

# SECTION 319 NONPOINT POLLUTION CONTROL PROGRAM

## FINAL REPORT

### 2013 FIRE REHABILITATION PROJECT

#### PROJECT NO. NPS2013A

By

Wyoming State Forestry Division

November 2016

This project was conducted in cooperation with the State of Wyoming Department of Environmental Quality and the United States Environmental Protection Agency, Region 8.

Grant No. C900863013

KEY WORDS: Forestry, Wildfires, Sediment, Roads

## SECTION 1.0 EXECUTIVE SUMMARY

PROJECT TITLE: 2013 FIRE REHABILITATION PROJECT

PROJECT START DATE: 5 AUGUST 2013

PROJECT COMPLETION DATE: 30 SEPTEMBER 2016

### BUDGET SUMMARY:

TOTAL 319 FUNDS AWARDED:	\$204,900.00
TOTAL 319 FUNDS EXPENDED:	\$204,900.00
TOTAL NONFEDERAL MATCH COMMITMENT:	\$136,600.00
TOTAL NONFEDERAL MATCH EXPENDED:	\$254,075.00
TOTAL PROJECT BUDGET:	\$341,500.00
TOTAL PROJECT EXPENDITURES:	\$458,975.00

BUDGET REVISIONS: \$15,900.00 MOVED FROM SUPPLIES TO CONTRACTUAL

### SUMMARY OF ACCOMPLISHMENTS:

The 2012 wildfire season was especially severe. Eight fires reached or exceeded 5,000 acres in size with the largest reaching 98,094 acres. Extensive areas were heavily burned with a near complete loss of overstory and understory vegetation and consumption of litter layer. Natural plant recovery was expected to be poor on many sites. The combination of adverse terrain and bare soils created a high potential for soil erosion and excessive sediment and nutrient delivery to nearby waterbodies.

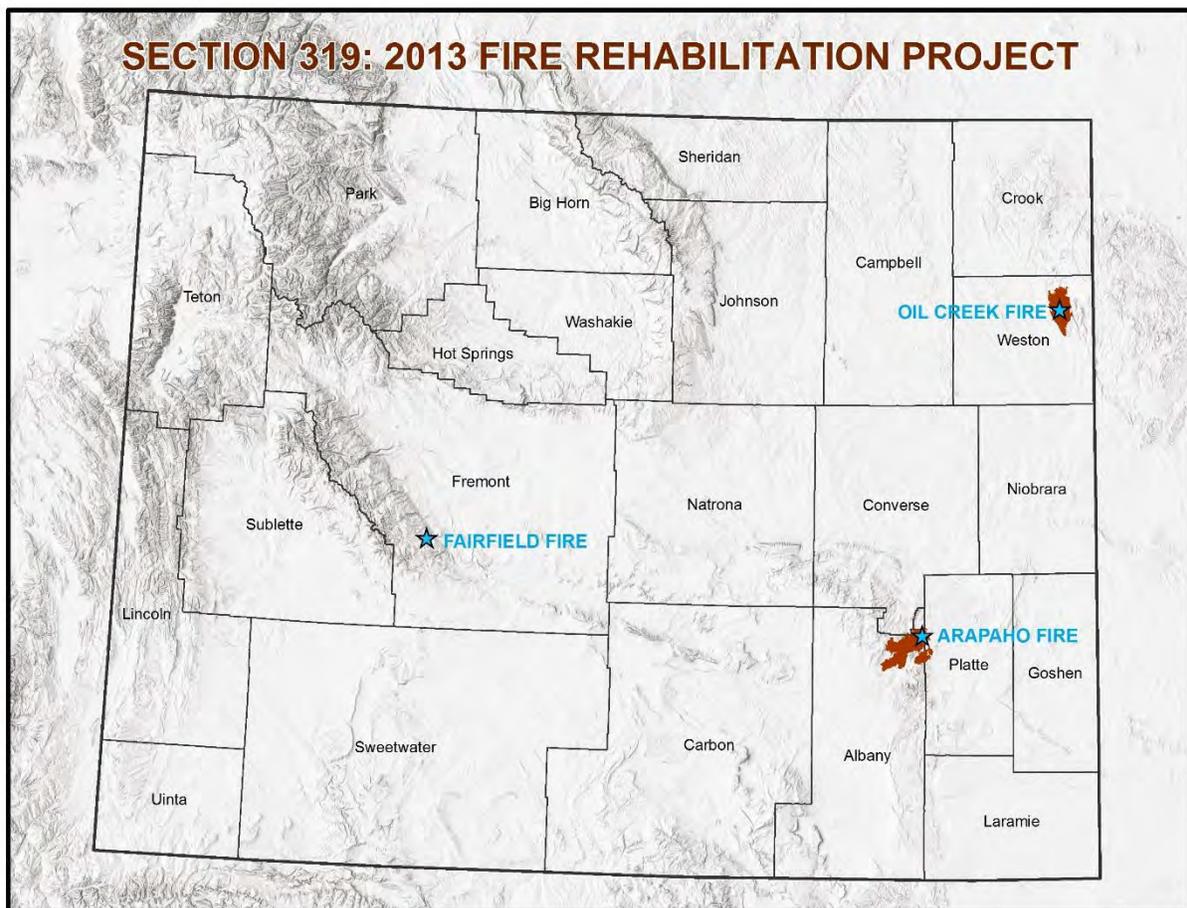
The project sought to reestablish ground cover vegetation to stabilize slopes and trap sediment to reduce sediment and nutrient loading to surface waterbodies from surface runoff on burned areas. Efforts were focused on two of the largest 2012 Wildfires, the 98,094 acre Arapaho Fire in Albany County and the 61,471 acre Oil Creek Fire in Weston County. A third project focus was Sinks Canyon State Park which burned in the 2013 Fairfield Fire. 319 funds were used to purchase native grass seed mixes, seedling trees/shrubs and pine seed which were used to reestablish vegetation on sites exhibiting slow or inadequate recovery; implement erosion control/containment treatments such as contour felling and wattles; repair/restore drainage features for roads and trails and replace culverts damaged in post fire rain events.

Section 319 funding allowed project partners to address issues at the drainage level with an across boundaries approach that provided for expanded treatment areas and greater project efficiency and effectiveness than would have been possible without the funding.

## SECTION 2.0 BACKGROUND

The 2012 wildfire season was especially severe. Drought, above average temperatures, erratic winds and heavy fuel loads led to an unprecedented number of large wildfires exhibiting severe fire behavior and resulting in extensive resource damage. Eight fires reached or exceeded 5,000 acres in size with the largest reaching 98,094 acres. Multiple fires have burned in close proximity to other fires, leaving relatively small unburned areas between fires or have actually burned into other fire perimeters, exacerbating resource concerns. For example the 98,094 acre Arapaho Fire burned into and around the 8,492 acre Cow Camp Fire resulting in a contiguous burned over area of 106,586 acres.

In 2013 the 1,300 acre Fairfield Fire burned into Sinks Canyon through which the Middle Fork of the Popo Agie River flows. The Middle Fork of the Popo Agie River is a Class 2AB waterbody protected for cold water fisheries and drinking water designated uses. The fire burned part of Sinks Canyon State Park and came within two miles of the surface water intake for the town of Lander.



Extensive areas were heavily burned with a near complete loss of overstory and understory vegetation and consumption of litter layer. Natural plant recovery was expected to be poor, due to extensive mortality of grass and forb root systems, consumption of residual seed stock and large areas without

viable parent sources for new seed. Hydrophobic soil conditions would further hamper revegetation in some areas. Unburned or lightly burned areas with expected good recovery rates were generally small and patchy and not considered adequate to filter potential sedimentation loads from heavily burned areas or provide significant seed sources within much of the burned over area. The extensive burned area includes many drainages with live water or which deliver sediment directly into adjacent water bodies. The topography frequently consisted of steep slopes where the potential for erosion was high. Thus, sediment delivery potential, along with increases in total phosphorus, to nearby waterbodies was considered high. Excessive sediment delivery had the real potential to adversely affect water quality for communities who may depend on these waterbodies as a source of drinking water and degrade wildlife and fish habitats. Heavy rains in some burned over areas, had already resulted in significant localized erosion and sedimentation in some drainages, with associated fish mortality and damage to roads and stream crossings.

Planned post fire rehabilitation efforts included reestablishing ground cover vegetation and forest cover where natural processes were inadequate. Install treatments to stabilize slopes and trap sediment. Provide needed maintenance and repairs to culverts, waterbars, drainage features and other infrastructure which have been impacted by erosion, sedimentation and debris accumulation. The primary environmental benefits anticipated of the project were reduced sediment and nutrient (primarily phosphorus) loading to surface waterbodies from surface runoff on burned areas.



Increased post wildfire storm runoff severely eroded roads. Example from Oil Creek Fire.

## SECTION 3.0 GOALS AND OUTCOMES

Under the work plan, Wyoming State Forestry Division would utilize its personnel, conservation crews and contract for professional services to undertake rehabilitation work in the burned areas which are within its jurisdiction. WSFD has jurisdiction over state trust lands, but not lands held by other state agencies such as Wyoming State Parks or private landowners. For rehabilitation work on lands outside its jurisdiction, WSFD would work with the landowner or responsible agency as a resource advisor, sub grant funds and ensure work is done in a satisfactory manner, though actual work would be done by the landowner, partner agency personnel or their contractors.

Post fire rehabilitation treatments would include:

Seeding of sites to reestablish native vegetation when natural seed sources are unavailable or inadequate.

Mulching, contour felling of dead trees and construction of slash filters to stabilize slopes and trap sediment.

Maintenance and repairs to culverts, waterbars and other infrastructure which have been impacted by erosion, sedimentation and debris accumulation.

Rehabilitation of fire lines which may include replacing bermed material back into the cleared area, construction of waterbars and sediment traps and seeding of cleared area.

The desired final product for this project is the reduction of sediment and nutrient (primarily phosphorus) loading to surface waterbodies from surface runoff on burned areas. Anticipated outcomes include a reduction in erosion rates within treated areas and accelerated establishment of native ground cover plants and forest cover providing long term soil stabilization and water quality improvements.

## SECTION 4.0 TASK ACTIVITIES

Task #	Task Title	Task Description	Actual Deliverables
1	Project Administration	Maintain Project Files and Records Submit Reimbursement Requests File Reports	Quarterly Progress Reports Annual Reports MBE/WBE Utilization Reports Draft Final Report
2	Post Fire Rehabilitation	Sediment Reduction and Catchment Re-establishment of Vegetative Cover Repair/Restoration of Drainage Features	Installation of wattles and sediment traps Contour Felling Grass Seeding Planting of Trees and Shrubs Roads and Trails Treated Drainage/ Catchment Features Repaired Culverts Installed

## SECTION 5.0

## BMP IMPLEMENTATION

<b>BMP Name/Description Oil Creek Burn Area, Weston County</b>	<b>HUC12</b>	<b>Date Completed</b>	<b>Targeted Pollutant(s)</b>	<b>Load Reduction Estimate(s)*</b>	<b>Load Reduction Estimate Method(s)</b>
Sediment Reduction and Catchment	101201070101 101201070102 101201070103 101201070104	March 2016	Sedimentation Excess Phosphorus	5,362 lb./yr. nitrogen 2,072 lb./yr. phosphorus 1,677 ton/yr. sediment	STEPL
Re-establishment of Vegetative Cover	101201070101 101201070102 101201070103 101201070104	June 2016	Sedimentation Excess Phosphorus		
Repair/Restoration of Drainage Features	101201070101 101201070102 101201070103 101201070104	December 2015	Sedimentation Excess Phosphorus		

<b>BMP Name/Description Arapaho Burn Area, Albany County</b>	<b>HUC12</b>	<b>Date Completed</b>	<b>Targeted Pollutant(s)</b>	<b>Load Reduction Estimate(s)*</b>	<b>Load Reduction Estimate Method(s)</b>
Sediment Reduction and Catchment	101800080901	August 2015	Sedimentation Excess Phosphorus	1,901 lb./yr. nitrogen 734 lb./yr. phosphorus 818 ton/yr. sediment	STEPL
Re-establishment of Vegetative Cover	101800080901	August 2015	Sedimentation Excess Phosphorus		
Repair/Restoration of Drainage Features	101800080901	August 2015	Sedimentation Excess Phosphorus		

<b>BMP Name/Description Fairfield Burn Area, Fremont County</b>	<b>HUC12</b>	<b>Date Completed</b>	<b>Targeted Pollutant(s)</b>	<b>Load Reduction Estimate(s)*</b>	<b>Load Reduction Estimate Method(s)</b>
Sediment Reduction and Catchment	100800030210	June 2015	Sedimentation Excess Phosphorus	49 lb./yr. nitrogen 19 lb./yr. phosphorus 15 ton/yr. sediment	STEPL
Re-establishment of Vegetative Cover	100800030210	June 2015	Sedimentation Excess Phosphorus		

\*Pollutant load reductions were estimated by the Wyoming Department of Environmental Quality Nonpoint Source Program using the Spreadsheet Tool for Estimating Pollutant Loads (STEPL). These numbers are provided as estimates only, for purposes of program reporting

## IMPLEMENTATION OF WATER QUALITY IMPROVEMENT PRACTICES

### Re-establishment of Vegetative Cover:

9,035 pounds of grass seed in various mixes formulated for different locations and sites was used for rehabilitation efforts on the 98,094 acre Arapaho Fire in Albany County, the 61,471 acre Oil Creek Fire in Weston County and the 1,300 acre Fairfield Fire in Fremont County. Seeding was conducted as a standalone treatment on some sites and in conjunction with other treatments such as contour felling, wattle installation and mulching on other sites. Seed was also used as a final phase to aid in the stabilization of repairs made to roads, trails and culverts. Five hundred and fifty eight strategically located acres were seeded.

Wyoming State Forestry Division personnel and Wyoming Honor Conservation Camp Crews did the seeding on State lands and within public right of ways. On private lands, seed was distributed to landowners who did the seeding on their lands.

9,075 seedling trees native to the area were planted along 6.38 miles of riparian corridor within the Oil Creek burn, labor was provided by Honor Conservation Camp Crews. 1,200 seedling shrubs were planted within Sinks Canyon State Park, work was done by volunteers and State Parks staff.

Black Hills sourced pine seed was purchased and WSFD staff and Honor Conservation Camp Crews collected and processed an additional 200 pounds of ponderosa pine seed which was planted within areas of the Oil Creek burn which lacked viable seed trees.

### Sediment Reduction and Catchment:

Contour felling of dead trees on burned slopes was done to stabilize slopes and retain sediment. Wattles were fabricated and installed in areas where contour felling was not possible or where remediation work necessitated containment structures. Sediment traps were constructed from local stone and timber on sites where wattles did not provide sufficient sediment retention capacity.



Contour felling reduced erosion, retained sediments on slopes and enhanced revegetation of site.

Repair and Restoration of Drainage Features:

A number of culverts proved inadequate for the increased flow rates and sediment loads within some drainages and became clogged, buried, washed out or otherwise damaged. Where needed, culverts were relocated and/or replaced with larger capacity pipes to prevent future clogging or washing out. Heavy runoff associated with rain events caused severe erosion to a number of roads and secondary trails. Work was done to repair and stabilize surfaces and to repair and/or replace drainage infrastructure such as waterbars and ditches. Project restored proper drainage function to 4.91 miles of roads and replaced 20 culverts with larger capacity pipes.



Many culverts were inadequate for increased water volumes. Washed out culvert on the Arapaho Fire.

Project	HUC 12	319 Rehabilitation Practices Implemented*	Other Rehabilitation Practices Implemented*
		*figures are for 319 funded practices only	*Implemented without 319 funding
Oil Creek	101201070101 101201070102 101201070103 101201070104	3,000 linear feet of wattles installed 4.02 miles of road drainage features restored 16 culverts replaced with larger capacity pipe 142 acres of contour felling 9,075 seedling trees planted	2.24 miles of road drainage features restored 3 culverts replaced with larger capacity pipe 239 acres of contour felling
Arapaho	101800080901	0.89 miles of road drainage features restored 4 culverts replaced with larger capacity pipe 25 acres of contour felling 12 sediment traps installed	1.18 miles of road drainage features restored 2 culverts replaced with larger capacity pipe 17 acres of contour felling
Fairfield	100800030210	2,600 linear feet of wattles installed 1,200 seedling trees and shrubs planted	

## SECTION 6.0 MONITORING RESULTS

Wyoming State Forestry Division requested the monitoring requirement be waived and the WDEQ Nonpoint Source Program approved the waiver for the reasons described below. The project intent was to reduce erosion and sedimentation that will occur following wildfire using tested techniques and strategies. The large scale of the project, with multiple sites would make monitoring, at spatial and temporal scales necessary to credibly detect water quality changes, a very labor intensive and expensive process. WSFD did not have the in house technical expertise or available manpower needed to implement an intensive monitoring regime. Monitoring would have needed to be contracted out, diverting a significant proportion of the project budget/resources away from on the ground treatments, with the unintended consequence of reducing the water quality benefit of the project.

The data produced would probably have been of limited value as good pre fire baseline data was difficult to obtain or did not exist and current water quality data would vary with recent storm intensity and occurrence. Expected erosion and sedimentation rates for an untreated site would vary widely due to a number of factors outside project control such as timing and intensity of precipitation, spring runoff etcetera. Nor would the project be able to treat the entire burn area and runoff from untreated areas would probably negatively impact results. At best, data would likely show a probable reduction in erosion/sedimentation of X% with a very wide margin of error.

WSFD and project partners did monitor treatment sites to maintain their function and ensure the efficacy of practices and performed needed maintenance and follow-up.



Sediment traps installed on the Arapaho Fire one year after installation.

## SECTION 7.0 PARTNERS

Weston County Natural Resource District

Weston County Road and Bridge

Sinks Canyon State Park

Private Landowners in Weston and Albany Counties

The Weston County Natural Resource District provided funds, equipment and materials for rehabilitation work on the Oil Creek Burn. Weston County Road and Bridge provided equipment and labor. State Preservation and Enhancement funds were used to purchase additional seed and facilitate complimentary rehabilitation work on state lands. Honor Conservation Crews performed work on state lands and public right of ways. Sinks Canyon State Park provided labor and equipment. Volunteers, including local school groups assisted with rehabilitation efforts in Sinks canyon State Park. Private landowners funded complimentary and adjuvant treatments on private lands. U.S. Forest Service Consolidated grant funds were also used for the purchase of additional seed and materials.



Local school group assists with installation of wattles in Sinks Canyon State Park.

## SECTION 8.0 EDUCATION AND INFORMATION

The project did not have a formal education and Information component. Wyoming State Forestry staff did provide one on one technical assistance to impacted landowners that requested assistance. A guide “Living with Wildfire in Wyoming” was developed cooperatively through University of Wyoming Extension to address a broad range of issues stemming from the exceptional 2012 wildfire season and distributed to impacted landowners.

## SECTION 9.0 COMPLICATIONS

There was a significant delay in acquiring the necessary budget authority to spend the 319 funds. This delayed the acquisition of supplies and equipment, necessary contracting and sub-recipient processes and resulted in the loss of a year’s field season. Access and terrain limited the ability to treat some sites and heavy rains negatively impacted some treatment sites before treatments could be applied.

## SECTION 10.0 RECOMMENDATIONS

While treatments were still deemed beneficial and effective when implemented in subsequent years after wildfire activity, treatments were most effective when implemented promptly after a wildfire event. Delays in implementing treatments did increase associated erosion and sedimentation and increased mitigation and repair costs. Given the unplanned nature of wildfire, it would be very beneficial to have some mechanism by which funds and/or resources could be mobilized quickly to implement mitigation practices while longer term solutions were being sought. That said, even if funds and infrastructure were available for immediate response the associated workload would necessitate some work being deferred to subsequent field seasons.

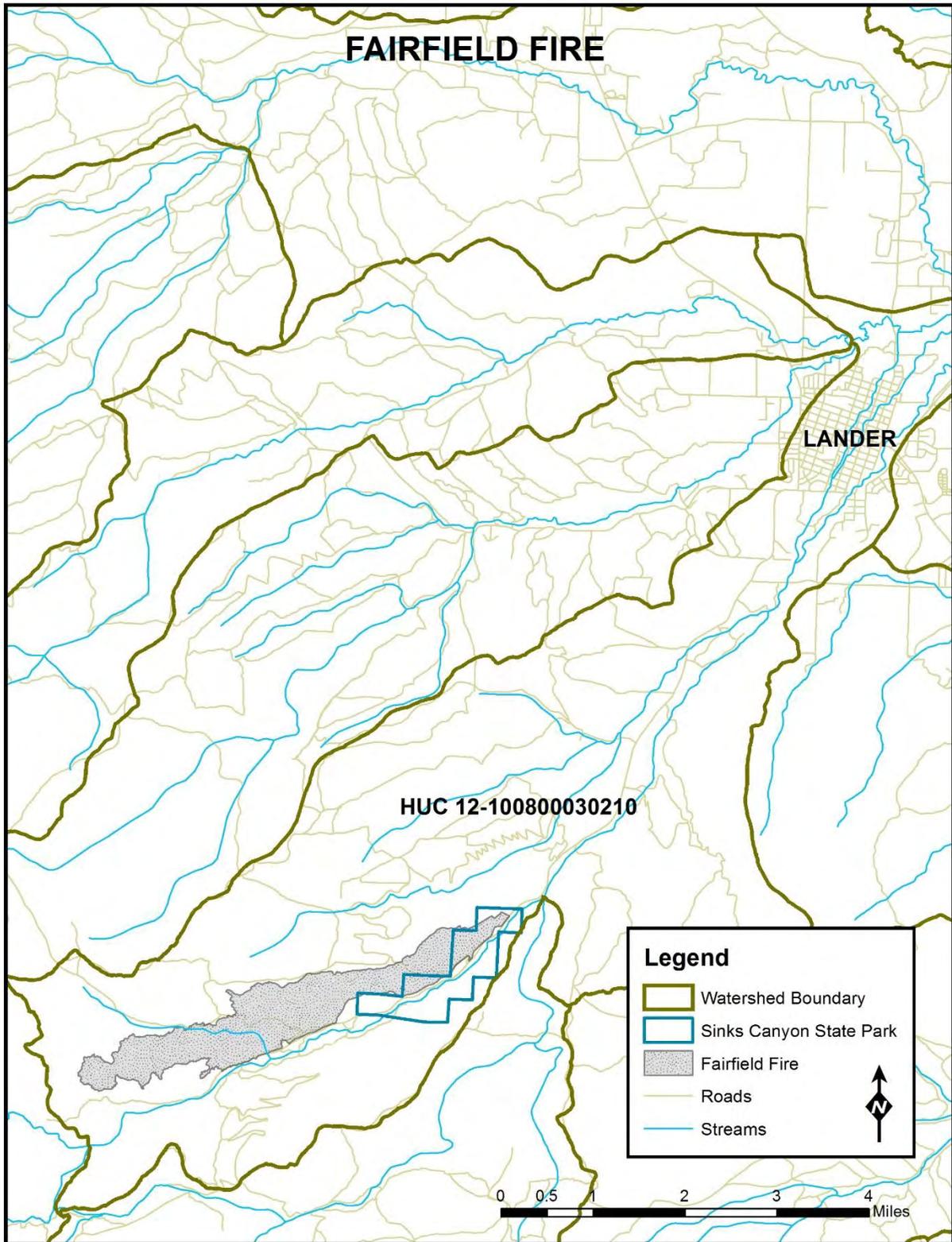
The project did have benefits beyond its original scope. The 2016 fire season within the Black Hills region of Crook and Weston Counties was very active and resulted in some extensive burned areas. Due to the knowledge, relationships and infrastructure developed in rehabilitation efforts on the 2012 Oil Creek burn area; WSFD staff and county partners have been able to mobilize and implement some mitigation treatments within the current field season.

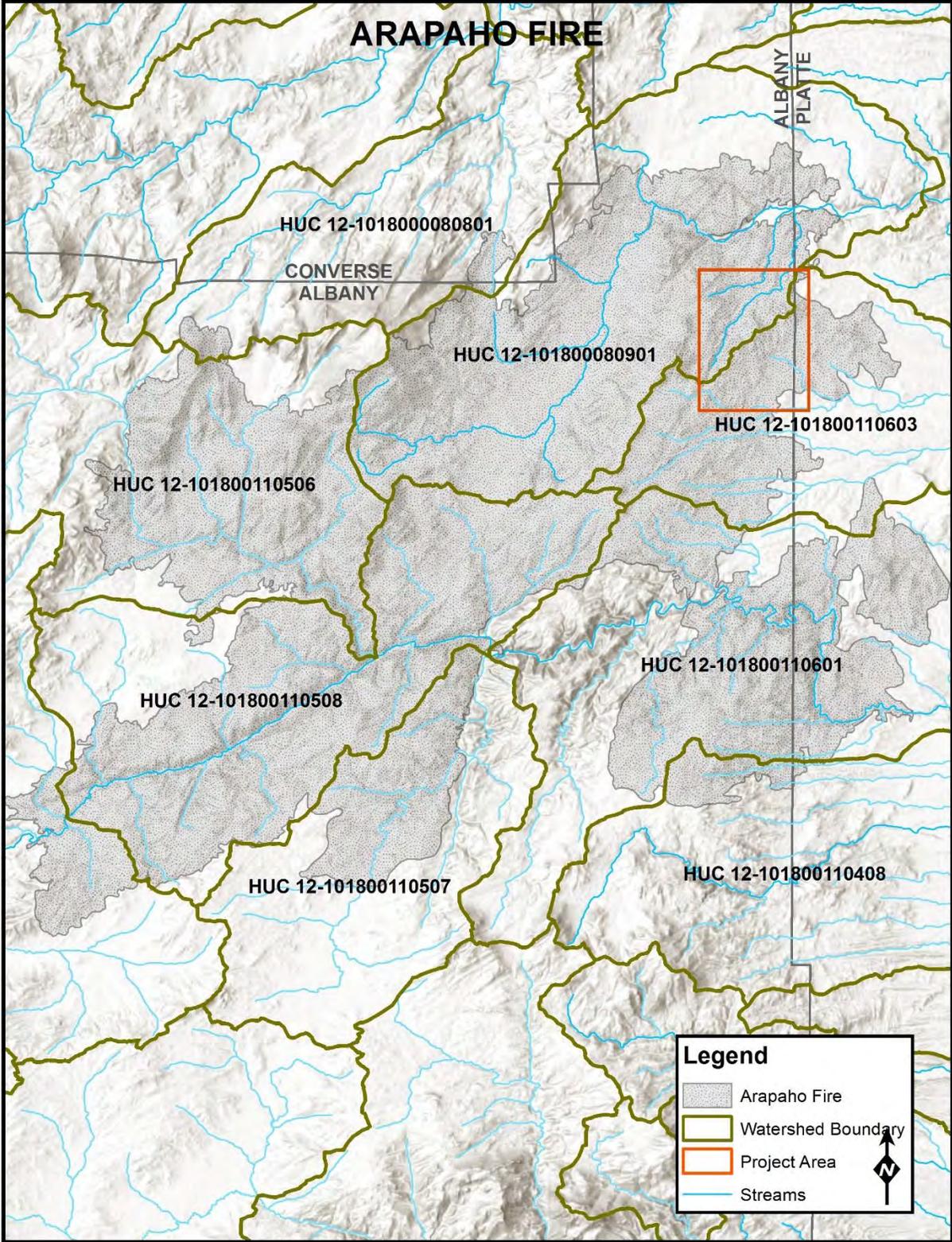
## SECTION 11.0 FINANCIAL SUMMARY

Task #	Task Title	319 or 205(j) Funds Expended	Nonfederal Match Expended	Total NPS Expenditures	Other Federal Funds Expended
1	Project Administration	Zero	\$24,678.09	Zero	Zero
2	Post Fire rehabilitation	\$204,900.00	\$229,397.35	\$204,900.00	\$2,628.29
	<b>TOTALS</b>	\$204,900.00	\$254,075.44	\$204,900.00	\$2,628.29

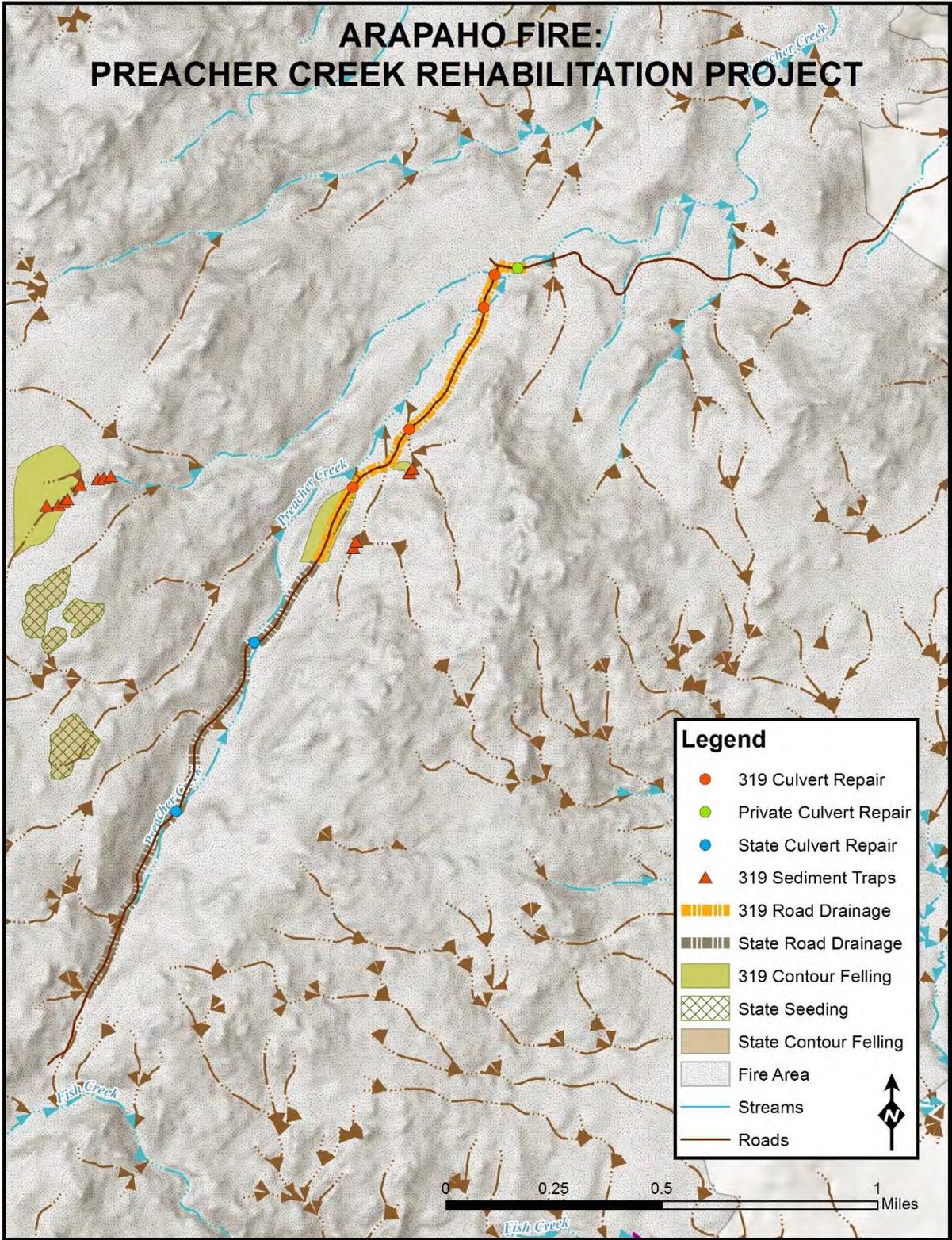


SECTION 12.0 ATTACHMENTS





# ARAPAHO FIRE: PREACHER CREEK REHABILITATION PROJECT



# OIL CREEK FIRE

HUC 12-101201070102

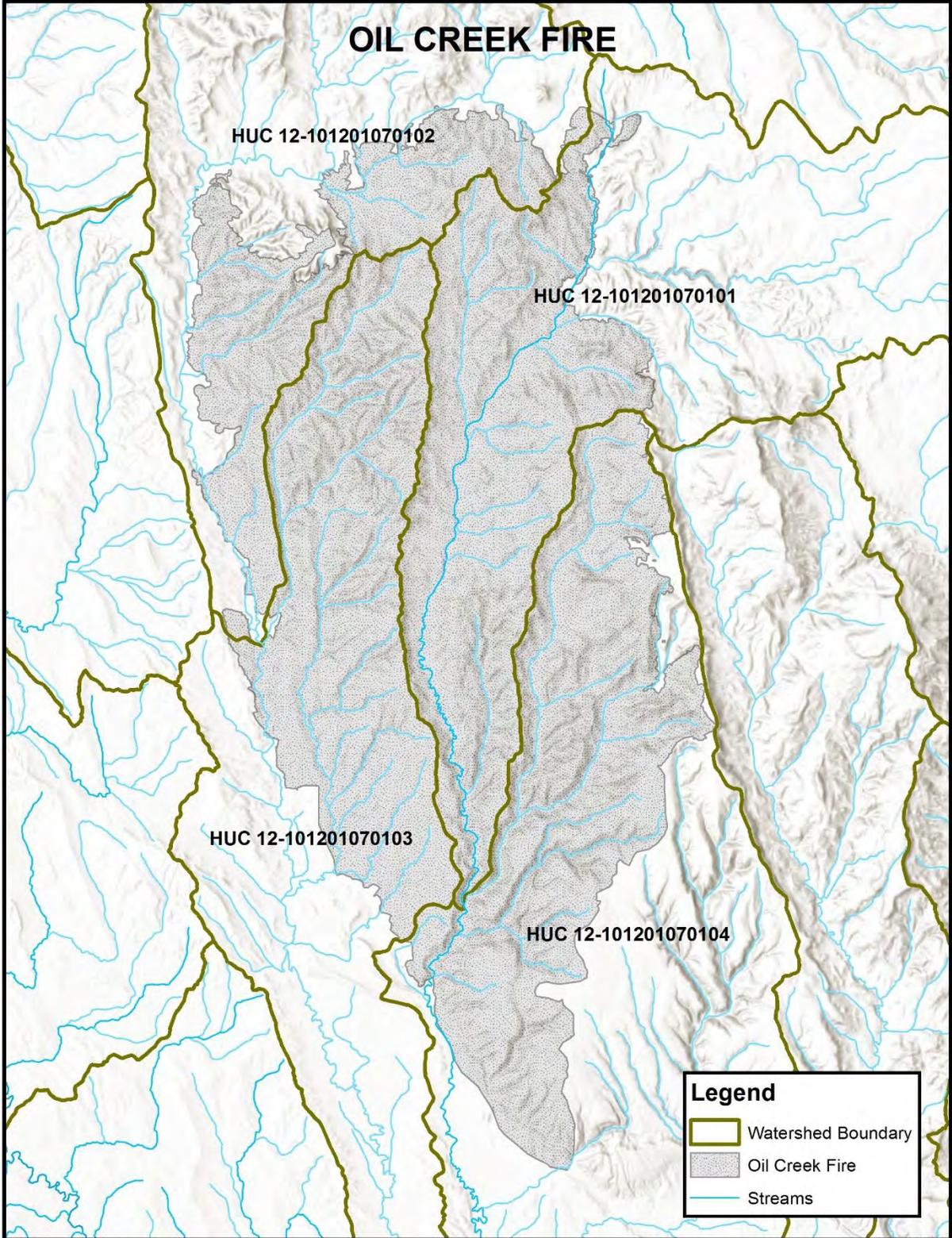
HUC 12-101201070101

HUC 12-101201070103

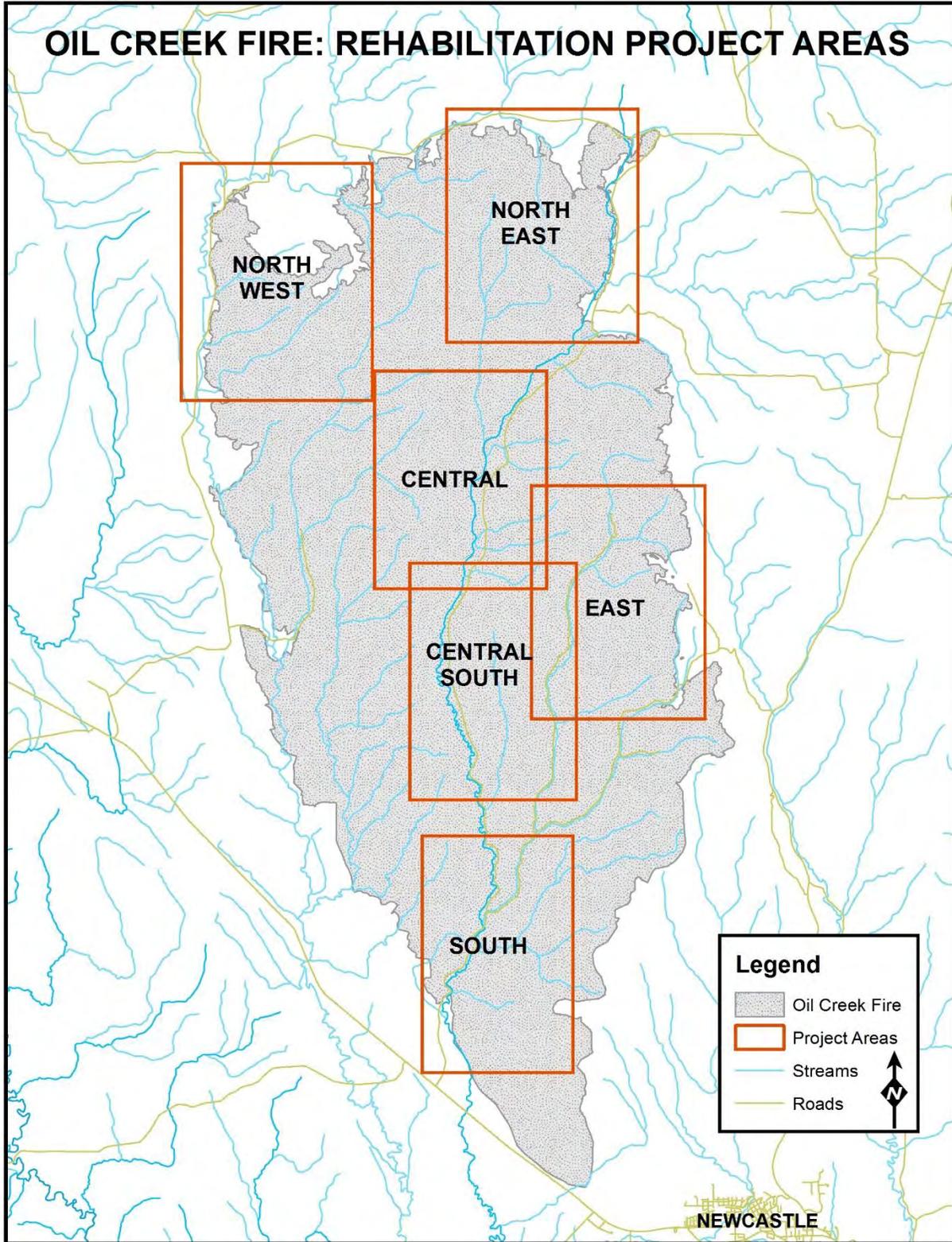
HUC 12-101201070104

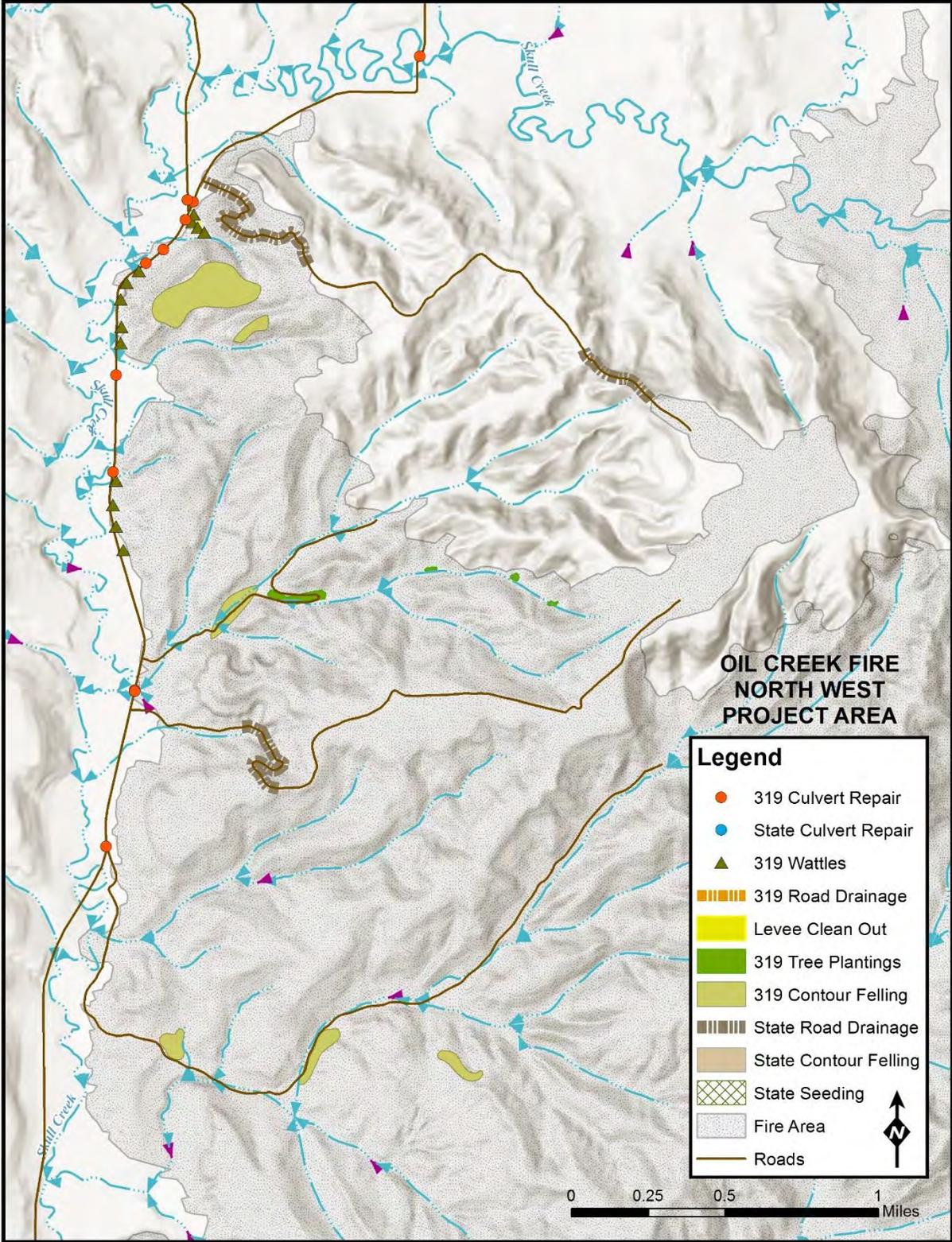
## Legend

-  Watershed Boundary
-  Oil Creek Fire
-  Streams



# OIL CREEK FIRE: REHABILITATION PROJECT AREAS



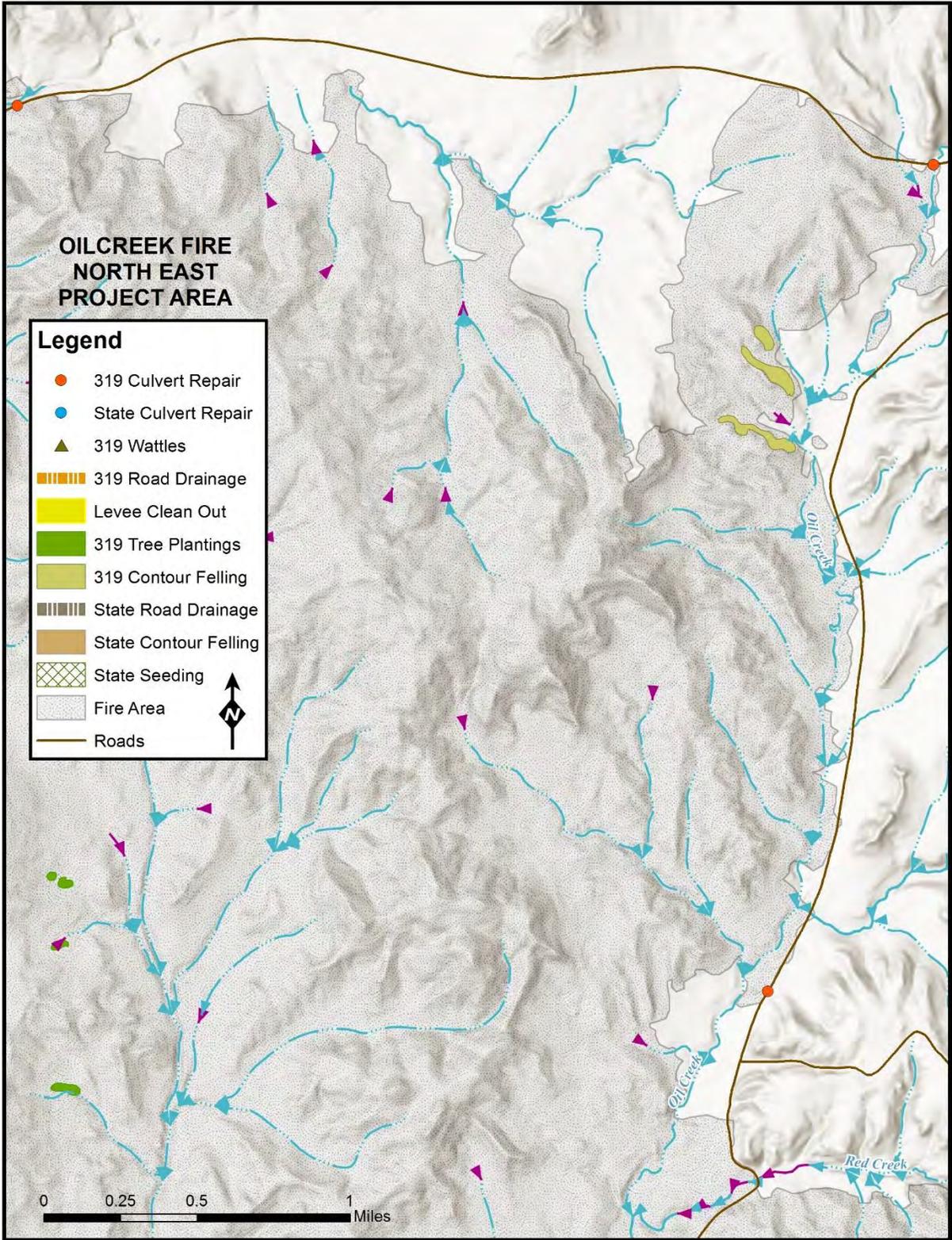


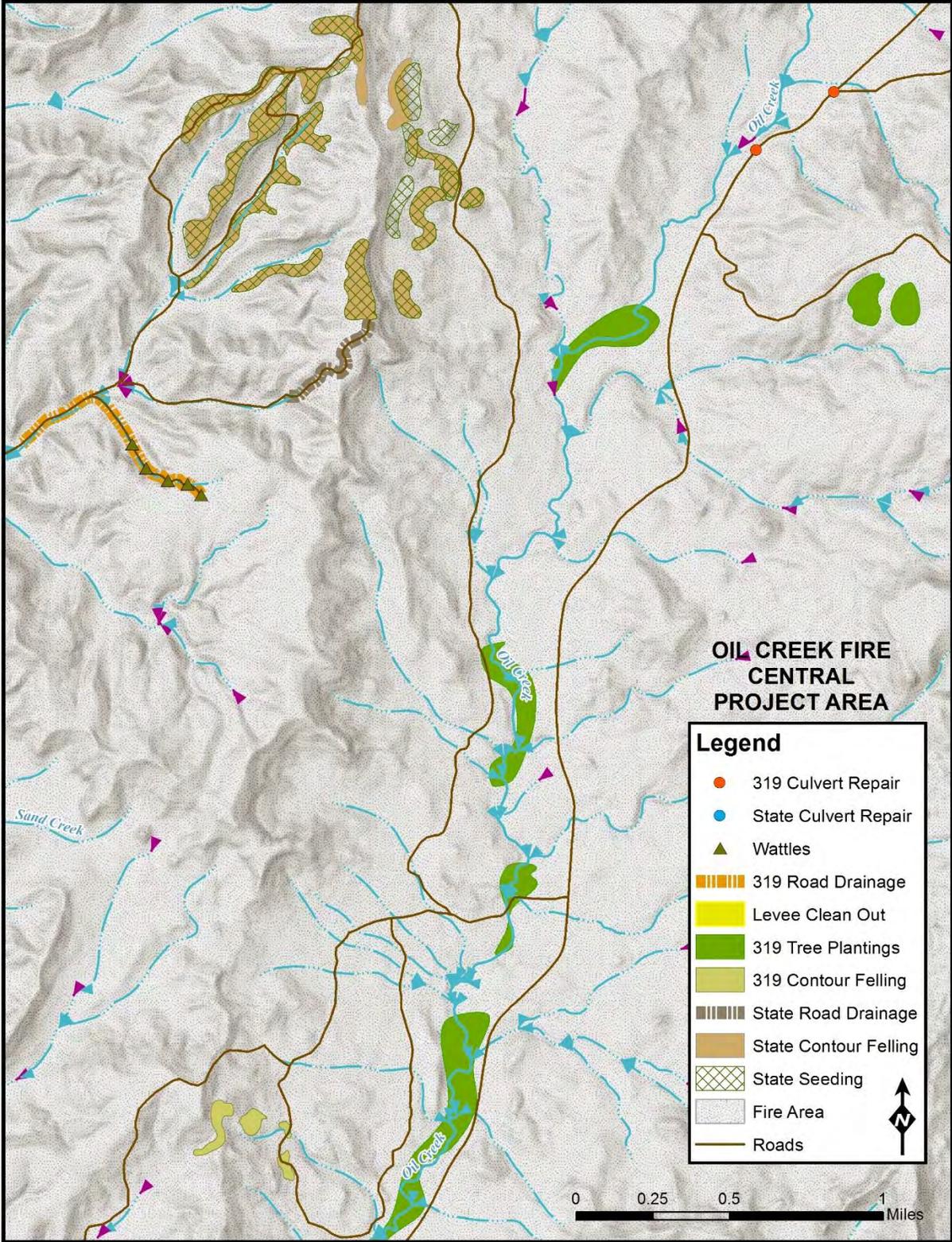
# OILCREEK FIRE NORTH EAST PROJECT AREA

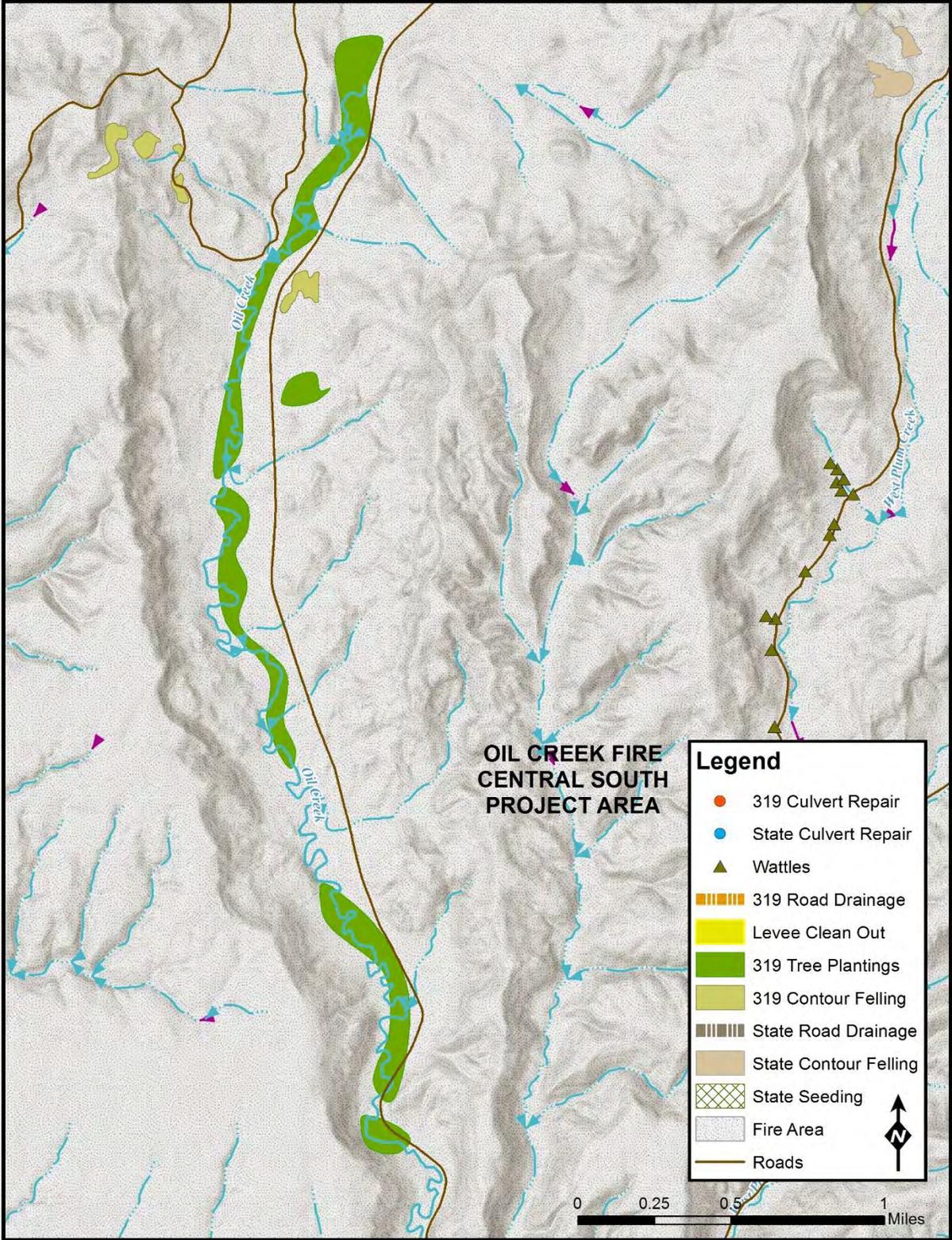
## Legend

- 319 Culvert Repair
- State Culvert Repair
- ▲ 319 Wattles
- ▨ 319 Road Drainage
- Levee Clean Out
- 319 Tree Plantings
- 319 Contour Felling
- ▨ State Road Drainage
- State Contour Felling
- ▨ State Seeding
- Fire Area
- Roads

0 0.25 0.5 1 Miles







# OIL CREEK FIRE EAST PROJECT AREA

**Legend**

- 319 Culvert Repair
- State Culvert Repair
- ▲ wattles
- ▨ 319 Road Drainage
- 319 Levee Clean Out
- 319 Tree Plantings
- 319 Contour Felling
- ▨ State Road Repair
- State Contour Felling
- ▨ State Seeding
- Fire Area
- Roads

