage grouse brood rearing.

This project will help ensure LCT habitats function ecologically (HU2) and will help achieve all three goals (representation, redundancy, and resiliency) outlined in the 2019 UGO's. Multiple partners such as the USFS, BLM, private landowners, permittees, and the NDOW have interest in protecting resources in the Marys River subbasin.

The BLM's Deeth, Antelope Basin, Anderson Creek, O'Neil, and Stormy Allotments and the USFS Lower Marys River, Marys River Complex, Wildcat, and the Guerry Allotments are active livestock grazing allotments within the subbasin (Figure 10). Through various other projects and actions in the Marys River subbasin, there have been positive and effective relationships built with private landowners, government agency personnel, permittees, and organizations that will help ensure these projects are successful.

Long Canyon Complex Project

Project summary

The purpose of this project is to eradicate non-native salmonid species and establish LCT in over 30 miles of climate resilient fluvial habitats within the Long Canyon Complex of the South Fork Humboldt River (SHFR) subbasin. Streams associated with this project include Box Canyon Creek, North Furlong Creek, Mahogany Creek, Long Canyon Creek, Segunda Creek, and Rattlesnake Creek. Brook Trout and hybridization with Rainbow Trout are currently threatening and severely impacting existing LCT populations in North Furlong Creek, Long Canyon Creek Segunda Creek, and Mahogany Creek. Despite the high quality habitat available this LCT population is currently not resilient. Figures 11 and 12 identify the project area, current understanding of natural fish passage barriers, distribution of fish, and remaining baseline uncertainties that will be addressed in the 2023 field season.

Objectives addressed

HU 1, HU 3, HU 10, and HU 11

Action plan (2023-2033)

2023

- Complete Safe Harbor Agreement (SHA) with current landowners and offer SHA to other interested parties.
- Meet with private and tribal representatives to discuss LCT management in the Ruby Mountains and interest in the collaborative process.
- Initiate SFHR collaborative.
- Start BA/BO process for adding proposed LCT reintroduction streams.
- Field visit with private landowners to examine proposed barrier locations on Long Canyon Creek and Rattlesnake Creek.
- Find upper limits for Mahogany Creek, Segunda Creek, and North Furlong Creek.
- Collect Genetics within the Long Canyon Complex.
- Document lower barrier on Box Canyon Creek

2024

- PIT tag and collect genetic samples from LCT in the Long Canyon Complex.
- Move PIT tagged LCT to the barren portions of Rattlesnake Creek (above documented barrier) once genetic purity is confirmed.
- Seek/secure funding, permitting, and any conservation easements for Long Canyon Creek and Rattlesnake Creek barriers.
- Finish BA/BO process for adding proposed LCT reintroduction streams.
- Start NEPA process for the use of rotenone.

2025

- Present project to Elko County Wildlife Advisory Board.
- Finish NEPA for the use of rotenone.
- Acquire all permitting for the use of rotenone.
- Install Rattlesnake Creek barrier.
- Purchase rotenone and start purchasing needed treatment supplies.
- PIT tag, genetic sample, and augment LCT into Rattlesnake Creek.

2026

- Box Canyon Creek treatment.
- PIT tag, genetic sample, and augment LCT into Rattlesnake Creek.
- Install Long Canyon Barrier.

2027

- Box Canyon Creek treatment (round 2).
- Collect eDNA samples in Box Canyon Creek for post-treatment monitoring.
- PIT tag, genetic sample, and augment LCT into Rattlesnake Creek.

2028

- Rattlesnake Creek treatment (below natural barriers).
- Collect eDNA samples in Box Canyon Creek for post-treatment monitoring.
- PIT tag, genetic sample, and augment LCT into Box Canyon Creek.

2029

- Rattlesnake Creek treatment (round 2).
- Collect eDNA samples in Rattlesnake Creek for post-treatment monitoring.
- PIT tag, genetic sample, and augment LCT into Box Canyon Creek.

2030

- Conduct pretreatment surveys of Long Canyon Complex.
- Collect eDNA samples in Rattlesnake Creek for post-treatment monitoring.
- PIT tag, genetic sample, and augment LCT into Box Canyon Creek and/or Rattlesnake Creek.
- Monitor LCT refugia populations.

2031

- Long Canyon Complex treatment.
- PIT tag, genetic sample, and augment LCT into Box Canyon Creek and/or Rattlesnake Creek.

2032

- Long Canyon Complex treatment (round 2).
- Collect eDNA samples in Long Canyon Complex for post-treatment monitoring.

2033

- Reintroduce LCT into Long Canyon Complex.

Project needs

There are two major funding needs for this project. The Long Canyon Creek and Rattlesnake Creek barriers are estimated to cost between $1,000,000 to $2,000,000 for design and construction. Treating the 34 miles of stream is estimated to cost $1,360,000 ($40,000/mile) from project implementation/permitting, treatment, post-treatment monitoring, and to the reintroduction of LCT. Treatments are planned for two consecutive days in two consecutive years for a total of four-treatment days over two years.

There is also a need for dedicated personnel from all the involved state and federal agencies to ensure goals and objectives are met in a timely manner. Seasonal assistants (3-9 month) and/or full-time field assistants are mandatory.

Monitoring plan

Monitoring will include post-treatment surveys which include backpack electrofishing and eDNA sampling. After LCT are reintroduced population monitoring will occur to evaluate distribution and needs for further augmentation, recruitment, ensuring fish remain genetically pure, and eventually abundance/population estimates once all available habitats are occupied. Surveys will also be completed periodically to verify the fish passage barrier is functioning correctly. Exact monitoring plans will be developed through the SFH working group as project plans develop.

Budget

Given the complexity of this project a budget is only given for the years 2023 and 2024. All funding for NDOW staff is anticipated to be included in the Section 6 Native Trout Management Grant. In 2023, there is expected to be 4 weeks of field work (1 biologist and 2 conservation aids) with an estimated cost of $20,000. There is also an estimated 6 weeks of reporting and coordination meetings by a biologist at a cost of $15,000. Genetic sample analysis, field equipment, and other supplies are estimated to cost $4,000.

In 2024, there is an estimated need for 6 weeks of field work (1 biologist and 2 conservation aids) at a cost of approximately $30,000. Reporting and coordination meetings are estimated to be 6 weeks of biologist's time at a total cost of $15,000. Genetic sample analysis, field equipment, and supplies are estimated at $5,000. As the Long Canyon Working Group develops and begins to meet and coordinate regularly on this project estimates for facilitation and meeting management support will be included in future budget estimates.

The budget for the Long Canyon Creek project will be updated annually as specific elements for the reintroduction effort are identified. Recognizing that this is a multiphase project partners will be required to need to identify and secure funding to implement all components of this project.

Justification as a priority

The streams within this project represent some of the most climate-resilient fluvial habitats in Nevada. LCT have continually declined in numbers and distribution due to introgression with non-native Rainbow Trout and interspecific competition with non-native Brook Trout. It is paramount that conservation actions to remove non-native threats be implemented to protect the genetic integrity and diversity of the South Fork Humboldt River LCT. The Long Canyon Complex Project will help achieve all three goals (representation, redundancy, and resiliency) outlined in the Updated Goals and Objectives for the Recovery of Lahontan Cutthroat Trout.

BUDGET REQUIREMENTS

The following table outlines the estimated annual budget needs to complete all seven recovery actions identified within the HMU STAP. These budget requirements will be reviewed and updated annually when the STAP is updated by December 31st of each year.

Estimated budget to implement Humboldt Management Unit Short-term Action Plan with costs known as of March 2023.

Project	Estimated Budget (annual funding priorities are highlighted)						Totals
	2023	2024	2025	2026	2027	2028	
Abel and Stonehouse YY Brook Trout	$32,500 – funding is secured	$32,500 – funding is anticipated to be secured	$46,500 – funding is anticipated to be secured	TBD	TBD	TBD	$111,500
South Fork Little Humboldt Habitat Restoration	$7,000 – funding is secured	$7,000 – funding is anticipated to be secured	TBD	TBD	TBD	TBD	$14,000
Rock Subbasin Habitat Restoration	Not available	TBD	TBD	TBD	TBD	TBD	
Willow Creek Hybridization Management	$10,000 – funding is anticipated to be secured	TBD after 2023 genetics and eDNA results	TBD	TBD	TBD	TBD	$10,000
North Fork Humboldt River Complex LCT Reintroduction and Augmentation	$21,800 – funding is anticipated to be secured	TBD	TBD	TBD	TBD	TBD	$21,800
Marys River Non-native Fish and Habitat Restoration	$75,000 – funding is anticipated to be secured	$242,000 – funding is not secured, grant application to be submitted	TBD	TBD	TBD	TBD	$66,000
Long Canyon Complex Project	$39,000 – funding is secured	$50,000 – funding is anticipated to be partially secured, $5,000 shortfall for genetic analysis	TBD	TBD	TBD	TBD	$89,000
Totals	$185,300	$331,500	$46,500				$563,300
Priority Project Budget Shortfall		$247,000					

Table will be updated annually to reflect when funding sources are secured or change, modifications to project descriptions and timelines, when cost estimates for project elements such as fish passage barriers are received, specific restoration projects are identified and associated costs developed, etc.

MANAGEMENT RECOMMENDATIONS

The Humboldt STAP will be reviewed at the October 2023 RIT meeting. Priority project leads will update project descriptions, budget estimates including secured and required additional funding, evaluation of progress on priority projects, and a review on continuing the effort and its benefits to achieving HMU objectives identified in the 2019 UGO's.

The 2024 Humboldt STAP revision will be shared with the Humboldt RIT by February 28, 2024.

FIGURES

Figures for the seven priority recovery projects for the HMU.

Number	Description
1	Priority LCT recovery projects for the Humboldt Management Unit.
2	YY Brook Trout project area and stream treatments.
3	South Fork Little Humboldt River watershed and land status.
4	Greater sage grouse resource values within the South Fork Little Humboldt River watershed.
5	Rock Creek watershed land status, LCT distribution, and climate resilient habitat.
6	Greater sage grouse resources and mule deer habitat within Rock Creek watershed.
7	Wildfire history in Rock Creek watershed.
8	Distribution of LCT in Willow Creek complex.
9	Status of North Fork Humboldt River area treatment and post-treatment surveys.
10	Land status and known distribution of nonnatives and/or hybrids from eDNA.
11	Greater sage grouse resources and mule deer habitat within Marys subbasin.
12	Long Canyon Complex project area.
13	Status of Long Canyon Complex project as of March 2023.

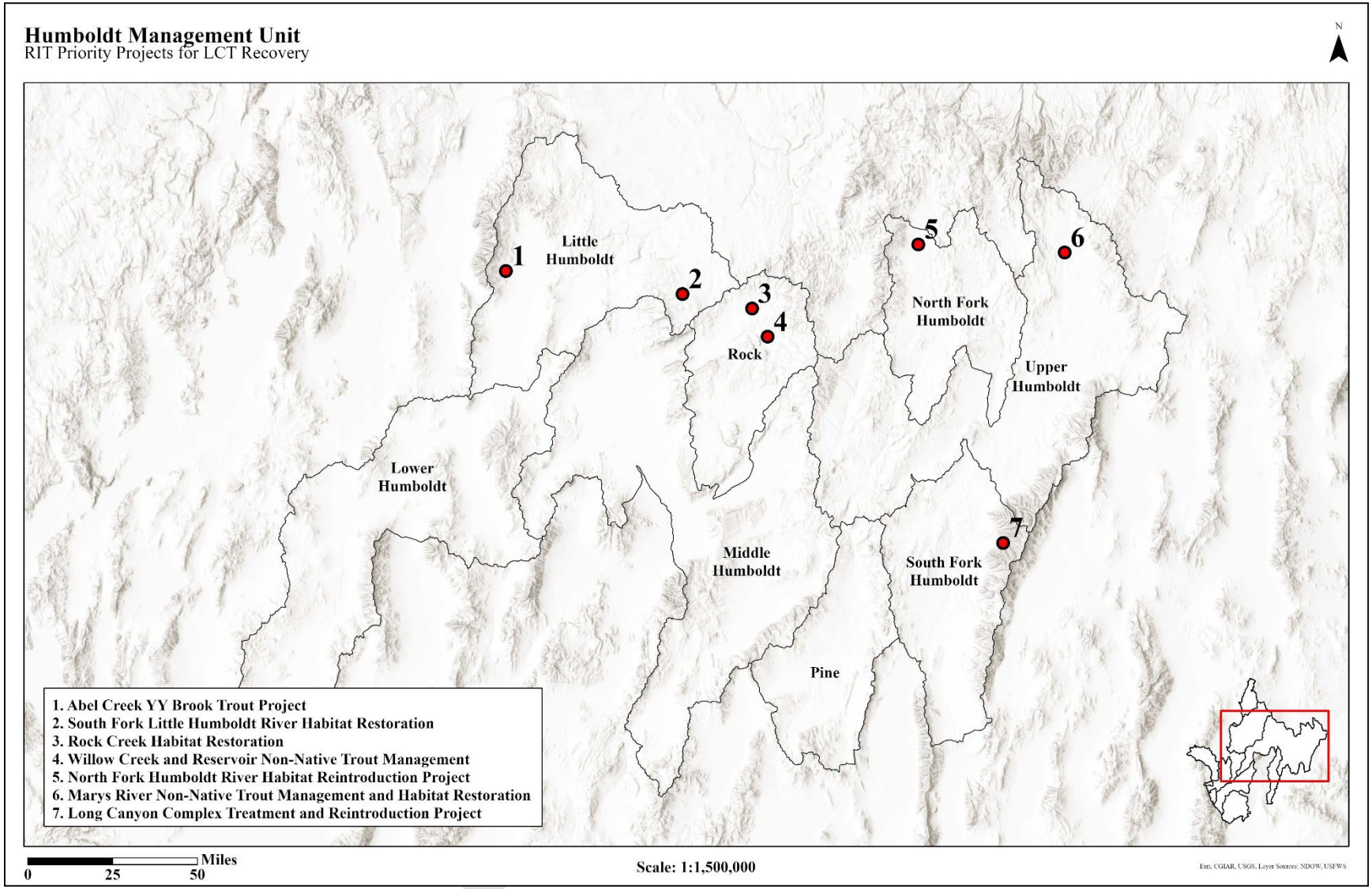

Figure 1. Priority LCT recovery projects for the Humboldt Management Unit.

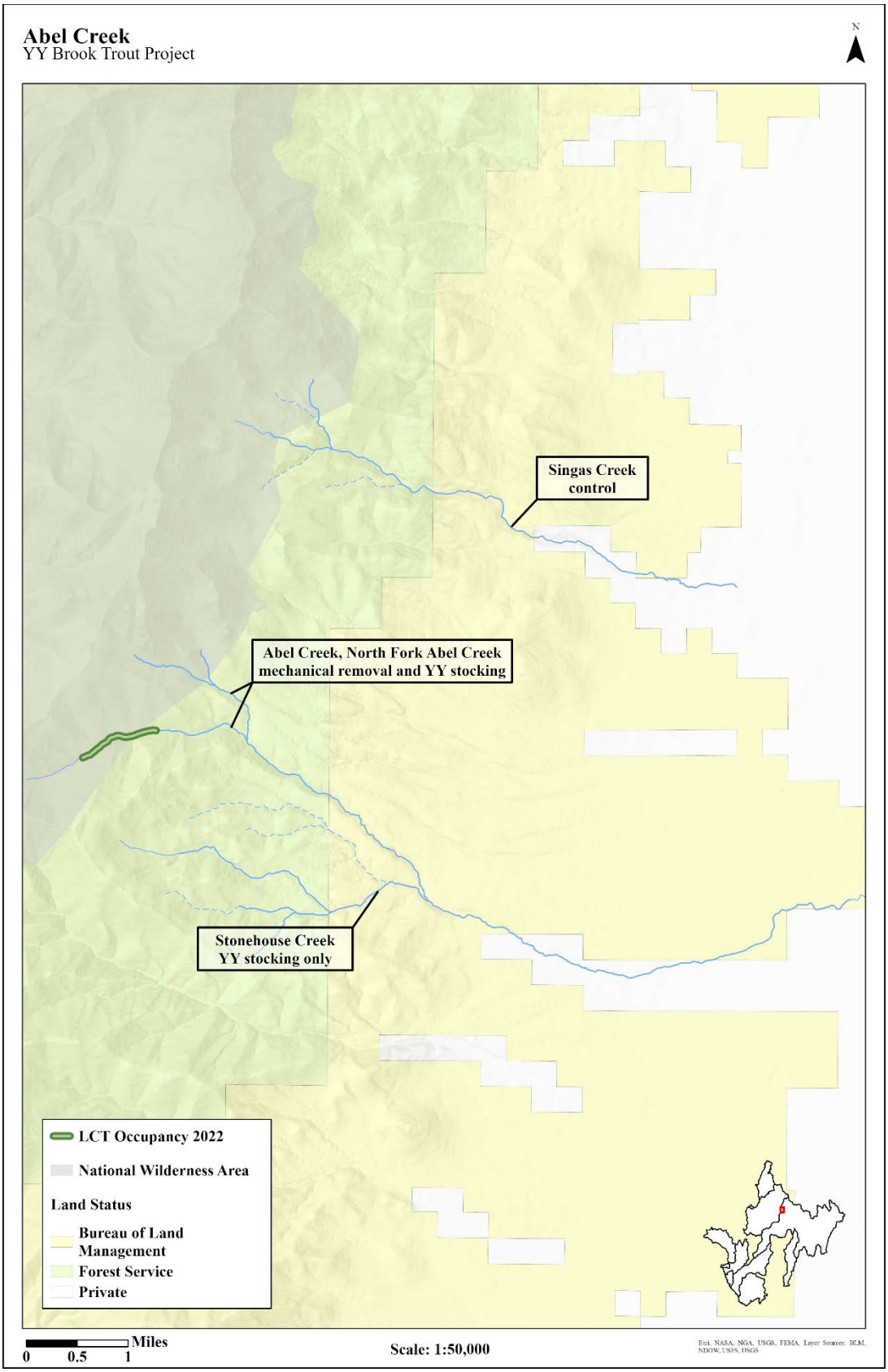

Figure 2. YY Brook Trout project area and stream treatments.

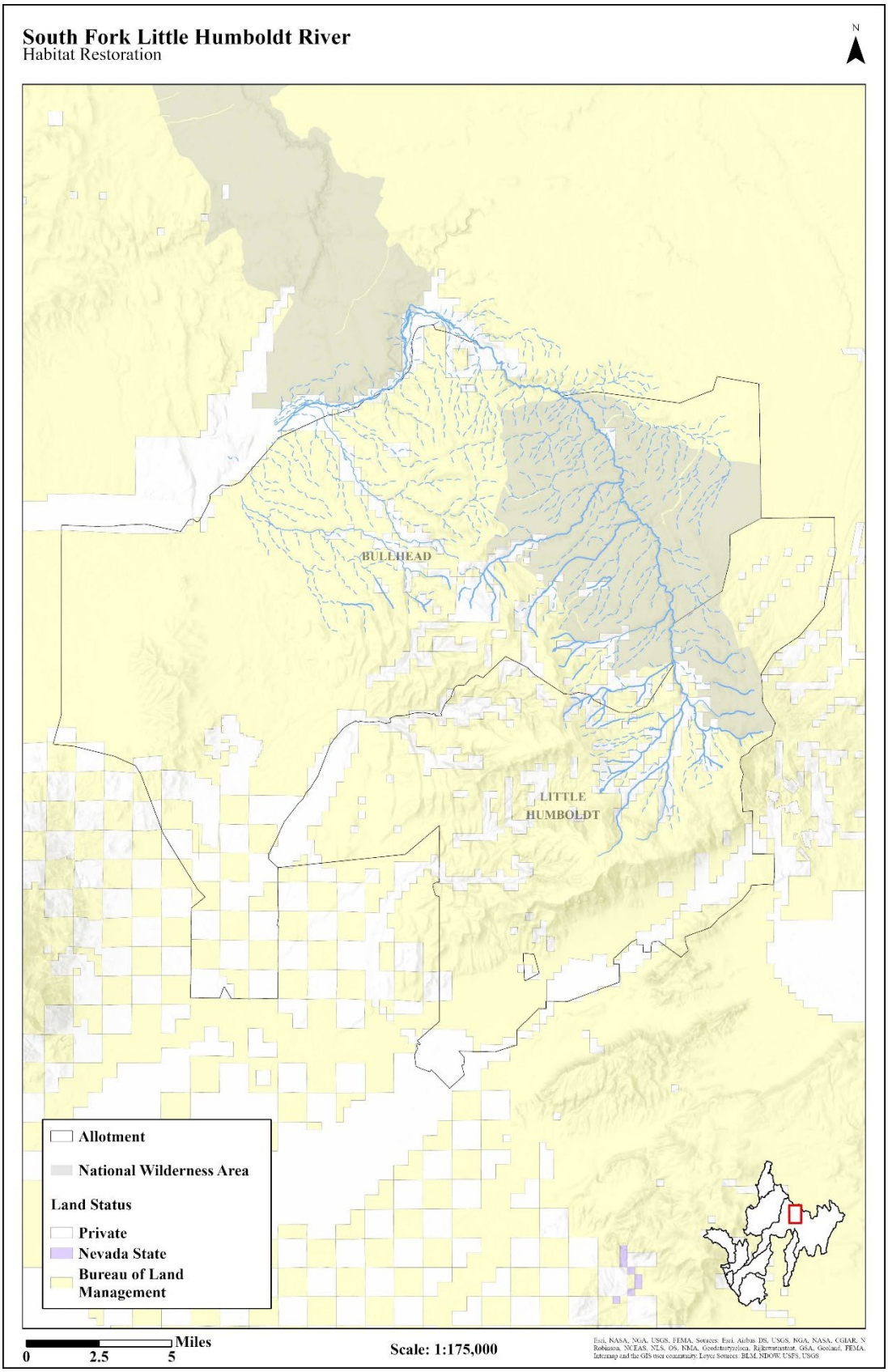

Figure 3. South Fork Little Humboldt River watershed and land status.

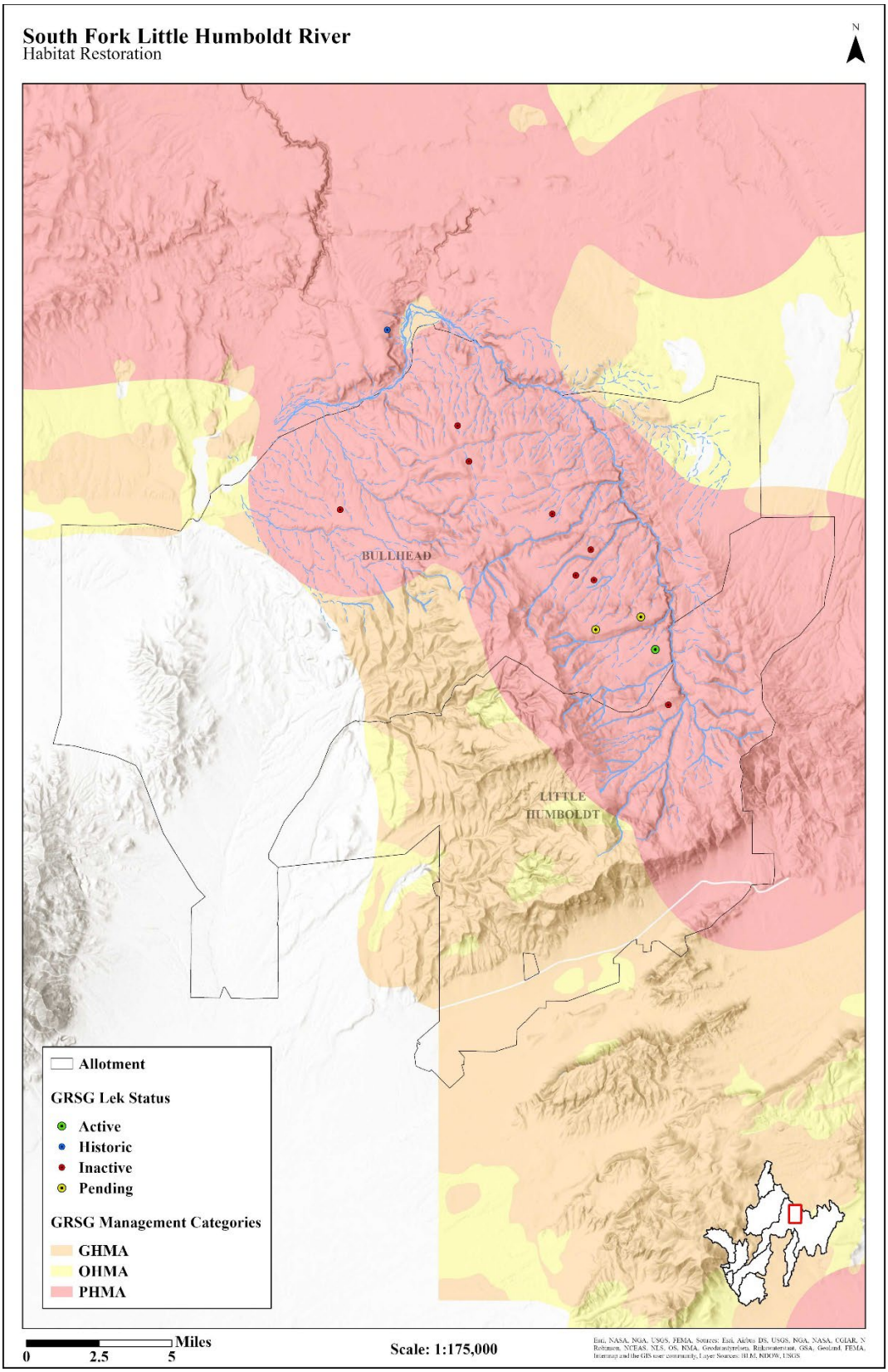

Figure 4. Greater sage grouse resource values within the South Fork Little Humboldt River watershed.

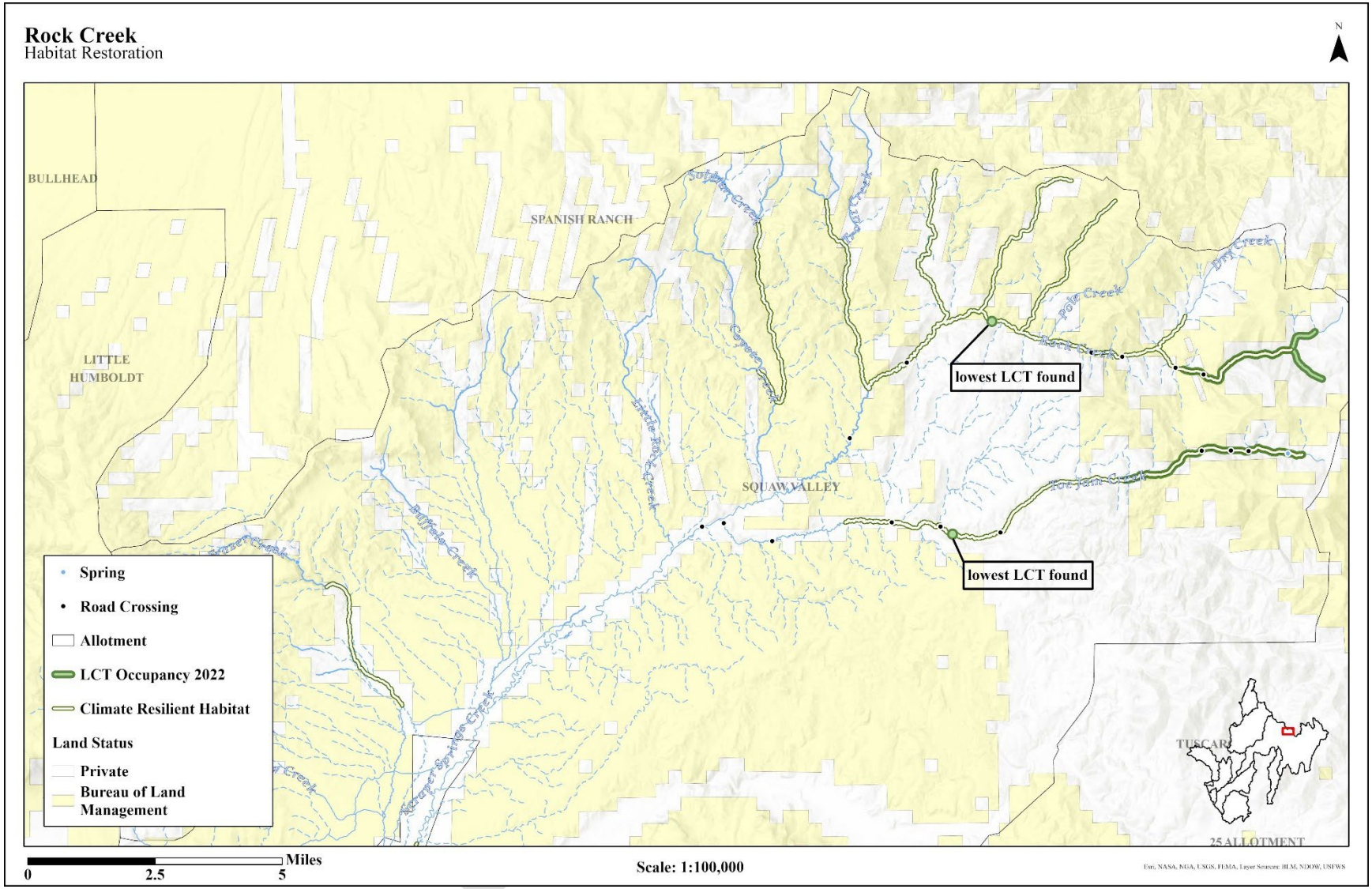

Figure 5. Rock Creek watershed land status, LCT distribution, and climate resilient habitat.

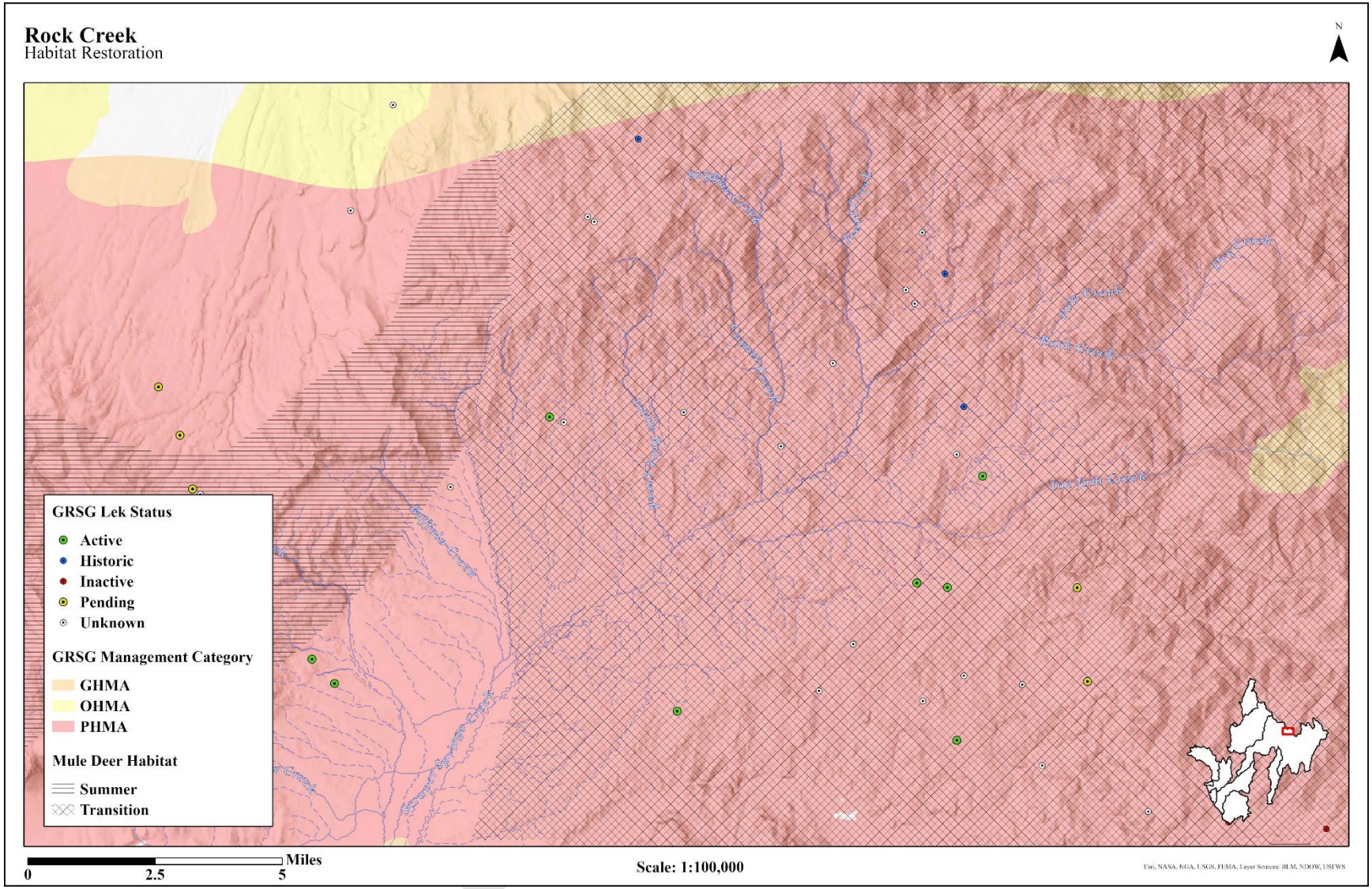

Figure 6. Greater sage grouse resources and mule deer habitat within Rock Creek watershed.

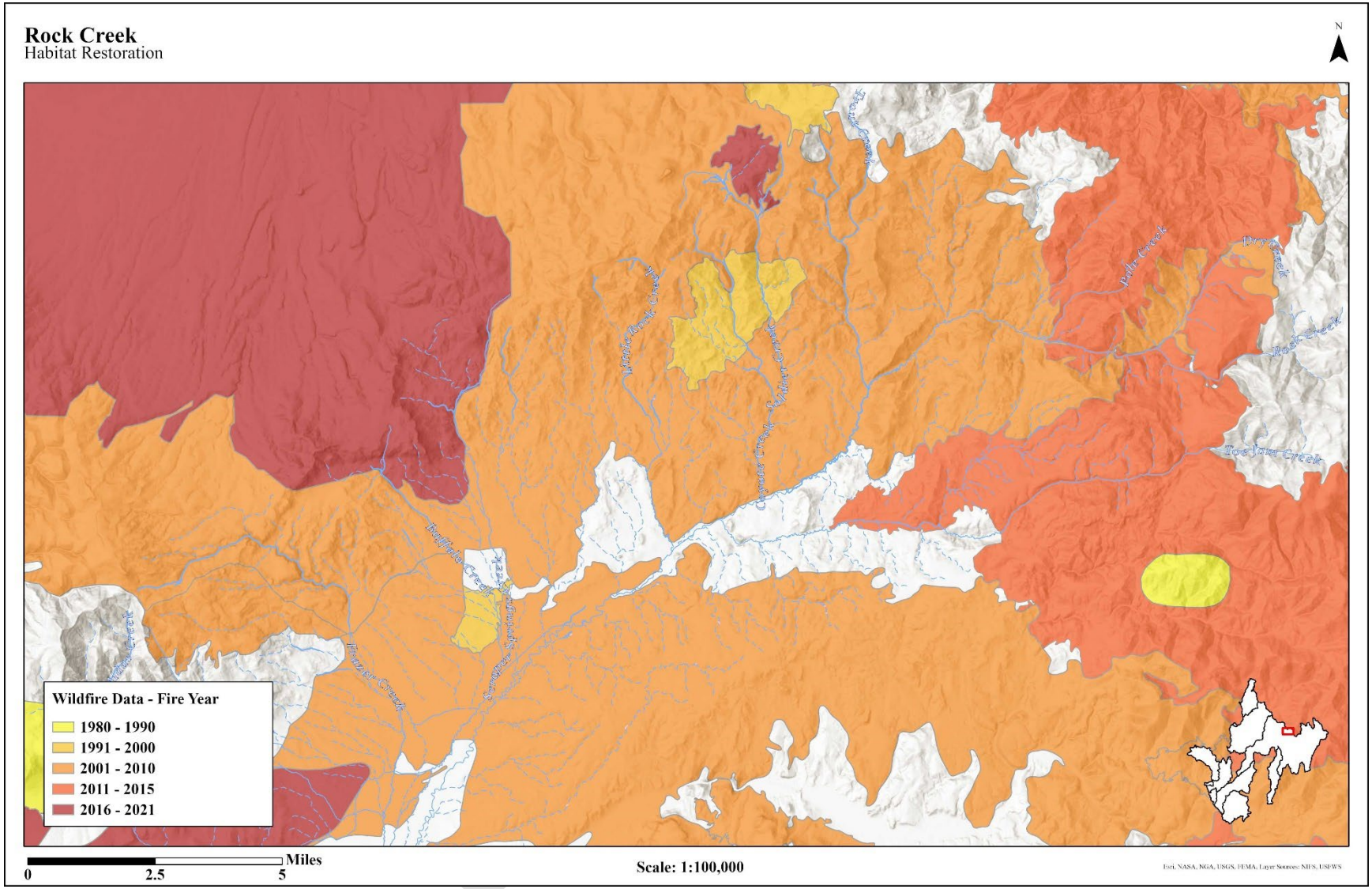

Figure 7. Wildfire history in Rock Creek watershed.

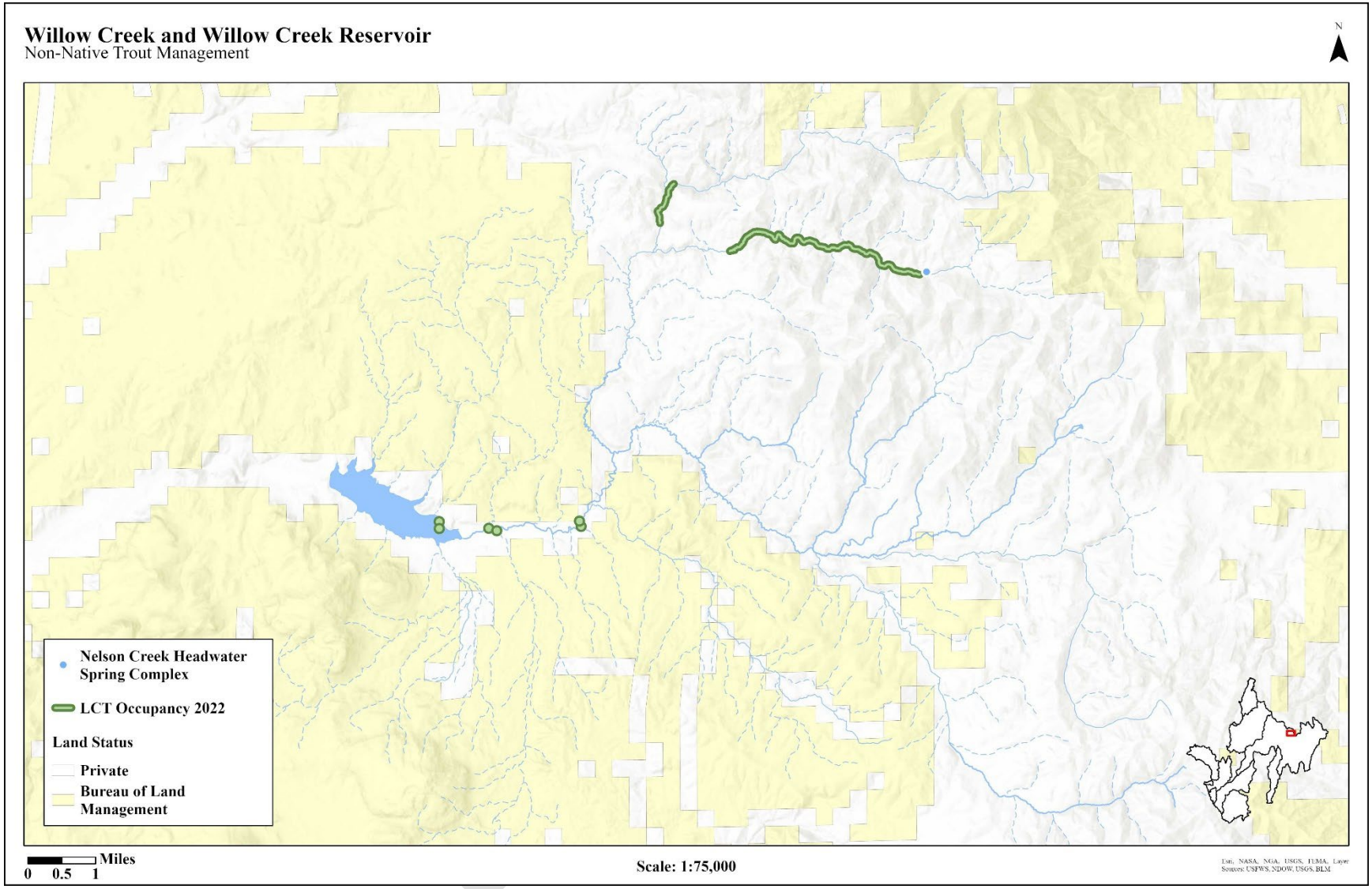

Figure 8. Distribution of LCT in Willow Creek complex as of summer 2022.

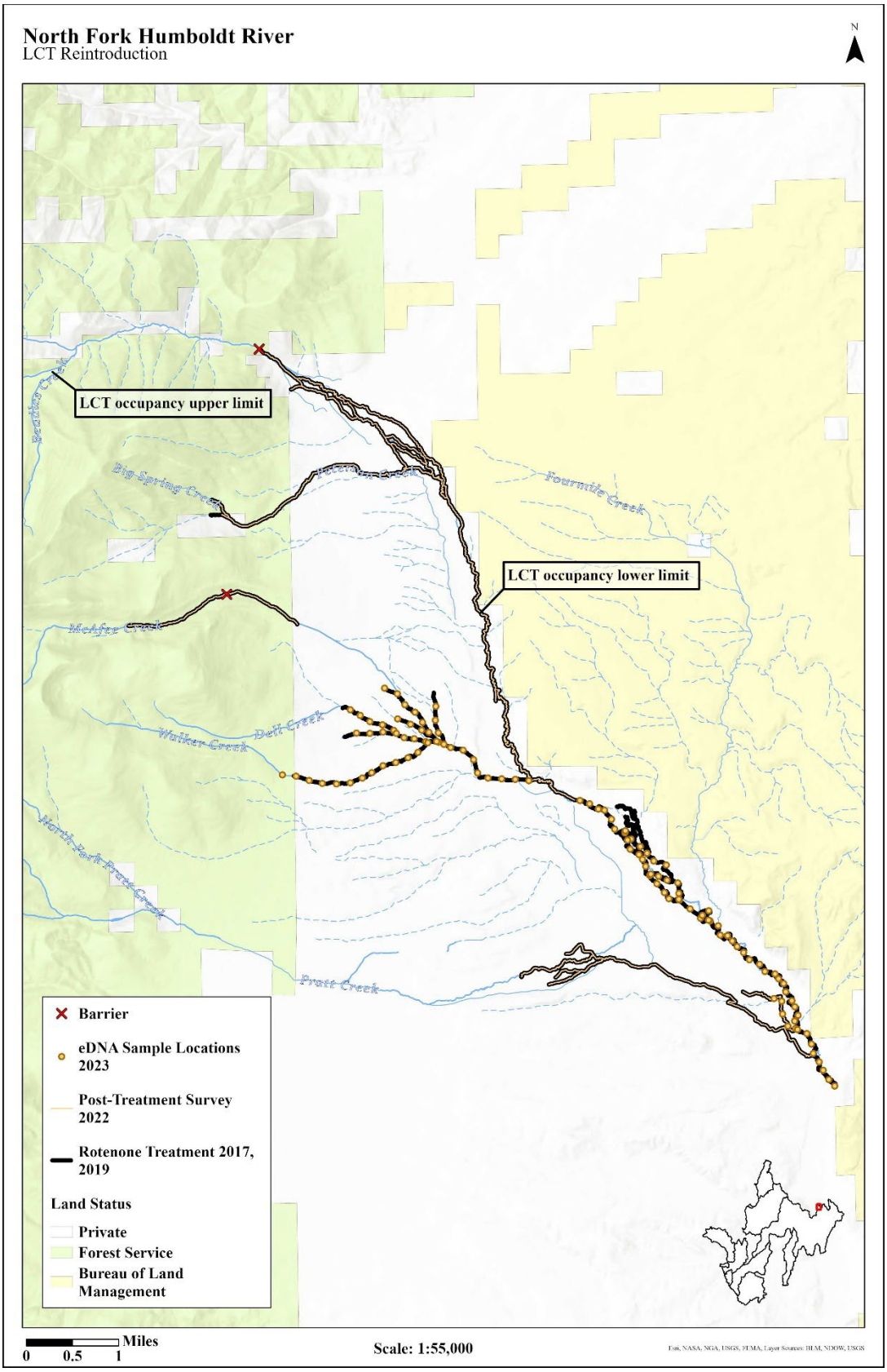

Figure 9. Status of North Fork Humboldt River area treatment and post-treatment surveys.

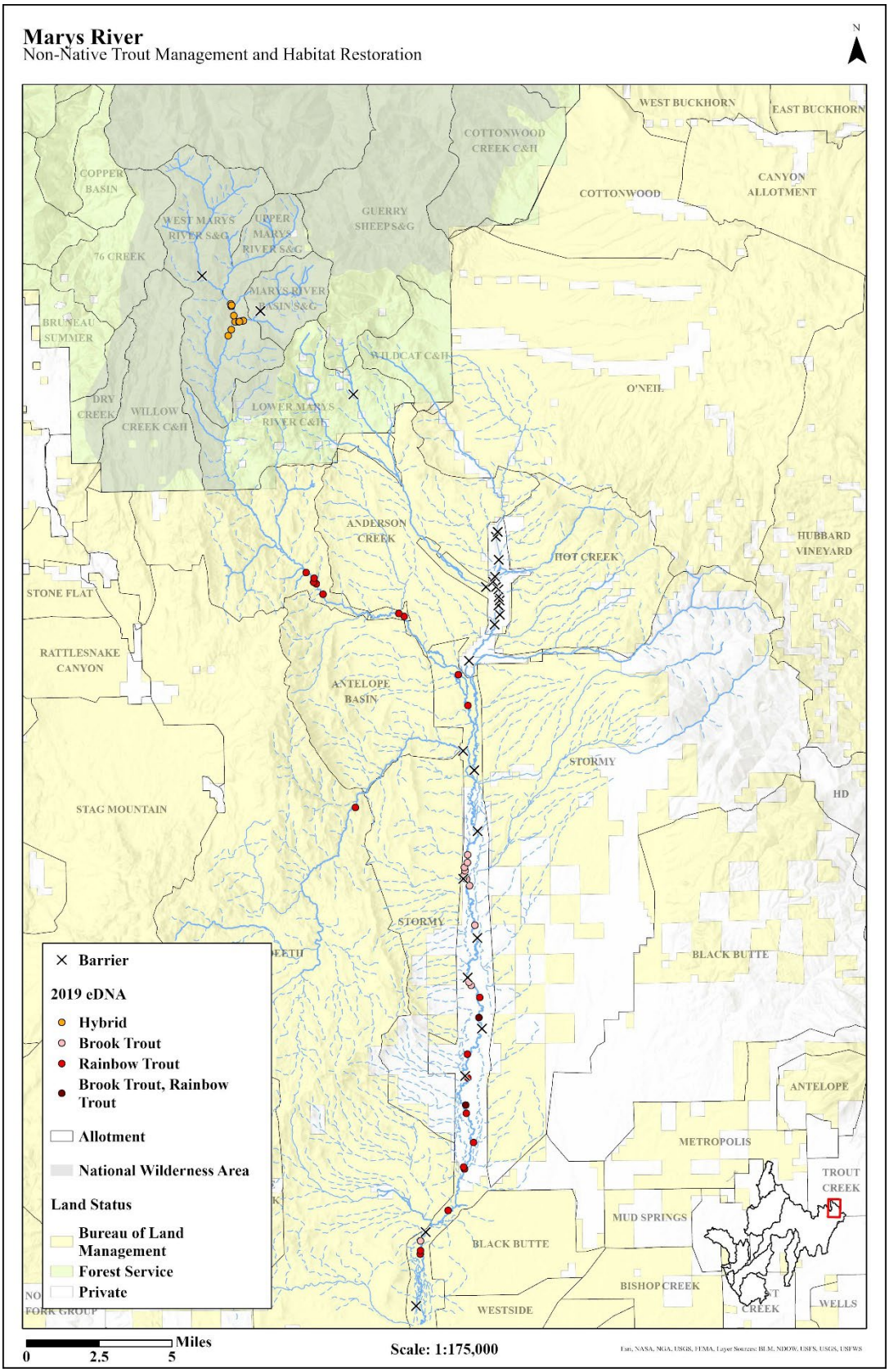

Figure 10. Land status and known distribution of nonnatives and/or hybrids from eDNA.

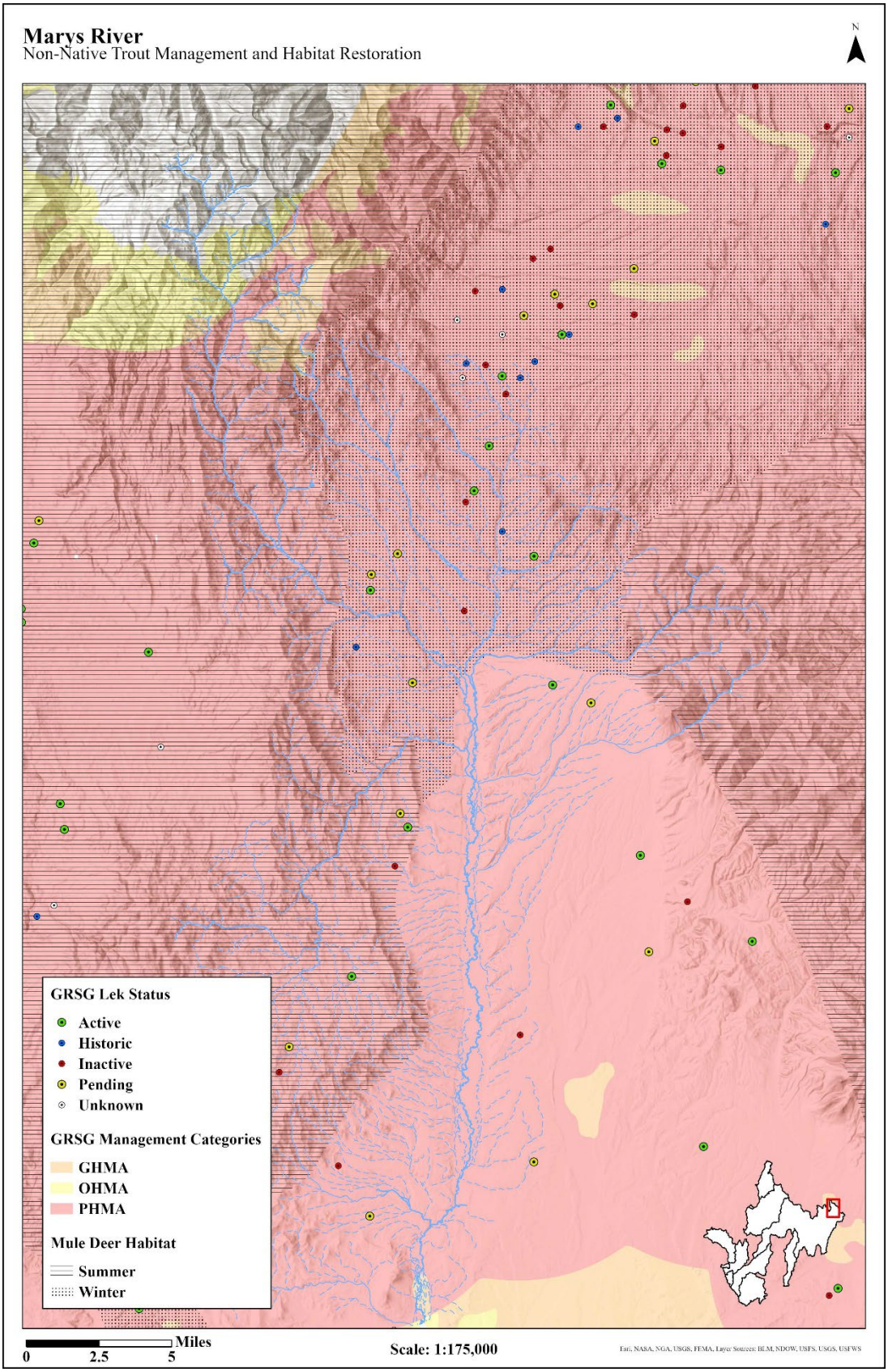

Figure 11. Greater sage grouse resources and mule deer habitat within Marys subbasin.

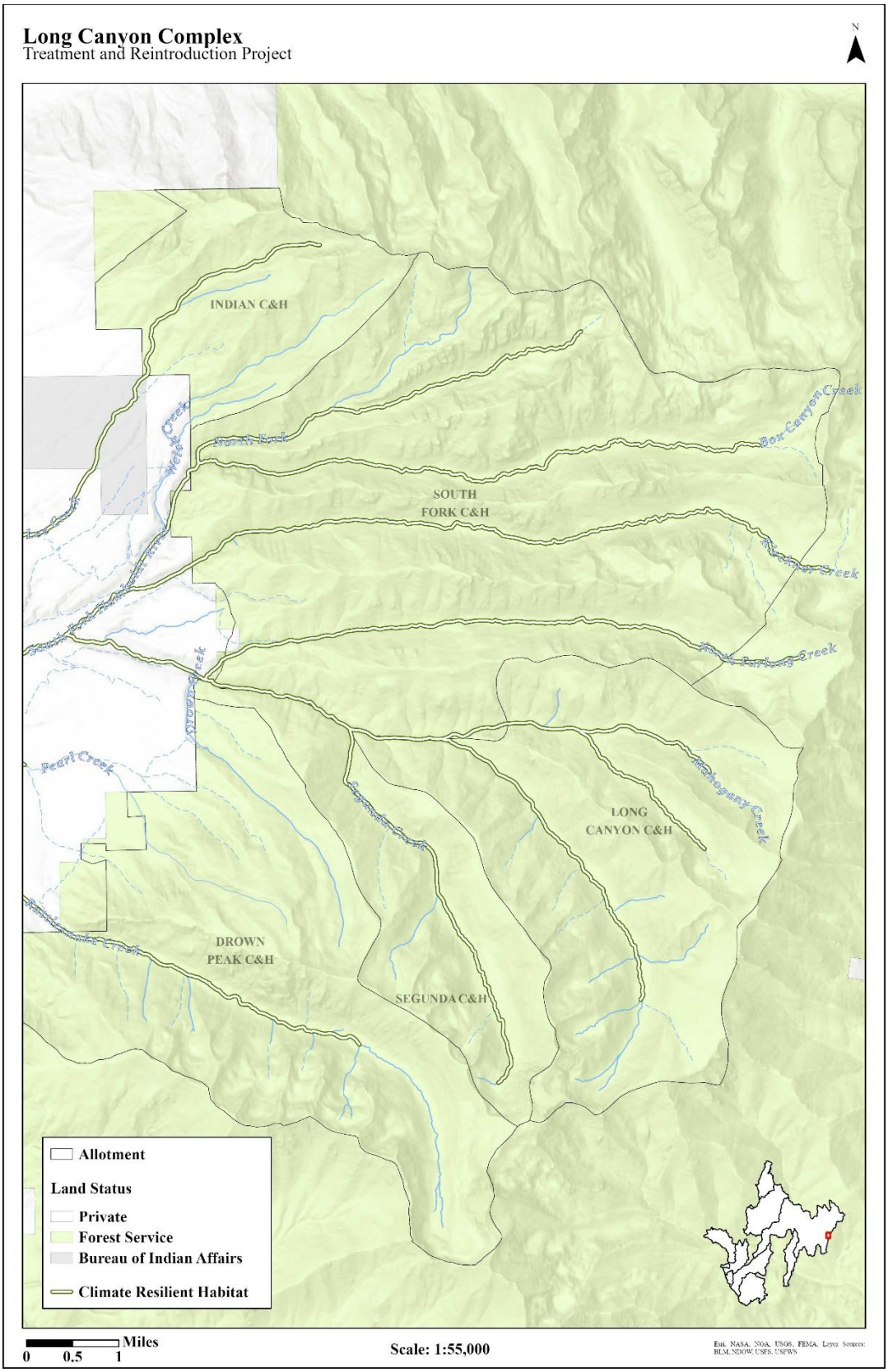

Figure 12. Long Canyon Complex project area.

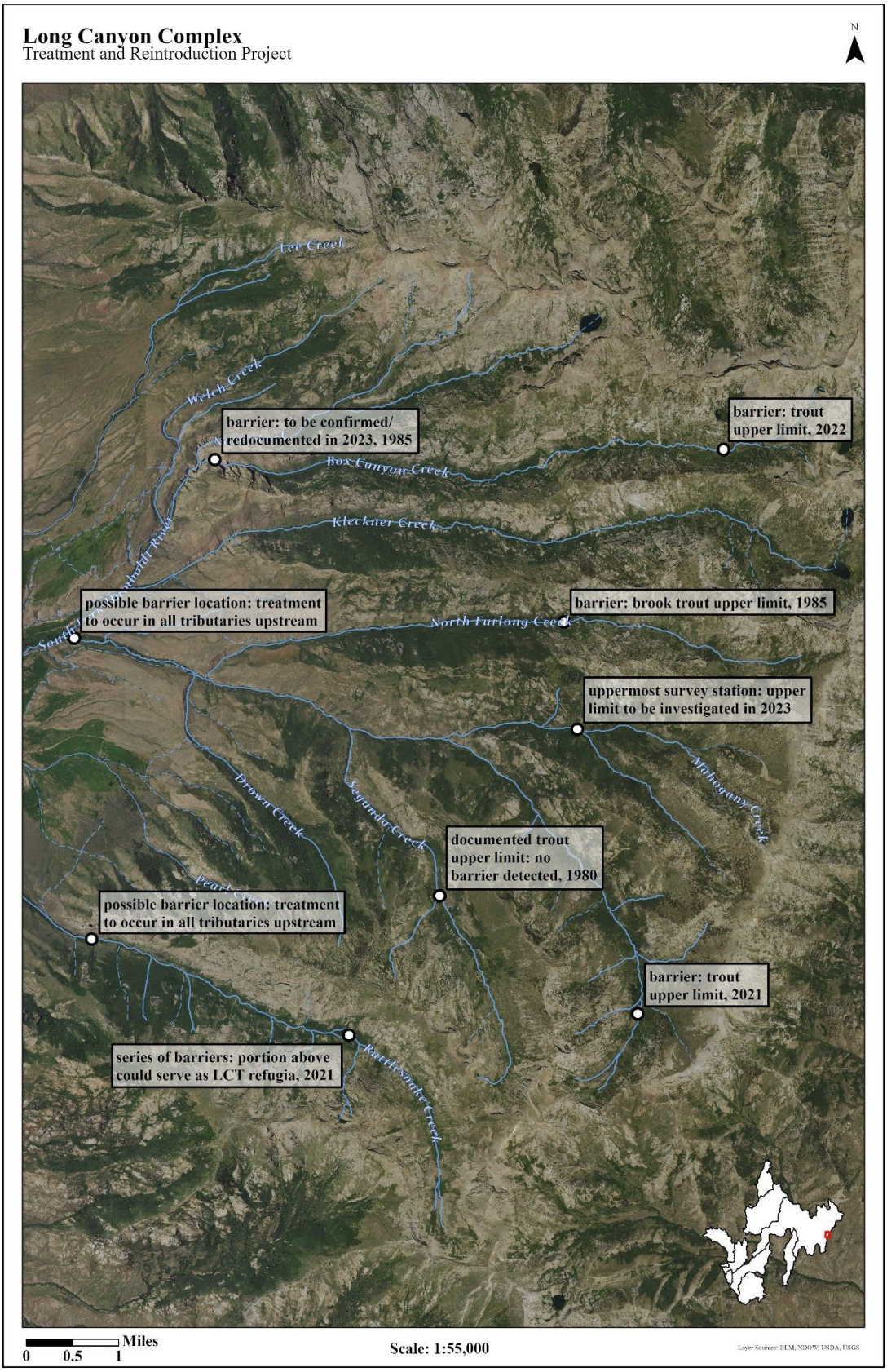

Figure 13. Status of Long Canyon Complex project as of March 2023.

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