USDA-FOREST SERVICE

htf-range2-Interim 1-FS-2500-8 (6/06)
Date of Report: November 10, 2018

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[X] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

[ ] 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

[X] 2. Interim Report **#1**
[X] Updating the initial funding request based on more accurate site data or design analysis
[X] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

Photo 1: Lamoille Creek Canyon portion of the Range Two Fire

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Range Two

B. Fire Number: NV-ECFX-010400

C. State: Nevada

D. County: Elko

E. Region: 4

F. Forest: Humboldt-Toiyabe

G. District: Mountain City-Ruby Mtns-Jarbidge

H. Fire Incident Job Code: PNL5LA-1502

I. Date Fire Started: 9/30/2018

J. Date Fire Contained: 98% Contained 10/10/2018

K. Suppression Cost: $3,003,789.15

L. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles): 0
2. Fireline seeded (miles): 0
3. Other (identify): 3.5 miles of dozer line rehab (all on private land)

M. Watershed Number:

HUC and Percent Soil Burn Severity

HUC12	Name	Total HUC (ac)	Outside Fire Perm	Unburned	Low	Moderate	High
160401010609	Rabbit Creek	25,600	96.4%	0.1%	2.5%	1.0%	0.0%
160401010605	Spring Creek	29,854	94.7%	1.2%	2.9%	1.1%	0.0%
160401030701	Talbot Creek	17,599	97.9%	0.2%	1.8%	0.1%	0.0%
160401010607	Thomas Creek-Lamoille Creek	32,421	80.5%	2.2%	10.2%	6.8%	0.3%

N. Total Acres Burned: NFS Acres 8,581 Other Federal (NA) State (NA) Private 615

O. Vegetation Types:

Vegetation Type	Ac	%
Aspen	2,571	28%
Mountain Big Sage	2,166	24%
Curl Leaf Mountain Mahogany	1,435	16%
Rock/Barren	1,152	13%
Whitebark/Limber Pine	704	8%
Mountain Shrub	513	6%
Mountain Grassland	284	3%
Misc. Vegetation[1]	372	4%
Grand Total	9,196	

P. Dominant Soils: Rock Outcrop, Hackwood, Bullump, Cleavage, Sumine, Wrenza, Denihler

Q. Geologic Types: Metaquartzite, Marble, Granodiorite gneiss, granite, morraine deposits, colluvium and steep slope alluvium

R. Miles of Stream Channels by Order or Class:

Stream Class	Miles
Ephemeral	**15.5**
Intermittent	**0.5**
Perennial	**12.7**
Artificial Path	*0.1*
Canal/Ditch	*0.1*

S. Transportation System Trails: 8.6 miles Roads: 15.6 miles

[1] Complete list of mapped vegetation types found within the burn perimeter available in project record.

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Soil Burn Severity	Acres	%
Unburned/Very Low	1,098	12%
Low	5,159	56%
Moderate	2,832	31%
High	108	1%
Total	9,197	

B. Water-Repellent Soil (acres): 2,302

Total	2,302
Very Low/Unburned	0
Low	516
Moderate[2]	1,700
High	86

C. Soil Erosion Hazard Rating (acres):
Low: 68 Moderate: 583 High: 7,393 Rock Outcrop: 1,152

D. Erosion Potential: Lamoille canyon: 0.15 tons/ acre
Seitz canyon: 0.5 tons/ acre

E. Sediment Potential: Lamoille Canyon: 0.06 tons/ acre
Seitz Canyon: 0.55 tons/ acre

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 1-2 years grasses, 10-30 aspen, 25-50 years mountain mahogany and conifers

B. Design Chance of Success, (percent): 80

C. Equivalent Design Recurrence Interval, (years): 5

D. Design Storm Duration, (hours): 0.5

E. Design Storm Magnitude, (inches): 0.536

F. Design Flow, (cubic feet / second/ square mile): 14[3]

G. Estimated Reduction in Infiltration, (percent): 27%[4]

H. Adjusted Design Flow, (cfs per square mile): 520[5]

[2] Hydrophobicity varied by pre-burn vegetation and resulted in an estimate range from 550 to 1700 acres
[3] Pre-fire average for three modeled side canyons.
[4] Both moderate and high severity soils showed hydrophobicity and are included in this estimate.
[5] Both moderate and high severity soils showed hydrophobicity and are included in this estimate.

PART V - SUMMARY OF ANALYSIS

The Range Two Fire started on September 30, 2018. It burned approximately 9,195 acres (8579 USFS, 615 private). The fuel models were for brush (2 feet), timber (grass and understory), and short grass (1 foot). Because of the fuels and the weather conditions on the day of ignition, most of the active burn occurred in a single operational period.This quick burn consumed surface vegetation but in most places did not last long enough affect fine roots or alter soil structure. The area has steep slopes and approximately 1,150 acres of exposed rock within the burn perimeter.

The fire occurred primarily in two drainages. Lamoille Canyon is a major recreational attraction and contains a developed campground (Thomas Canyon), a day use area (Powerhouse), and a developed Lyon's Camp (Camp Lamoille). There are numerous dispersed recreation sites and developed trails. A series of recreation residence cabins are located across from the Thomas Canyon Campground. The Lamoille Canyon road is a Scenic Byway. The Seitz Canyon has one developed road that is only accessible through private land. Rabbit Creek which flows through Seitz Canyon had more riparian burn than Lamoille Creek and considerable woody debris.

A. Describe Critical Values/Resources and Threats:
Risks were assigned based on Interim Directive No. 2520-2014-1. The BAER Team tentatively identified several potential Values at Risk. The Interdisciplinary BAER Team identified the threatened values at risk to be: human health and safety (life, property), weeds/native plant community (resource), recreational facilities (life, resource, property), roads (life, resource, property), Lahontan Cutthroat Trout in Seitz Creek (resource), burned beaver dams and resulting stream clogging culverts under the road (resource and property), Ruby Dome Ranch (life, property), snow course (property),recreation residence cabins (property), Lamoille town flooding (life, property, resource), heritage resources (property, resources), and irrigation/diversion channel (property).

Weeds/Native Plant Community
Before the fire, Lamoille Canyon and Seitz Creek had only relatively low levels of invasive plants (approximately 2.3% per available FACTS data) and relatively intact native plant communities. However, it is known from other fires occurring in the vicinity that cheatgrass (*Bromus tectorum*) and other weedy species quickly dominate after the wildfires.

Recreational Facilities
One campground, one day use area, a dispersed camping area, and 6 system trails were identified as potentially affected areas within the fire perimeter. There are concerns about visitors being hurt while using the trails and the long term stability of the trail tread.

Roads
There are two main roads in the burn perimeter for a total of approximately 15.6 miles. The main road is Lamoille Canyon Road. It is an Operational Maintenance Level 5 (High Degree of User Comfort) paved road through a popular recreation area. Of major concern for this road is that the guard rail supports burned and the guard rail itself is down thereby greatly reducing the safety of the road and the recreationists that use the road. Further, the canyon is steep and much of the upslope sides have large rocks which could impact the road since no longer held in place by vegetation. There is also concern the culverts and bridges in multiple places will be able to support the increased storm flow volume and debris expected after the fire.

The Seitz Canyon Road (57339) is an Operational Maintenance Level 2 (High Clearance Vehicles). The access to this road is through private property and it is not heavily used.

Lahontan Cutthroat Trout in Seitz Creek
There is a known population of Lahontan cutthroat trout in Rabbit Creek in Seitz Canyon. This population has migrated from Seitz Lake where they were previously stocked. Per discussion with the Nevada Division of Wildlife, there is no concern about the long term viability of this species since they were stocked and not a native population.

Burned Beaver Dams
Before the Range Two Fire, there were several beaver dams, especially on Lamoille Creek. These natural dams provided natural settling basins to slow and clean water and modulate storm flows. Further, large logs and other debris would get caught on these dams thus minimizing debris flow that may clog culverts under the road. Some of these beaver dams burned and are no longer in a functioning condition and are at risk from blowing out.

Ruby Dome Ranch
There is a private ranch on the northwest side of the fire. This rancher has an allotment to graze cattle on portions of Forest Service Land and has privately managed land in both the Lamoille and Rabbit Creek drainages. In addition, the rancher lives on this land and has several hundred cows that may be at risk if flooding occurs. BAER does not support activities to protect private land and property but there is a concern about increased storm flows coming from Forest Service lands. NRCS was notified of the identified risk and asked to follow up with the ranch manager.

Snow Course and SnoTel stations
There was an initial concern about the presence of potential snow course and SnoTel monitoring locations within the burn area. Additional research into this issue found that there was a Snow Course that has been actively monitored since the 1920s. NRCS will be checking the location in the coming weeks to determine if it is still useable. The SnoTel Station, Lamoille #3, is located above the burn area and was unaffected by the fire.

Recreation Residence Cabins
There are a series of recreation residence cabins located in Lamoille Canyon, approximately across from Thomas Canyon Campground. As reported in the Range Two Fire Resource Advisor Report, one residence and two out-buildings were lost and several other buildings sustained minor damage. There is a concern that the lack of vegetation upslope could result in additional avalanche and moving rock/debris danger for these buildings. These buildings are privately owned but located on the forest under special use permit.

Lamoille Town Flooding
The town of Lamoille is approximately 2.75 miles downstream. There is a concern about the current Lamoille Creek's ability to control an increase in flow and debris that may occur as a result of the fire. There is also a Forest Service Administrative site that the creek runs behind. There is concern that high flows could overtop the banks and impact the site.

Irrigation/Diversion Channel
There are irrigation/diversion channels coming off both Rabbit Creek and Lamoille Creek. There is a concern that these may be clogged and become inoperable as a result of debris flow associated with the fire.

Heritage Resources
There are several heritage resources in Lamoille Canyon that were either damaged by the fire (Lyon's Camp Lodge) or are now subject to damage since they are now visible (Powerhouse area).

Values at Risk Summary

Value at Risk	Value Life (L), Property (P), Resource (R)	Probability Damage or Loss	Magnitude of Consequences	Risk	Discussion
Human Life and safety	L	Possible	Major	High	There is a concern about rolling rocks and lack of a guardrail along portions of the Lamoille Canyon Road. There is a concern about flooding in the stream channels and downstream. The BAER team is working with partners at the National Weather Service to install early alert weather stations. We are also planning on closing the Lamoille Canyon Road for the winter. The fire has saw modules clearing hazard trees from the road side and the felled trees are being chipped. Other health and safety concerns are being addressed in specific resource areas (roads, recreation, etc.)
Weeds/Loss of Native Plant Diversity	R	Likely	Moderate	High	Weed populations surrounding and isolated within the fire area offer seed source to expanding populations in light of the fire caused disturbance.
Recreational Facilities	L,P,R	Likely	Moderate	High	One campground, one day use area, a dispersed camping area, and 6 system trails were identified as potentially affected areas within the fire perimeter. There are concerns about indirect effects of flooding, sedimentation, and debris flow caused by increased runoff and erosion from moderate and high burn severity canyons upslope
Roads	L,P,R	Likely	Major	Very High	As discussed in the human life and safety line above, the fire burned the guardrails which are essential to keep visitors on the road. The steep slopes above the roadway have a greatly increased risk of falling and unstable rocks of larger sizes and quantities. There is also a concern that some of the culverts along the roadways are undersized for the anticipated increased storm flows.
Lahontan Cutthroat Trout	R	Possible	Minor	Low	As stated above, we coordinated with the Nevada Division of Wildlife and they were not concerned about the LCT in Rabbit Creek.
Burned Beaver Dams	P,R	Possible	Minor	Low	Several beaver dams were partially or fully destroyed by the fire. Since these currently serve for natural storm attenuation, there was initially a concern about the increased storm flows.

Snow Course and SnoTel Station	P	Unlikely	Minor	Very Low	There is one active snow course. NRCS will be checking the site in the next few weeks to determine if it is still useable. The SnoTel station is located up the canyon and was not impacted by the fire.
Recreation Residence Cabins	P	Possible	Moderate	Intermediate	The recreational cabins opposite Thomas Canyon are recreation residence cabins on special use permits. There is increased risk of erosion, road washout, and sediment delivery at these sites, and cabin owners are therefore encouraged to work with the Elko district office to gain access to their cabins and conduct appropriate winterization work in light of post-fire conditions and closures.
Lamoille Town Flooding and FS Admin Site	L,P	Possible	Major	High	We are anticipating increased storm flows in both Lamoille and Rabbit Creeks. There is a possibility that this may affect the town of Lamoille and the Forest Service Administrative site immediately downstream. We are proposing in coordination with the weather service to install additional radio activated weather stations to provide additional warning to the town. There is a USGS stream gauge near the mouth of Lamoille Canyon that the Weather Service and emergency response officials will also continue to monitor. Any evaluation of risk to the Forest Service Administrative site will occur at a later time.
Irrigation/Diversion Channels	P	Possible	Moderate	Intermediate	These ditches are off Forest Service land. We will be providing additional information to NRCS and are already in the process of providing information and coordinating with the adjacent landowners.

Powerhouse Heritage Resources	P,R	Possible	Major	High	A series of foundations for the original powerhouse site are now visible. This site is eligible for listing on the National Register of Historic Places. These locations have been camouflaged for many years because of the extensive vegetation around them. Although no immediate stabilization is planned, we would like to request one day a month of site monitoring by a qualified archaeologist from March until August of 2019 and signage to be placed at various locations within Lamoille Canyon. The lodge at the Lyon's Camp burned. This is also a historic site. For protection of the site and for public safety it is proposed to fence around it to keep individuals from falling into the open cellar.

Risk Level Color Scheme Legend	
	Very High
	High
	Intermediate (Where Treatments Are Recommended)
	Low

B. Emergency Treatment Objectives:

- Provide for public and employee safety.
- Protect native plant community; monitor and rapidly treat new and expanding infestations. Preventatively seed areas where there is an unacceptable risk of undesired species seed spread and plant establishment due to adjacent populations.
- Protect or minimize damage to Forest roads and recreational facilities.
- Heritage: monitor known heritage sites, install infromational signs to increase awareness about not disturbing sites, provide fencing around burned lodge at the Lyon's Camp to protect the site until additional surveys can be completed and improve public safety around the open cellar.

Guardrail needing replacement for human safety.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land **90** % Channel **NA** % Roads/Trails **90** % Protection/Safety **90** %

Justification of Probability Assessment
Land – a large part of the land treatments will be the proposed seeding. This is being planned to occur over snow during the winter before the spring thaw. The Forest has experience with this type of project and a record of success.

Roads/Trails – The roads and trails will be initially closed during the winter months. Other actions such as installing trash racks over culverts are planned to be accomplished.

Protection/Safety – The primary item for protection/safety will be the closure of Lamoille Canyon to public access during the winter. We have already discussed this issue with the District Ranger and the process of getting the appropriate closure order together is in process.

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	90	85	85
Channel	NA	NA	NA
Roads/Trails	90	90	90
Protection/Safety	75	90	90

E. Cost of No-Action (Including Loss):
Native Plant Community and Range
It is difficult to place monetary value on the loss of 9,197 acres of high value bighorn sheep, mule deer, elk, northern goshawk, and flammulated owl habitat, in addition to valuable rangelands. If the proposed BAER treatment is not funded, it is expected that non-native invasive annual grasses and noxious weeds will spread through the burned area. The expected consequences include: loss of native plant communities, consequently diminishing the quality of wildlife habitat and decreasing the value of forage production.

In order to estimate costs to treat infested NF lands affected by the Range Two Fire with pre-emergent and post-emergent herbicide applications, without BAER funds, a series of calculations were performed. These calculations were based off of the conservative prediction that one third of the areas highlighted in risk area recommended for seeding would become infested if left to recover completely naturally; approximately 2,850 acres. In order to treat this size of an infestation, it was determined that the area would require one weed crew, of two members, to be assigned uniquely to this infestation. Each day worked would represent one trip to the field, totaling 70 miles. The two herbicides chosen in this estimate were Glyphosate—documented as efficient in eliminating annual grasses—and Tordon—documented as efficient in eliminating perennial forbs with rhizomatous or tap root systems. The rates of application shown in the table and the documentation leading to the selection of these two herbicides is found on Table 5 of the "Gallatin National Forest Noxious and Invasive Weed Control EIS." The determination to repeat herbicide treatments for ten years was influenced by a Project Report written by the USDA. It explains that not every infestation will be reached each year, and so seed production of invasive species, although it will decrease from year to year, will persist. It states "Repeated treatments over the course of many years are required to eradicate weed populations," ("Noxious Weed Treatment Project" USDA). A document published by the Oregon Department of Agriculture supports this determination and even states that some weed treatments take up to 20 years to be effective and successful ("Economic Impact From Selected Noxious Weeds in Oregon"). Ten years was determined to be conservative in the years it would take to reduce the invasive species populations in this large of an area back to pre-fire levels of 2.26 percent. Prices for the two herbicides were taken from *Agri Supply*'s online website.

Re-seeding the treated area, to bolster the herbicide efforts, would be implemented in years 2, 5, and 8 after initial herbicide treatment had begun. The cost for the treatment was determined using the Seed Mix proposed below. Each re-seeding event goes down in acreage by two thirds to reflect a success rate of 66 percent in the seeding each time.

Line Item	**Unit Cost**	**Total**
Salaries four GS 4	$135/ day x 2 x 132 days	$35,640
District plant specialist	$364.32/ day x 10 days	$3,643
Salary two GS 9	$241.85/ day x 2 x 20 days	$9,674
GIS/FACTS specialist	$442.63/ day x 10 days	$4,426
Vehicle mileage	$0.60/ mile x 9,240 miles	$5,544
Implementation team leader	$410/ day x 1 day	$410
Supplies	$2,500 for supplies (such as utvs or vehicles needed to support 1 crew over the years, trainings, etc.) $4.63/ acre for Tordon x 2,850 acres $0.62/ acre for Glyphosate x 2,850 acres	$1,000 $13,196 $1,767
	Total Cost	$75,300
	Total Cost x 10 years	$753,000
Aerial seeding contract	$40-67/ acre for 2,850 acres year 2, for 969 acres year 5, and 320 acres year 8	$277,313
Seed mix is $90.30/ acre	For 2,850 acres year 2, 969 acres year 5, and 320 acres year 8	$373,752
COTR	$410 per day x 5 days x 3 (for 3 years implemented)	$6,150
Inspectors	(2) $241.85 & (1) $364.32 x 2 days x3	$5,088
Vehicle mileage	$0.60/ mile x 420 miles x 3	$756
Implementation team leader	$410/ day x 1 day x 3	$1,230
	Total Cost	**$1,417,289**

Unmeasurable items: soil productivity, forage production due to lost soil productivity for wildlife and livestock.

Recreational Facilities

The Lamoille Canyon is the most popular recreation area on the district and is visited by conservatively 60,000 people a year. If some of these recreational users are hurt or injured because of the unstable slopes collapsing on dispersed camping areas the cost is incalculable. If the trails are not appropriately marked and members of the public get lost or injured, it may be necessary to call out search and rescue team. These teams, especially if air support is needed, typically cost hundreds of thousands of dollars.

Roads

The cost of performing no action on the Lamoille Canyon Road has monetary as well as public impacts. If the roadway was opened without any of the safety (signage, rock fall mitigation, guardrail, etc.) actions occurring, there would be a high risk to life and safety that could result in severe injuries or the loss of life. This is a highly visited and recreated area with invaluable physical characteristics to the local community, visiting public and therefore an asset to the Forest. If the roadway and canyon was closed to the public, there is a high probability that the canyon would still be visited with the same associated risks.

Monetarily, the cost of not doing the repairs for resource concerns could be catastrophic. This level of high standard roadway can be estimated to cost at least $2 million dollars a mile to repair. If the entire roadway were lost due to post fire damage, this would be in excess of $21 million to replace. In addition, the majority of the damaged roadway would directly impact Lamoille Creek causing debris flows, damage and/or loss of bridge structures at Thomas CG, Powerhouse Picnic area, and under the Lamoille Canyon road. If the flows were to continue, the impact would continue into the community of Lamoille immediately downstream of the canyon.

Heritage
The loss of heritage resources is difficult to quantify since once the resources are lost they are lost forever. The Powerhouse site is not listed on the National Register of Historic Places but has been determined as potentially eligible. Minimal efforts are being proposed to protect the sites from looting and monitoring to determine if additional actions are needed.

F. Cost of Selected Alternative (Including Loss):

Range Two BAER Costs Summary

Initial Request	**$442,819**
Road	$313,583
Recreation	$17,169
Weeds/Range	$107,267
BAER Implementation Team Leader	$2,500
Heritage	$2,300

G. Skills Represented on Burned-Area Survey Team:

[X] Hydrology	[X] Soils	[ ] Geology	[X] Range
[ ] Forestry	[ ] Wildlife	[ ] Fire Mgmt	[X] Engineering
[ ] Contracting	[ ] Ecology	[ ] Botany	[X] Archaeology
[ ] Fisheries	[ ] Research	[ ] Landscape Arch	[X] GIS

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Recreation – Jeremy Evans
Heritage – Chimalis Kuehn

H. **Treatment Narrative:**

Weeds/Loss of Native Plant Diversity

Noxious Weed Early Detection Rapid Response (EDRR)
Noxious weed and invasive annual grass species early detection surveys and monitoring, with the potential for rapid response herbicidal treatments, are necessary in post-fire year one. Treatment objectives are to reduce and manage unacceptable risk of aggressive weed invasion and establishment with early detection and rapid response surveys and monitoring methods to avoid or minimize threats to the re-establishment of the native plant community.

EDRR will concentrate on determining if weed sites are expanding and determine if extra treatments, such as ground-based herbicidal application, are necessary. No effort will be made through EDRR to eradicate existing weed infestation areas, rather surveys will be conducted to determine if these sites are expanding before addressing the areas of expansion. The data gathered from EDRR will be used to determine if and what treatment will be needed.

Post-burn weed treatment plan year 1: Fund a two person weed crew to survey and monitor the burn area for the presence of invasive weeds along roads, trails, riparian and rangeland areas; rapid response treatment with herbicide may be warranted. Multiple trips to the field will be required totaling 20 days, with one trip per day. In the past, it took weed crews approximately five days to spray leafy spurge in Lamoille Canyon CU and five days to detect and spray leafy spurge in Seitz Canyon C&H due to the steep terrain and the numerous populations of the weeds spread throughout the area. Consequently, the majority the detection surveys and potential spraying will be conducted on foot. Mileage includes a UTV and a vehicle to travel to and from treatment areas: round trip travel from the District office in Elko to the treatment area is 40 miles with an additional 20 miles of off road travel per day and 10 miles to retrieve equipment at the District's off site warehouse, totaling 70 miles per trip.

Line Item	Unit Cost	Total
Salaries two GS 4	$135 per day x 2 x 20 days	$5,400
District plant specialist	$364 per day x 5 days	$1,820
Salary one GS 9	$242 per day x 5 days	$1,210
GIS/FACTS specialist	$443 per day x 5 days	$2,215
Vehicle mileage	$0.60 per mile x 1400 miles	$840
Implementation team leader	$410 per day x 1 day	$410
Supplies	$1,000	$1,000
	Total Cost	**$12,895**

Reseeding of the Native Plant Community

The objective of the proposed reseeding treatment is to provide erosion control on slopes and riparian areas within the burn and to encourage native plant community re-establishment against the potential invasion of annual grasses and noxious weed species. The local native plant communities provide necessary habitat for important native wildlife species such as bighorn sheep, mule deer, elk, the northern goshawk, and flammulated owls. The Humboldt Forest Land and Resource Management Plan (IV-47), Fire Rehabilitation-Standards and Guidelines states:

> *"Site-Specific resource objectives will be identified as part of the analysis and rehabilitation plan. Every effort should be made to reseed areas which are prone to cheatgrass invasion as soon as possible after fire burn".*

There are known populations of cheatgrass adjacent to the fire perimeter that will be very likely to spread into the now denuded areas. Two past fires in close proximity to the Range Two Fire, the Pleasant Valley Fire in 2007 and the Smith Ranch Fire in 2012, both came back as predominately cheatgrass. This gives reason to believe that lower elevation slopes within the Range Two Fire perimeter and even higher elevation rocky areas are likely to re-establish predominately as cheatgrass. Furthermore, there is a 150 acre infestation of medusahead (*Taeniatherum caput-medusae)* on the west side of the Lamoille Canyon Road on private land just below the Ruby Dome Ranch in close proximity to the fire area (BLM Weed Specialist). This invasive annual grass is highly opportunistic and will be likely to spread onto areas with exposed soil within the fire area; once this species has established it is very difficult to eradicate due to the thick thatch layer that it creates each year. Reseeding with competitive, native vegetation will give the native plant community the opportunity to re-establish and reduces the risk of invasive annual grass expansion onto FS land.

Under program funding, fence replacement and repair will be necessary to exclude livestock from affected areas. As identified in the Forest Plan, a minimum two growing season rest or recovery period will be enacted in order to allow native plant communities, including the seeding units, the opportunity to re-establish.

If the NDOW agreement falls through then the fall back proposal is that 574 acres be reseeded with the Seed Mix shown in Appendix A. Treating 574 acres amounts to treating only 6.4 percent of the total acres that burned on FS land within the fire perimeter, and only 6.2 percent of the total acres within the fire perimeter.

Due to the extent of the seeding area, multiple trips to the field will be required to inspect the seeding treatments. Mileage includes two UTVs and up to four vehicles to travel to and from treatment areas.

Line Item	Unit Cost	Total ($)
Aerial Seeding Contract	40-67$/acre for 574 acres	NDOW match
Seed Mix	$51,832	NDOW match
COTR	$410 per day X 4 days	$1,640
Inspectors	(2) $242 & (1) $365 X 2 Days	$1,698
Vehicle Mileage	$0.60 per mile x 560 miles	$336
Implementation Team Leader	$410 per day X 1 day	$410
	Total Cost	**$4,084**

The sites for the recommended seeding units (Appendix A) were determined through a suite of factors: bordering the Lamoille Canyon CU and the Seitz Canyon C&H to the north there is high annual grass cover documented in the adjacent private lands, while the interior of the allotments show low to zero percent cover of annual grasses. Cheatgrass and Medusahead—both documented in the area—are both opportunistic and are very likely to spread from the adjacent private land into the burned area early in the spring before the native plants have the opportunity to regenerate. Containing the current population of annual grasses is more cost effective than reclaiming newly infested acres. The proposed Seed Mix was consciously developed to address the concern of the spread of invasive plants; each species is native to the area and exhibits competitive characteristics to combat the aggressive establishment of invasive annuals.

Average precipitation levels in these allotments range from 12-40 inches, therefore the reseeding treatments will have sufficient moisture in an average year to provide for successful germination rates. The seeding units include valley bottoms and the slopes that are under 45 percent, and documentation shows that slopes below 60 percent are good candidates for high germination success. While the soil burn severities in the proposed seeding units show a mix of low and moderate, the vegetative burn severities within the seeding units range from moderate-low to high. How this translates into the landscape is that a large portion of the soil within these areas is now exposed and susceptible to the spread of invasive plant species. Exposed soils can also lead to an increase in erosion; the plant species in the proposed seed mix act as stabilizers and will also help to decrease the chances of high erosion events in which valuable top soil is lost and increased sedimentation in the creeks can occur. When native plant communities experience moderate to high burn severities, not only are they more susceptible to invasive species infestation, but they also potentially have lost the seed source within the burned area to re-establish naturally.

The assessment team considered several alternatives to the proposed action including:

- Reseeding Proposed Action: Nevada Department of Wildlife (NDOW) propsed several seeding units, totalling approximately 800 acres. The BAER team counter offered with different units and the seed mix contained below. NDOW has committed to seeding both their proposed units and the BAER team proposed units (574acres) for a total seeding of 1374 acres on the forest service portion of the fire.

- Seeding of the dozer line was considered, however there was only 0.9 miles of Dozer Line constructed on FS land. It was decided to address this through another avenue, either through working with the Nevada Department of Forestry (NDF) or through the Range Two Fire's P-code.

- A riparian seed mix was considered, but eliminated due to field assessments leading to the conclusion that affected riparian areas in Lamoille Canyon CU have the potential to re-establish naturally. The majority of the burned riparian areas exhibited mosaic burn patterns, and consequently should have unaffected seed-sources to re-establish. For Rabbit Creek, in the Seitz Canyon C&H, the lower portion of the creek totaling approximately one mile has lost the majority of its vegetation. However, the upstream portion of the creek still has intact stands of vegetation, providing a seed source that will flow downstream and help to re-establish native vegetation on the portions that burned more severely.

Furthermore, a seeding unit has been proposed that includes this portion of the creek, which will help to re-establish vegetation along the creek.

- Mulch was considered as a possibility to couple with re-seeding efforts. However, it was not pursued due to a large increase in cost and an uncertain potential increase in effectiveness. The majority of the areas in the seeding proposal units exhibit slopes of less than 45 percent, and there is only a small portion of one seeding unit that has a 60 percent slope.

- Seeding with ground based equipment was determined likely to be ineffective due to the steep, rocky terrain. Furthermore, ground based equipment that disturb soil surfaces require archeological surveys, which would increase the time taken to apply the treatment.

- A sterile cereal grain seeding was considered, however, the district has had limited experience with seeding these species and thus has no grounds to prove effectiveness. The neighboring District, Santa Rosa, has had low success with sterile cereal grain seed germination. Due to the uncertain success of sterile cereal grain seeding, and the potential economic loss with an ineffective reseeding, this alternative was not carried forward.

- A No Action alternative was considered for all of the allotments affected by the fire. It was determined that some allotments have the potential to re-establish naturally. However, some areas, analysis for risks “A” and “C” (see Range Specialist Report) it was determined that post-fire treatment is warranted due to burn severity and the threat of noxious weed and invasive annual grass invasion.

- Aerial herbicide applications were considered as a component of the EDRR proposal, however there is not currently an EIS for this treatment on the Forest and consequently this alternative is not currently an option. An aerial herbicide application EIS would cost approximately $500,000 to prepare, and would take a minimum of six months.

- Reseeding Fall Back Proposed Action Aerial seeding utilizing the regional IDIQ contract is the fallback alternative for the proposed allotments for the following reasons: it is more expeditious and more effective at covering large amounts of acres. In addition, noxious weed and invasive annual grass species early detection, surveys, monitoring and potential rapid response ground based herbicidal treatment are the preferred alternatives to address weed invasion on allotments in some risk categories because early treatment of smaller acreages proves to be more economically efficient.

Recreation

Developed and Dispersed Recreation

USFS Campgrounds and picnic area

Treatments to reduce unacceptable risk to human life and safety: Signs should be posted to educate visitors of the hazards.

Right Fork Trailhead Parking

Signs should be posted to educate visitors of the hazards and explain the closure.

Right Fork Dispersed Area

Treatments to reduce unacceptable risk to human life and safety: Temporary closure of dispersed recreation. Signs should be posted to educate visitors of the hazards and explain the closure. This closure will be reevaluated in the spring once regrowth has begun.

NFS Trails

Treatments to reduce unacceptable risk to human life and safety: Temporary closure of Lamoille-Talbot until the mountain slopes stabilize. Closures should be implemented with a signed Forest Order and enforced through patrols by Law Enforcement Officers or Forest Protection Officers. Signs should be posted to educate

visitors of the hazards and explain the closure. This closure will be lifted once it is determined that the trail is safe for use.

Item	Materials	Labor	QTY	UOM	Total
Burned Area Hazard Signage	$130		8.0	each	$1,040
Installation of Burned Area Haz. Signage		$130	2	days	$260
Forest Order Preparation (GS-11 Rec)		$365	1.0	days	$365
Forest Order Signage	$20		8.0	each	$160
Implementation Monitoring (GS-11 Rec)		$365	5.0	days	$1,825
Safety Monitoring/FPO Patrol (GS-6 Rec Tech)		$201	10.0	days	$2,010
LE Patrol (GL-9, 10hr day)		$310	5.0	days	$1,550
Vehicle-GS-11 Rec Officer	0.60		375.0	miles	$225
Vehicle-GS-6 Rec Tech	0.60		400.0	miles	$240
Vehicle-LEO	0.60		1890.0	miles	$1,134
Total					**$ 8,809**

Roads

Emergency stabilization treatments should be implemented as quickly as possible to protect human life and safety and minimize the negative impacts of other critical values.

Reconstruct Road Drainage to Accommodate Expected Runoff Flows

Situation: The roads within the burned area were found to have issues with their drainage system and are now at risk for flash flooding, mud/debris flows and rolling / falling rock.

The majority of roads within the fire area are expected to see an increase in flows over the next couple of years. Some existing culverts and drainage structures on these roads are undersized and/or are not designed for the expected increase in flows. It is nearly certain that damage will occur if measures aren't taken to stabilize the roads and drainage structures.

Recommendation: Clean culverts, ditches, and catchment basins of sediment and debris. Replace damaged culverts and install new culverts in locations determined by the Engineer that will provide relief to existing culverts. Undersize culverts should be upsized, where feasible, appropriate, and cost effective. Large culverts with high fills under major arterial roads (Level 3-5 Roads) will be very expensive to install and should therefore be regularly maintained after each storm event.

> See *Burned Area Emergency Response Treatments Catalog Chapter 4, Riser Pipes pages 139-144 and Catchment-Basin Cleanout pages 145-147* and *BAER Specification Road Drainage Reconstruction* for more information.

Culvert Replacements/ Modifications

Situation: Numerous existing roadway culverts on Lamoille Canyon road at ephemeral and intermittent crossings have been identified as being undersized for the post-fire flows and at risk of being overtopped. Eight culverts under the Lamoille Canyon road were identified as being undersized or at high risk of being overtopped due to the expected increase in runoff from their particular watershed.

Recommendation: Remove three culverts identified as being undersized and at risk of overtopping and replace those culverts as necessary to keep the road system open. On the other five identified culverts not recommended for replacement, install debris racks to minimize the risk to property and the impacts to water quality. Map of locations in Appendix C. Maintain during storm patrols.

See *Burned Area Emergency Response Treatments Catalog Chapter 4, Culvert Modifications pages 127-129* and BAER Specifications for Road Drainage Reconstruction, Culvert Replacements, and Culvert Removals and *Chapter 4, Debris Rack and Deflectors pages 131-137* and BAER Specifications for Debris Rack and Deflectors for more information.

Facility Safety Work

Situation: Due to the severity of the burn, portions of the guardrail were destroyed by the fire. These guardrails are required per Federal Highway Standards and are also necessary to provide a safe passage to motorists traveling on this roadway.

Recommendation: Concrete barriers were considered as a temporary option for roadside protection but rates are expected to be similar or more expensive than permanent guardrail replacement. Recommend replacing the damaged guardrail, posts and terminal sections along the roadway. Until guardrail is replaced, restrict public and administrative access to the area by installing a gate, temporary barriers and increasing enforcement in the area. Reusing the existing guardrail is not recommended since the heat from the fire reduces the strength of the steel and potentially reduces the safety of the guard rail.

See *Burned Area Emergency Response Treatments Catalog Chapter 5, Facility – Safety Work pages 161-162, Protection Enforcement pages 169-171, and Protective fences and Barriers pages 173-178* for more information.

Remove Unstable Rocks

Situation: There is an immediate and future threat to travelers along the roads within the burned area due to the increased likelihood for rolling and falling rock of increased size and quantity from burned slopes. This threat is elevated along the Lamoille Canyon road where rock fall potential is highest.

Recommendation: Remove unstable rocks by rock scaling or other appropriate methods in areas where it is feasible and in areas it is not feasible, provide rock barriers to contain rock fall from the roadway. Until rock fall can be mitigated restrict public and administrative access to the area by installing a gate, temporary barriers and increasing enforcement in the area.

See *Burned Area Emergency Response Treatments Catalog Chapter 5, Hazard Trees and Unstable Rocks pages 165-167, Protection Enforcement pages 169-171, and Protective fences and Barriers pages 173-178* for more information.

Patrol Burned Area During Significant Storm Events & Spring Runoff
Situation: There is an immediate and future threat to travelers along the roads within the burned area due to the increased potential for rolling and falling rock from burned slopes above the roadway and increased potential for flash floods and mudflows. This threat is elevated along the Lamoille Canyon road where rock fall potential is high.

With the loss of vegetation normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts at drainage facilities (culverts) or stream crossings. These events make for hazardous access along steep slopes and put the safety of users at risk and also pose threats of large sediment deliveries to the streams below.

In addition**,** with the presence of several bridges in the Lamoille Creek drainage, there is potential for floating debris to cause damage to these expensive structures.

Recommendation: Monitor road drainage structures and debris flow treatment structures after significant storm events to ensure the maximum drainage capacity is maintained until the natural re-vegetation of the burned area has occurred. Maintain and/or repair any damage to road surfaces. Remove sediment and debris from drainage and treatment structures and repair headcutting in streams and drainages to prevent further degradation of channels. Monitor the movement of large woody debris and make a determination of whether or not the material should be removed before it contacts bridge piers or abutments.

> See *Burned Area Emergency Response Treatments Catalog Chapter 4, Storm Inspection and Response* pages 149 -152 and *BAER Specification for Storm Patrols* for more information.

Install Warning Signs Along Roads

Situation: Due to the severity of burn in some watersheds, combined with road location, trailhead, and/or developed recreation sites, the threat of rolling rocks and flash floods has increased significantly to critical values such as Human Life and Safety.

In addition, the fire burned several traffic warning signs. The traffic warning signs were located along the Lamoille Canyon road which informed the motorist of curves ahead and advised speed for the particular curve.

Recommendation: Replace the warning and directional signs damaged by the fire. Install warning signs for flash flooding and potential debris flows. Install “Burn Area Warning” signs at primary road entry points to alert the travelers of the dangers ahead and at developed recreation sites and trails intersecting the fire perimeter.

See *Burned Area Emergency Response Treatments Catalog Chapter 5, Warning Signs pages 179-182* for more information *and BAER Specification Warning Signs.*

Engineering Treatments (specification related)

Engineering Specification	**Treatments**	**Cost**
Road Drainage Reconstruction	Ditch cleaning, cleaning of culverts and catch basins, and debris racks.	$23,975
Temporary Road Closure	Gates, barriers, signs, hardware, LEO	$60,000

Storm Patrols	Storm patrols will be used to identify problem areas such as clogged culverts, washed out roads and damaged drainage and treatment structures. Storm patrols will perform maintenance on damaged structures and roads, removing debris from treatment structures to ensure they continue to function during future flood events.	$28,444
Warning Signs	Install highway warning signs, directional signs, burned area warning signs, and road closure signs at roads that enter or are within the burned area to warn of increased hazards from falling debris, flash floods, falling rock, and burned trees.	$2,651
Culvert Replacements/ Modifications	Remove and replace, where feasible, the culverts identified as being undersized or damaged and add debris racks where critical values are at risk and where vehicle access is needed. Replace culverts with structures that meet the anticipated post-fire flows. Structures shall comply with Forest Plan standards.	$70,900
Contract Design and Oversight	Local engineer and vehicle to help prepare culvert rock stabilization contracts	$8,550
Life Safety Health of Public – Geotechnical Inspection	Evaluate the rock stability and barricade areas of unstable rock.	$50,000
Life Safety Health of Public	Replace the destroyed and damaged guardrail along the Lamoille Canyon road. Restrict public access until the repairs can be completed.	Undetermined at this time
Mobilization	Costs associated with Contracting work including transporting equipment to and from the site and miscellaneous overhead costs (i.e. weed free Cleaning) and Contract oversight	$69,063
Total Cost of Treatments		**$313,583**

While planning implementation of the approved engineering treatments, the following additional costs were determined to need funding:

- The original BAER cost estimate to install the 60" culverts did not take into account that the existing road base is bedrock or full of large boulders. This will require a wider excavation than the 30' wide that is calculated in the original estimate and, therefore, more backfill, wider asphalt patching, and two excavators.The additional cost to do this work will be $145,350.
    - The initial cost estimate did not include delivery of the asphalt at $117/ ton for 300 tons, totalling $35,100.
    - The increased patching needs will require an additional 240 tons of asphalt at $100/ ton, totalling $24,000.
    - The increased aggregate needs will require an additional 812 CY at $60/ CY, totalling $48,750.
    - The extra equipment and labor will be $37,500.
- Temporary K-rail diversion structures will be placed on the road over the 3 undersized culverts to direct overflow to the other side of the road at a toal cost of $15,000. These K-rail sections will be placed to allow traffic to pass through in an s-shaped traffic pattern to maintain emergency access. This cost includes a barrier lift ($4,000) to facilitate safe and timely placement and repalcement of the barriers that is not possible with a rented lift.
    - Heavy equipment rental companies have store fronts in Elko but the equipment is generally coming in from Reno or Salt lake every time the forest rents it which leads to additional costs in transportation and delays.
- Carsonite Culvert object markers $300
    - These minor safety signs mark the end of the culverts where the shoulder is narrowed to provide for a safe working environment for employess. They also aid in finding the culvert ends during storm patrol when the inlets clog thereby reducing the costs by limiting the unnessecary escavation looking for inlets.

Heritage Resouces

Professional archaeologist visit the site one time per month from March (snow out) to August. Also purchase several signs regarding protection of heritage resources.

Line Item	Unit Cost	Number	Total
Site visit monthly from March to April	$330 per visit	6	$1,980
Heritage Resource signs	$20 per sign	5	$100
Fencing for around Lyon's Camp Lodge	$20/50 foot roll $5/fence post $20 Wire	5 20 1	$100 $100 $20
			$2,300

The fencing around the lodge, well/ grease trap, and fire damaged storage units has been installed as of 11/10/2018 when the last section was completed. Keep out/ restricted access signs were installed at the same time. Volunteers were used for all labor equaling 22hrs.

I. **Monitoring Narrative:**

Part VI – Emergency Stabilization Treatments and Source of Funds Interim #1

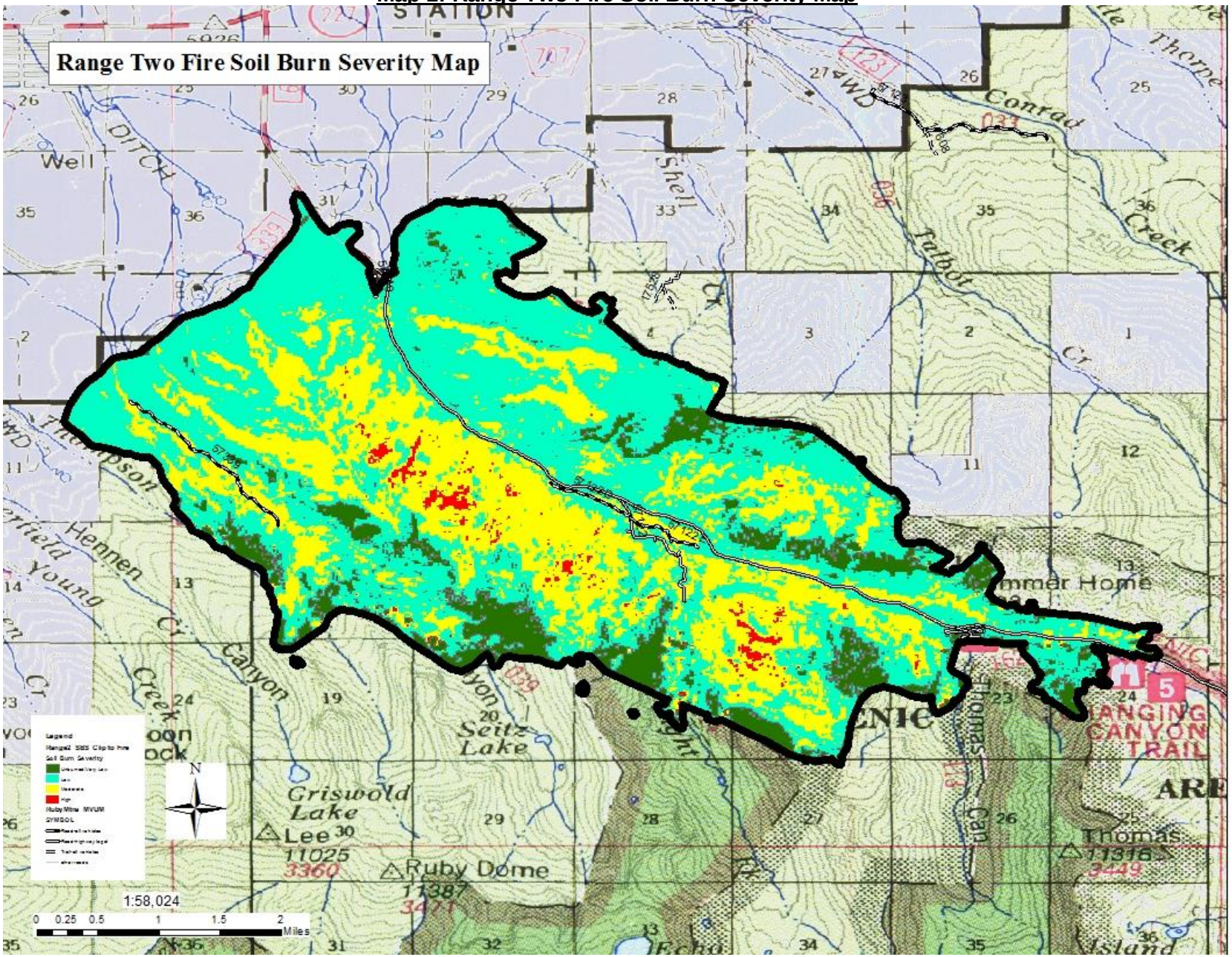
A. Land Treatments										
Nox Weed Early Detecti	1	12895	1	$12,895	$0		$0		$0	$12,895
Seeding	1	4084	1	$4,084	$0		$0		$0	$4,084
Subtotal Land Treatments				$16,979	$0		$0		$0	$16,979
B. Channel Treatments										
				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$0	$0		$0		$0	$0
C. Road and Trails										
Mobilization	1	$ 15,637	1	$15,637	$0					
Storm Proofing	5	$ 23,975	1	$23,975	$0					
Temp Road Closure		$ 18,600	1	$18,600	$0					
Burned Area Haz Signs	200	$ 747	1	$747	$0					
Storm Patrol		$ 28,444	1	$28,444	$0					
Regulatory Sign Placement	9	$ 1,904	1	$1,904						
Contract Design and Oversight		$ 8,550	1	$8,550	$0					
Rock stabilzation assessment and barriers	1	$ -	1	$0						
Culvert Replacement	3	$ 70,900	1	$70,900	$0					
Additional culvert costs	each	$145,350	1	$145,350						
K-rail and supplies	each	$ 15,000	1	$15,000						
Carsonite signs	each	$ 300	1	$300						
Trail Closure/Safety Monit/Trl Stabilization	1	$ 8,809	1	$8,809						
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$338,216	$0		$0		$0	$0
D. Protection/Safety										
Most Included in Road and Trail Above				$0	$0		$0		$0	$0
BAER Implementation T	1	2500	1	$2,500						
Heritage Resource Protection	1	$ 2,300	1	$2,300	$0					
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$4,800	$0		$0		$0	$0
E. BAER Evaluation										
Team Evaluation	1	35600	1	---			$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				---	$0		$0		$0	$0
F. Monitoring										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$359,995	$0		**$0**		**$0**	**$16,979**
Previously approved				$199,345						
Total for this request				**$160,650**						

PART VII - APPROVALS

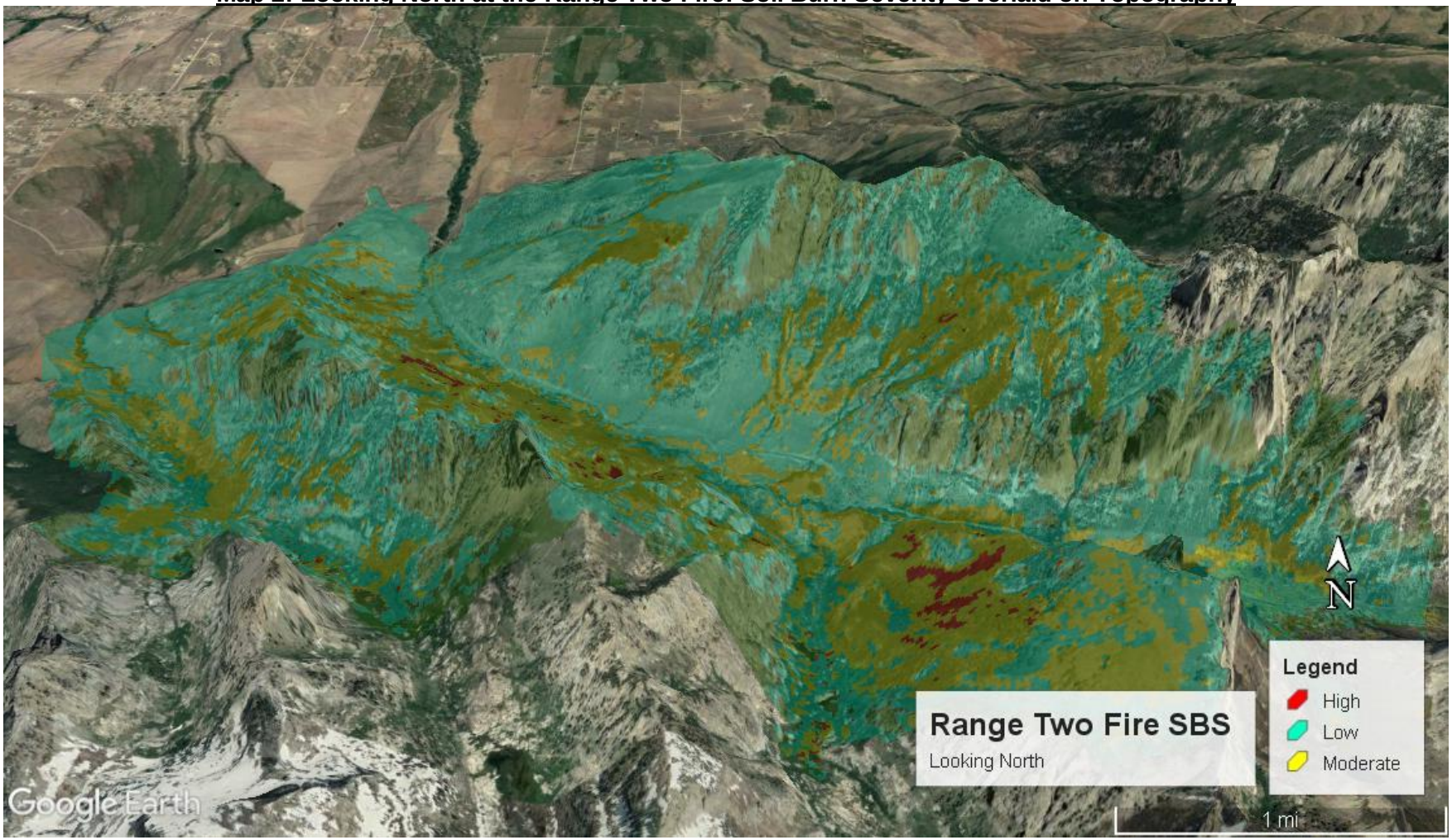
1. /s/ WILLIAM A. DUNKLEBURGER — November 13, 2018
   Forest Supervisor (signature) — Date

2. _____ _____
   Regional Forester (signature) — Date

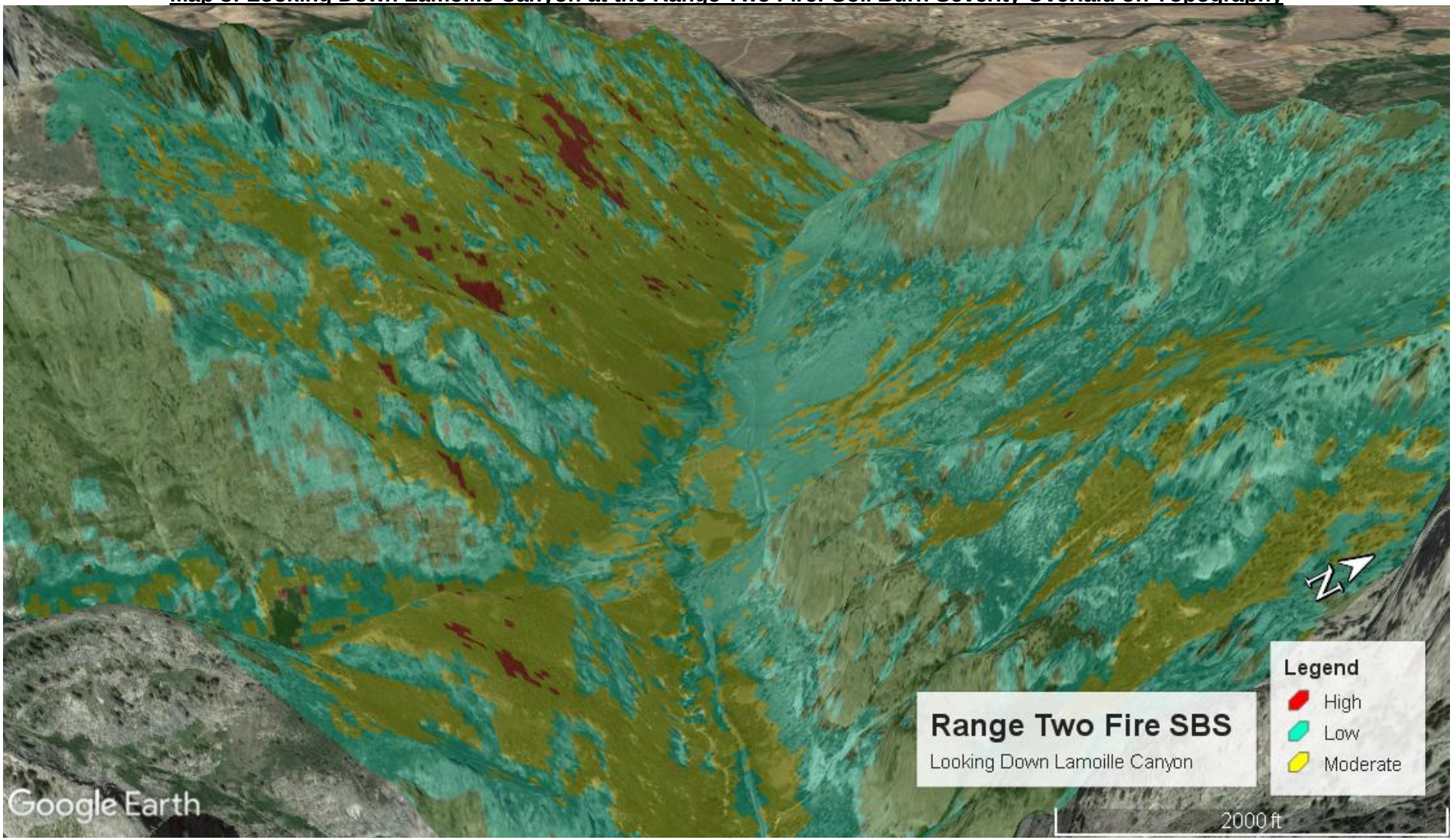
Map 1: Range Two Fire Soil Burn Severity Map



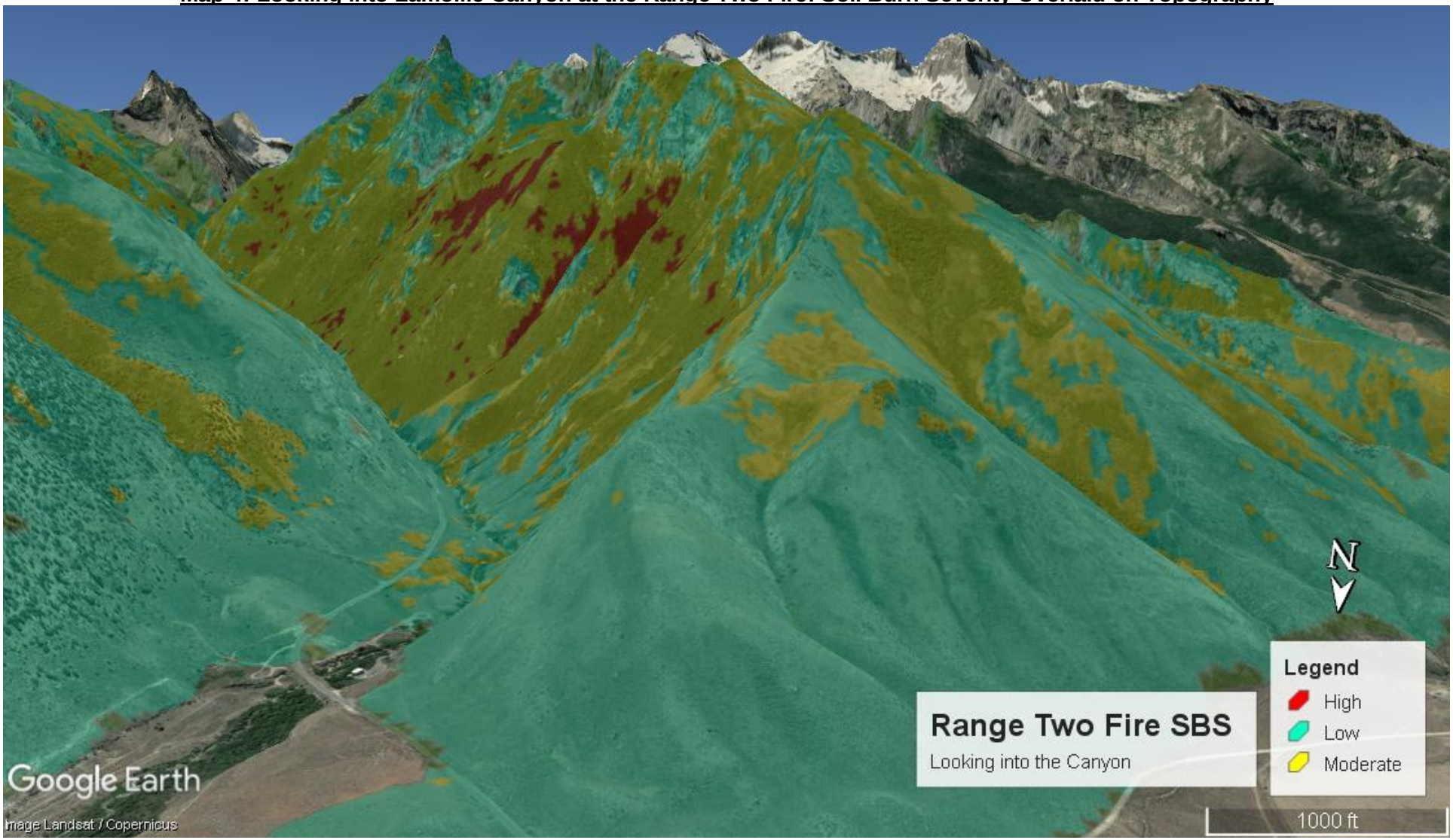
Map 2: Looking North at the Range Two Fire: Soil Burn Severity Overlaid on Topography



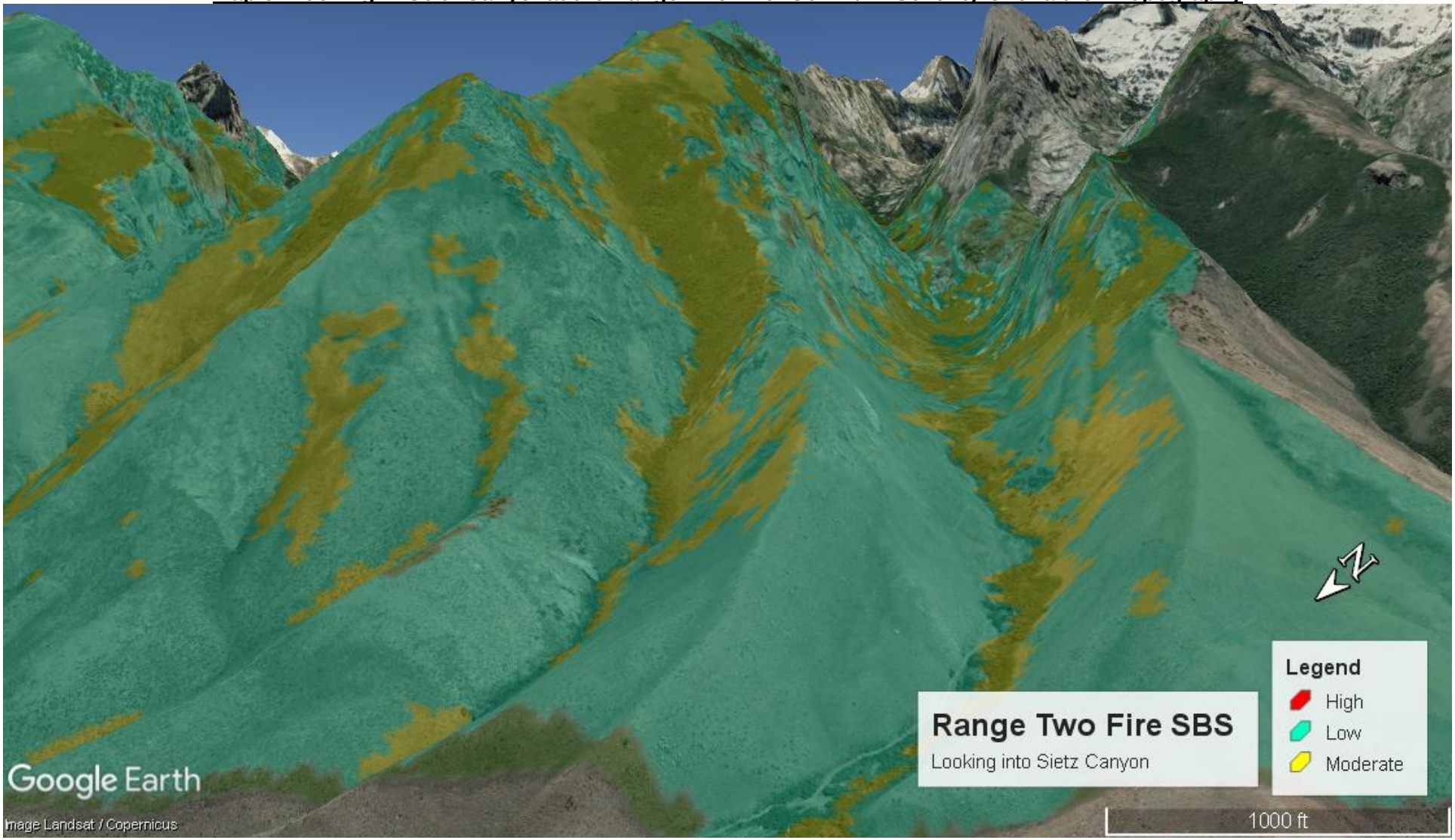
Map 3: Looking Down Lamoille Canyon at the Range Two Fire: Soil Burn Severity Overlaid on Topography



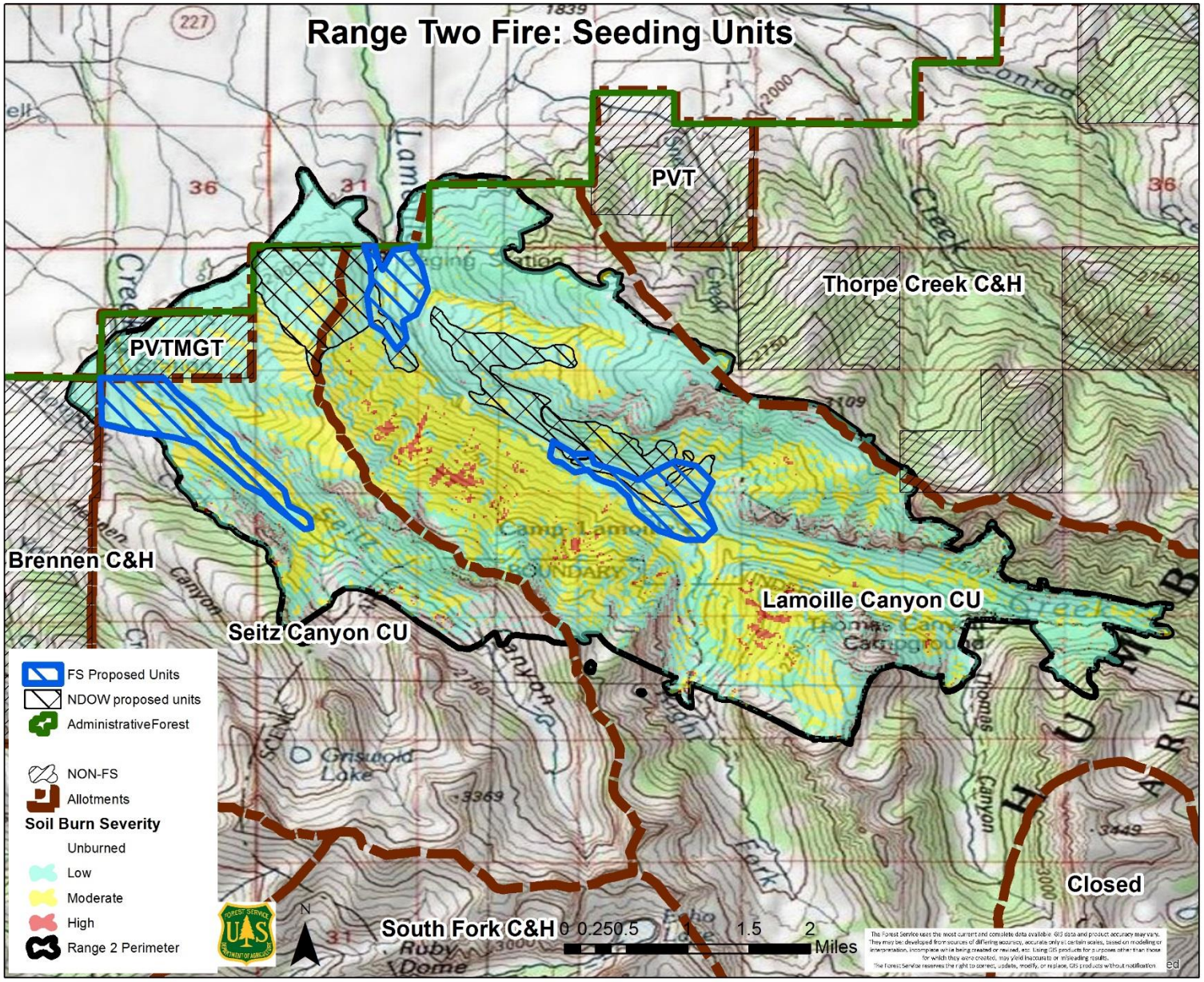
Map 4: Looking into Lamoille Canyon at the Range Two Fire: Soil Burn Severity Overlaid on Topography



Map 5: Looking in Seitz Canyonat the Range Two Fire: Soil Burn Severity Overlaid on Topography



Appendix A: Range Two Fire Proposed Reseeding Locations



Appendix B: Proposed Seed Mix and Plant Species Information

The following seed mix was chosen because the included species that occurred on the site prior to the fire and because they possess the following attributes: drought tolerance, extensive root systems, early colonizers, rapid growth, high seedling vigor, and competitive advantages that make them an important component of post-fire restoration activities. The number of species included in the mix will also encourage the native plant community to re-establish with sufficient diversity compared to pre-fire composition, in order to offer quality habitat to wildlife species, while maintaining its ecological resilience.

Both Great Basin Seeds and Granite Seed costs were included to demonstrate the variability in seed prices. It is recommended that flexibility be built into the funding in order to obtain the cleanest lot possible, not simply the least expensive, in order to conform to agency policy of using weed free seed.

Proposed Seed Mix

Species	lbs./ Acre	Ac	Total lbs. needed	Granite Seed Co. (estimated price/bulk#)	Granite Seed Co. Seed Cost	Granite Seed Co. Cost/acre	Great Basin Seed (estimate price/bulk#)	Great Basin Seed Cost	Great Basin Seed cost/acre
Bluebunch Wheatgrass (Pseudoroegneria spicata)	2	574	1148	$9.00	$10,332.00	$18.00	$8.95	$10,274.60	$17.90
Great Basin Wildrye (Leymus cinereus) v. Magnar	0.5	574	287	$9.00	$2,583.00	$4.50	$16.95	$4,864.65	$8.48
Canby Bluegrass (Poa Secunda cultivar)	2	574	1148	$9.00	$10,332.00	$18.00	$6.50	$7,462.00	$13.00
Western Wheatgrass (Pascopyrum smithii)	2	574	1148	$5.00	$5,740.00	$10.00	$5.95	$6,830.60	$11.90
Idaho Fescue (Festuca idahoensis)	1	574	574	$12.00	$6,888.00	$12.00	$8.95	$5,137.30	$8.95
Bottlebrush Squirreltail (Elymus elymoides)	1	574	574	$18.00	$10,877.30	$18.95	$18.95	$10,877.30	$18.95
Mountain Brome (Bromus Marginatus)	1	574	574	$2.00	$2,209.90	$3.85	$3.85	$2,209.90	$3.85
Lewis Flax (Linum lewisii)*	0.5	574	287	$10.00	$2,870.00	$5.00	N/A	$2,870.00	$5.00
Total	10	574	5740	N/A	$51,832.20	$90.30	N/A	$50,526.35	$88.03

*Lewis Flax seed is not available through Great Basin Seed; for comparison purposes, Granite Seed Company's bulk price for Lewis Flax was used in the calculations.

This Seed Mix is recommended for use on the Lamoille Canyon CU and Seitz Canyon C&H because these species occurred naturally on the site pre-fire and will help to re-establish the native plant community (Appendix P & T). The average precipitation levels in these allotments is 12-40 inches, therefore the reseeding treatments will have sufficient moisture in an average year to provide for successful germination rates (Appendix E). Each species in the mix was chosen for its ability to re-establish in the first year after seeding under a variety of climatic conditions, in order to ensure that even if there were a drought in year one, there will be species from the seeding that can establish. For descriptions of each species used in the Seed Mix refer to the descriptions derived from the USDA plant database listed below:

Bluebunch Wheatgrass ***Pseudoroegneria spicata ssp. Spicata*** – Bluebunch wheatgrass is very drought resistant, persistent, and adapted to the stabilization of disturbed soils. It does not out-compete slower developing native species, such as thickspike wheatgrass. Its drought tolerance, combined with extensive root systems and good seedling vigor, make this species ideal for reclamation in areas receiving 10 to 20 inches annual precipitation. 'Secar' competes well in areas as low as 8 inches annual rainfall. It is very fire tolerant and establishes quickly for a native grass.

Great Basin Wildrye ***Leymus cinereus*** – Basin wildrye is well adapted to stabilizing disturbed soils and has been used for disturbed area stabilization, mine reclamation, and fire rehabilitation. It has a deep fibrous root system extending to depths of 200 cm (63 in) in undisturbed soils with a lateral root spread of up to 100 cm. The drought tolerance of basin wildrye, combined with a fibrous root system and fair seedling vigor, make it desirable for reclamation in areas receiving 8 to 20 inches annual precipitation.

Sandberg bluegrass ***Poa secunda*** **(syn. *P. sandbergii)*** – Sandberg bluegrass is a pioneer species, one of the first grasses to colonize on disturbed sites. It is small in stature, early to establish, and quick to mature. It is also a "self-seeder" and often produces viable seeds within the first growing season.

Western wheatgrass ***Pascopyrum smithii-*** Western wheatgrass is a long-lived, cool season species that has coarse blue-green leaves with prominent veins. Western is a sod former with strong, spreading rhizomes making it an excellent erosion control plant. It also has the ability to adapt for a variety of soils and is widely used in seed mixtures for range seedings and reclamation projects.

Idaho fescue ***Festuca idahoensis-*** Idaho fescue is a native, perennial, cool-season, drought tolerant grass that produces an extensive, deep root system making it an excellent erosion control grass. Idaho fescue stands are persistent with good seedling vigor and is adapted to stabilization of disturbed soils.

Bottlebrush squirreltail ***Elymus elymoides***- Bottlebrush squirreltail is a native, perennial, and cool-season grass that has been cited as an excellent erosion control grass due to its strong seedling vigor and quick establishment. It has a proficient seed dispersal mechanism, is resistant to fire damage as it burns at low temperatures and remains green into the winter, and has shown that it can compete well with undesirable annual weed species. Bottlebrush squirreltail is valuable winter forage to many domestic and wildlife species as it remains green and palatable throughout the winter.

Mountain brome ***Bromus carinatus***- is a native, perennial, cool-season grass that germinates and establishes quickly after seeding making it a good choice for wildfire revegetation. In foothill and mountain locations, Mountain brome is an excellent plant for the revegetation of ranges as it provides good forage to wildlife and livestock. Mountain brome has a medium to rapid seedling vigor.

Flax ***Linum lewisii*** – All flax species are noted for their value in mixes for erosion control and beautification values. Due to the semi-evergreen nature of the species, flax can also be used as a fire suppressant species in green strip plantings. Most ecotypes do well on infertile, disturbed soils. They have excellent cold winter and drought tolerance. They are fire resistant since leaves and stems stay green with relatively high moisture content during most of the fire season. The semi-woody, fibrous root systems make this species ideal for erosion control.

Appendix C: Proposed Engineering Road Work – Culvert Replacement and Trash Rack Installation