Date of Report: 10-13-2021

BURNED-AREA REPORT

PART I - TYPE OF REQUEST

A. Type of Report

☒ 1. Funding request for estimated emergency stabilization funds
☐ 2. No Treatment Recommendation

B. Type of Action

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

☐ 2. Interim Request #___
☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Greenwood
A1. **Fire Name**: John Ek

B. Fire Number: MN-SUF-210002
B1. **Fire Number**: MN-SUF-000409

C. State: MN
C1 **State**: MN

D. County: Lake County
D1. **County**:Lake County

E. Region: 9
E1. **Region**: 9

F. Forest: Superior National Forest
F1. **Forest**: Superior National Forest

G. **District**: Laurentian, Tofte, and Kawishiwi
G1: **District**:Tofte

H. Fire Incident Job Code:P9N8HX21
H1. Fire Incident Job Code: P9N8TU21

I. Date Fire Started: Sunday August 15th, 2021
I1. **Date Fire Started**: Saturday August 14th 2021

J. Date Fire Contained: 80% contained
J1. **Date Fire Contained**: 0% contained

K. Suppression Cost: $22million
K1. Suppression Cost: $3million

L. Fire Suppression Damages Repaired with Suppression Funds (estimates):
1. **Greenwood Fireline repaired (miles):** 23.5 miles
2. **Greenwood Other (identify):** 28-point locations

L1. **Fire Suppression Damages Repaired with Suppression Funds (estimates):**
3. **John Ek Fireline repaired (miles):** none
4. **John Ek Other (identify):** none

M. Watershed Numbers:

Greenwood Fire

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned

090300010603	Greenwood River	31143	6722	22%
090300010601	Headwaters Stony River	36118	2616	7%
090300010604	Stony Lake	16619	7900	48%
090300010602	McDougal Lakes-Stony River	11700	5061	43%
090300010605	Nip Creek	15549	2361	15%
090300010607	Outlet Stony River	29978	898	3%
090300010708	Little Isabella River	32952	789	2%

John Ek Fire

Table 2a: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
090300010903	Malberg Lake-Kawishiwi River	25804	173	1%
090300010401	Frost River	20358	4	0.02%
090300010403	Little Saganaga Lake	24992	1312	5%

N. Total Acres Burned

Greenwood:

Table 3: Total Acres Burned by Ownership (excludes acres mis-mapped on lakes greater than 40 acres)

OWNERSHIP	ACRES
NFS	9,867
STATE	2,779
PRIVATE	13,014
COUNTY	688
TOTAL	26,348

Total Acres Burned John EK

Table 4b: Total Acres Burned by Ownership (excludes acres mis-mapped on lakes greater than 40 acres)

OWNERSHIP	ACRES
NFS	1,486
STATE	4
TOTAL	1,490

O. Vegetation Types:

Greenwood: The vegetation in the Greenwood Lake Fire is approximately 56% upland forest, 34% lowland forest, and 10% non-forested areas. The upland forest is on higher ground throughout the burn area, with lowland forest primarily in depressions and along riparian corridors throughout the burn area. About half of the upland forest is hardwood, primarily aspen or birch forest. A little over a quarter of the upland forest is conifer forest like jack pine, red pine, or white pine forest, and most of this is located in the northwest part of the burned area. The remaining upland forest is mixed conifer-hardwood forest. Most of the non-forested areas are alder swamps, non-forested peatlands, and beaver meadows.

John Ek: The vegetation in the John Ek Fire is predominantly upland conifer forest, either red pine/white pine forest or jack pine/black spruce forest. Aspen/birch forest makes up a small portion of the uplands. Lowlands are dominated by lowland black spruce forest, with non-forested peatlands occupying the drainages between uplands.

P. Dominant Soils:

Greenwood:

Ecological Landtypes 1, 2, 5, and 6 (59%)
Nearly level to slightly convex terrain with soils that range from poorly drained to very poorly drained, acidic to very acidic, hemic to sapric organics and somewhat poorly to poorly drained loamy and clayey mineral soils. Surface rock content is typically less than 5%, with locally higher percentages in transitional areas adjacent to uplands. Dominant vegetation consists of lowland conifer and shrub swamp.

Ecological Landtypes 11, 13, and 14 (36%)
Nearly level to locally steep terrain with soils that range from well to moderately well drained fine sandy loam to silt loam till with a substratum of gravelly sandy loam to very gravelly loamy sand till, sometimes dense enough to hold moisture for longer periods. Other localized areas consist of excessively well to well drained, gravelly to sandy outwash. Surface rock content ranges from 5 to 30%. Dominant vegetation consists of pine and mixed pine-hardwoods.

John Ek:

Uplands (79%)
Nearly level to hilly terrain with soils that range from well to moderately well drained; shallow to moderately deep to bedrock; stony to gravelly sandy loam to loam till with areas of denser till in the substratum that hold moisture for longer periods. Surface rock content ranges from 3 to 35%. Dominant vegetation consists of pine and mixed pine-hardwoods.

Lowlands (16%)
Nearly level to slightly convex terrain with soils that range from poorly to very poorly drained, acidic to very acidic, hemic to sapric organics; and somewhat poorly to poorly drained loamy mineral soils. Surface rock content is typically less than 5%, with locally higher percentages in transitional areas adjacent to uplands. Dominant vegetation consists of lowland conifer and shrub swamp.

Q. Geologic Types:

Greenwood:

212Le10 – Greenwood Till Plain (72%)
Nearly level to gently sloping terrain formed in Rainy Lobe ground moraine and Superior Lobe outwash plain and controlled by the underlying Duluth Complex – Gabbro. Materials are primarily deep to moderately deep loamy till and localized areas of sandy outwash on uplands with peat and loamy till in the lowlands. Broad landscape units with a large component of wetlands are common. Overall nutrient status is low to medium.

212Le01 – Isabella and McDougal End Moraine (23%)
Parallel and hilly to locally steep terrain formed in Rainy Lobe end moraines that are oriented east-west, with gently sloping ground moraine and outwash plain in between. Materials are loamy till or gravelly to sandy outwash on the uplands and peat in the lowlands. Broad, contiguous landscape units are common. Overall nutrient status is medium.

John Ek:

212La13 – Gabbro Lake Shallow Ground Moraine/Duluth Gabbro (100%)
The terrain is east-west oriented narrow ridges that are stairstep, steep slopes or escarpments on north facing slopes and gently to strongly sloping south facing slopes formed in shallow Rainy lobe ground moraine on the Rove Slate formation. Materials are shallow and deep loam on the uplands and peat in the lowlands. Landscape units are commonly long and narrow. Overall nutrient status is medium to low depending on depth of material to bedrock.

R. Miles of Stream Channels by Order or Class:

Greenwood:

Table 5: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	25.6
INTERMITTENT	2.7
EPHEMERAL	
OTHER (DEFINE)	

John Ek:

Table 6b: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	3.5
INTERMITTENT	0.6
EPHEMERAL	
OTHER (DEFINE)	

S. Transportation System:

Greenwood:

Trails: *National Forest (miles):* 8 *Other (miles):* 0

Roads: *National Forest (miles):* 18.4 *Other (miles):* 13.3

John Ek:

Trails: *National Forest (miles):* *Other (miles):*

Roads: *National Forest (miles):* 0 *Other (miles):* 0

PART III - WATERSHED CONDITION

A. Burn Severity (acres) Greenwood:

Table 7: Burn Severity Acres by Ownership (excludes acres mis-mapped on lakes greater than 40 acres)

Soil Burn Severity	NFS	County	State	Private	Total	% within the Fire Perimeter
Unburned	1,927	56	379	1,743	4,105	16
Low	5,541	474	1,889	8,814	16,718	63
Moderate	2,144	141	451	2,296	5,032	19
High	255	17	60	161	493	2
Total	9,867	688	2,779	13,014	26,348	100

Burn Severity (acres) John Ek

Table 8b: Burn Severity Acres by Ownership (excludes acres mis-mapped on lakes greater than 40 acres)

Soil Burn Severity	NFS	State	Total	% within the Fire Perimeter
Unburned	368	4	372	25
Low	710	0	710	48
Moderate	325	0	325	22
High	83	0	83	6
Total	1,486	4	1,490	100

B. Water-Repellent Soil (acres):

There was only weak to no observed hydrophobicity in the soils for the Greenwood and John Ek fires.

C. Soil Erosion Hazard Rating:

Greenwood:

Within areas of moderate to high soil burn severity there was only weak to no soil hydrophobicity observed; soil structure and surface root content remained largely unchanged; some duff and coarse and fine woody debris remained present on the soil surface (including recent needle cast and deciduous litter fall in areas of moderate, leaning to low soil burn severity).

There is a low probability for mass wasting and rill or gully formation due to the predominantly flat terrain, rate of vegetative regrowth, and high surface rock content to break up runoff. It is unlikely that soil loss and sediment transport would occur at a measurable scale, following large storm events, due to the abundant open water and wetland storage within the landscape. Only small, localized areas of erosion and sediment transport are likely to occur, predominantly on short but steep slopes greater than 18%.

John Ek:
Overall soil burn severity is generally consistent with other past fires in the BWCA, within a similar landscape, soil, and ecological unit context. As such, it is unlikely that soil structure and surface root content has changed substantially, nor is it unlikely that duff and coarse and fine woody debris remain present on the soil surface (including recent needle cast and deciduous litter fall in areas of moderate to low soil burn severity).

There is a low probability for mass wasting and rill or gully formation due to rate of vegetative regrowth and high surface rock content to break up runoff. It is unlikely that soil loss and sediment transport would occur at a measurable scale, following large storm events, due to the moderately abundant open water and wetland storage within the landscape. Only small, localized areas of erosion and sediment transport are likely to occur, predominantly on short but steep slopes greater than 18%.

D. Erosion Potential:
Greenwood: see comments in the soil erosion hazard rating

John Ek: see comments in the soil erosion hazard rating

E. Sediment Potential:
Greenwood: see comments in the soil erosion hazard rating

John Ek: see comments in the soil erosion hazard rating

F. Estimated Vegetative Recovery Period (years):
Greenwood: Estimated shrub recovery is 3-5 years with upland aspen/birch recovery estimated at 40-50 years.

John Ek: Estimated shrub recovery is 3-5 years with upland aspen/birch recovery estimated at 40-50 years.

G. Estimated Hydrologic Response (brief description):
Greenwood:
The Greenwood Fire is positioned high in the Rainy River Headwaters watershed; the southern edge of five of seven 6th-level watersheds affected by the fire forms part of the continental (Atlantic-Arctic) divide. Water in the vast majority of the burned area (97 percent) flows to the Stony River (5th-level watershed) while the remaining three percent of burned area lies within the Isabella River Watershed, the northern part of which intersects the Boundary Waters Canoe Area Wilderness (BWCAW). Approximately 23 river miles separate the burn area within the Little Isabella River watershed from the BWCAW. The 6th-level watersheds Stony Lake, McDougal Lakes-Stony River, and Greenwood River individually experienced the greatest burn extents, with 48, 43, and 22 percent burned, respectively (Table 1). The remaining four watersheds where the Greenwood Fire burned impacted less than 10 percent of the watershed area.

Given the landscape position, extensive wetland resources were anticipated and identified during field visits and via GIS analysis. Wetlands are an important element in moderating hydrology associated with potential fire-induced increased runoff effects; indeed, while several greater than one-inch storms have already occurred over the burned area, streams continue to discharge at below normal volume. Field reviews indicated minor to moderate loss of peat thickness in some wetlands; however, given the typical depth of peat in these resources

overall storage capacity is not expected to be substantially impacted. Wetlands in five of the seven impacted 6th-level watersheds cover nearly 50 percent of those watersheds (Table x). GIS analysis indicated wetlands generally burned as frequently as uplands except in the Little Isabella watershed, where wetlands cover 29 percent of the watershed overall, but 70 percent of the area burned in that watershed was wetland (Table x).

Based on a review of available hydrometeorological data from the National Oceanic and Atmospheric Administration's (NOAA) Hydrometeorological Design Studies Center (HDSC), including precipitation events within the burn extent since ignition, seasonal/annual data available for Isabella (limited), Babbitt, and Brimson, and local knowledge as a current Superior National Forest hydrologist and from other BAER team members, the BAER team hydrologist identified the first likely damaging storm as a rain-on-snow event that would occur mid-winter to spring. A five-year, seven-day return period is likely to carry additional risk of flooding and damage to infrastructure; total modeled precipitation for this return period is approximately 4.74 inches. Overall, the risk of the damaging storm occurring prior to sufficient revegetation of the landscape is relatively low; limited re-vegetation was already identified within burned areas during a field review (see Section F) and much fine-to-coarse root structure remains intact in the soil. Risk is further mediated by the relatively low erosion potential of these watersheds (see Section D), low slopes, and widespread wetland presence (Table x). The fire did not result in exceedance of the "60-

Table 5. Fire and wetland area by watershed and wetland area burned percent" threshold (Superior National Forest Land and Resource Management Plan, 2004 S-WS-1; Verry, 1987) in any of the burned watersheds.

HUC #	Watershed Name	Fire Area per watershed	Wetland Area (% of WS)	Wetland Burned (% of burned area)
090300010603	Greenwood River	26%	48%	51%
090300010601	Headwaters Stony River	10%	54%	59%
090300010604	Stony Lake	31%	48%	42%
090300010602	McDougal Lakes-Stony River	20%	48%	49%
090300010605	Nip Creek	7%	48%	49%
090300010607	Outlet Stony River	3%	31%	32%
090300010708	Little Isabella River	3%	29%	70%

John Ek:

The John Ek Fire is also positioned relatively high in the Rainy River Headwaters watershed. Water from a majority of the burned area (87 percent) flows to Saganaga Lake (5th-level watershed) and the Canadian Border while the remaining 13 percent of moves north via the Kawishiwi River drainage (Table x). The fire extent is entirely within the BWCAW. The John Ek fire was relatively small and impacted just five percent of the 6th-level Little Saganaga Lake watershed, one percent of the Malberg Lake watershed, and less than one percent of the Frost River watershed (Table 1).

In contrast to the wetland-dense Greenwood Fire footprint, wetlands and streams within the John Ek fire footprint are limited in extent (Table x) and generally restricted to glacially scraped corridors between more resistant expanses of exposed or thinly covered Canadian Shield. Minnesota Department of Natural Resources Watershed Health Assessment Framework scores for the John Ek burn extent indicate the presence of steep slopes near streams and low soil erodibility (likely in part due to the high concentration of exposed bedrock in the area). Soil that is present on these steep slopes may be vulnerable to erosion prior to re-development of vegetation, although with generally low-to-moderate burn severity across the fire much of the existing root matrix is likely preserved; root presence will mitigate the effects of the steep but relatively short slopes. Localized erosion that does occur is unlikely to overwhelm sediment transport and filtration processes within the relatively small footprint of the John Ek fire.

Meteorological stations within the Boundary Waters are very limited; the closest station to the John Ek fire was identified approximately 17 miles northeast at Gunflint Lake near the end of the Gunflint Trail. Based on a

review of the Gunflint Lake data from the NOAA HDSC, and local knowledge as a current Superior National Forest hydrologist and from other BAER team members, the BAER team hydrologist identified the first likely damaging storm as a rain-on-snow event that would occur mid-winter to spring. A five-year, seven-day return period is likely to carry additional risk of flooding; total modeled precipitation for this return period is approximately 4.40 inches. Overall, the risk of the damaging storm occurring prior to revegetation of the landscape is relatively low; based on the response observed to the Greenwood Fire, limited re-vegetation is likely already present and substantial root structure likely remains intact in the soil. The fire did not result in exceedance of the "60-percent" threshold (Superior National Forest Land and Resource Management Plan, 2004 S-WS-1; Verry, 1987) in any of the burned watersheds.

Table 5b. Fire and wetland area by watershed and wetland area burned

HUC #	Watershed Name	Fire Area per watershed	Wetland Area (% of WS)	Wetland Burned (% of burned area)
090300010903	Malberg Lake-Kawishiwi River	13%	28%	21%
090300010401	Frost River	0.1%	23%	0%
090300010403	Little Saganaga Lake	87%	31%	19%

PART IV - HYDROLOGIC DESIGN FACTORS

Greenwood:

A. Estimated Vegetative Recovery Period	**3-7 years**
B. Design Chance of Success	80%
C. Equivalent Design Recurrence Interval	5 years
D. Design Storm Duration	7 day
E. Design Storm Magnitude	4.74 inches
F. Design Flow	------
G. Estimated Reduction in Infiltration	21%
H. Adjusted Design Flow	-------

John Ek:

A. Estimated Vegetative Recovery Period	**3-7 years**
B. Design Chance of Success	80%
C. Equivalent Design Recurrence Interval	5 years
D. Design Storm Duration	7 day
E. Design Storm Magnitude	4.40 inches
F. Design Flow	------
G. Estimated Reduction in Infiltration	21%
H. Adjusted Design Flow	-------

No formal watershed yield analysis associated with the damaging/design storm was performed based on analyst understanding of watershed processes in the northeastern Minnesota landscape, effects monitoring associated with previous fires on the SNF, and generally low-to-moderate burn severity observed with these fires, including the location of moderate to high soil burn severity in relation to the values at risk.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Greenwood Fire was detected on August 15, 2021 near Greenwood Lake on the Laurentian Ranger District. The fire started between Greenwood Lake and the intersections of Highways 1 and 2. The fire spread rapidly after it started around 3 p.m. Sunday near Greenwood Lake. The cause of the fire was lightning. With the drought that occurred this year, the dry vegetation, and a lot of dead and dying trees (due to spruce

budworm) into the mix, this fire had a lot of fuel and factors that caused it to spread quickly. It destroyed 14 primary structures, including homes and cabins, and nearly 60 outbuildings.

The John Ek Fire started on Saturday August 14th, 2021 and is located within the Boundary Waters Canoe Area Wilderness approximately 2.5 miles south of Little Saganaga Lake. It extends from John Ek Lake to the SE corner of Elton Lake. The fire was determined to be caused by lightning.

A. Describe Critical Values/Resources and Threats (narrative):
A comprehensive list of potential values at risk within or directly downstream of the Greenwood and John Ek burned area was compiled through consultation with local management and resource specialists and through BAER Team on the ground and GIS assessments. It can be requested from the Project Record. Following guidance in Interim Directive 2520-2013-1, the BAER assessment team evaluated this list of values through field assessment and subsequent analysis to identify the BAER critical values (FSM 2523.1 – Exhibit 01) that may be treated under the BAER program (Appendix A for Greenwood and Appendix B for John Ek). The BAER critical values were then assigned a level of risk defined by the probability of damage or loss coupled with the magnitude of consequences using the risk assessment matrix (FSM 2523.1 – Exhibit 02). The BAER critical values with unacceptable risks signify a burned-area emergency exists. The characterization of the probability of damage or loss is based on the watershed response analysis completed by the BAER Assessment. BAER Critical values having a “Very High” or “High” risk rating include recommended emergency stabilization actions known to mitigate potential threats or minimize expected damage, which are described below. No treatments were identified for NFS values when the analysis resulted in an “Intermediate” or lower risk rating for all categories except for human life/safety. Non-National Forest System (NFS) values and threats were identified but not assessed for risk. Where a threat was identified, the BAER team recommends that these values are referred to local, state, and other federal cooperators for their own risk assessment.

Table 6: Critical Value Matrix

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

Greenwood:

1. **Human Life and Safety (HLS):**
   a. **High** risk to human life/safety on NFS land from threats associated with hazard trees and loss of egress/access throughout the burned area, but particularly on roads and summer (such as the McDougal Lake Hiking Trail and ATV trails) and winter (such as the Yukon North Snowmobile Trail) trails in the burn. Treatment recommendations are installation of warning signage for both roads and trails and ensure treatments are functioning as intended.
   b. **High to intermediate** risk to human life/safety on NFS land from threats associated with hazard trees, falling into stump holes, and interacting with debris from burnt infrastructure at high value recreation sites in the McDougal Lake Area (picnic area, campground, boat launch, etc.). Treatment recommendations include temporary closures and install warning signage, removal of smaller unsalvageable burnt debris, and stabilization of open areas within these sites. This area will need to be assessed for hazard trees prior to reopening.
   c. **High** risk to human life/safety on NFS land from threats associated with hazard trees at the Jackpot ATV Trailhead. Treatment recommendations include temporary closures and install warning signage. This trailhead will need to be assessed for hazard trees prior to reopening.
   d. **Intermediate** risk to human life/safety on NFS land from threats associated with hazard trees and falling into stump holes throughout the burned area, but particularly travelling cross country on foot or by horseback. Treatment recommendations include temporary closures and install warning signage at major access points before entering the burn and along roads and trails.

There may be an increased threat to private residences within and adjacent to the fire perimeter, to other third-party road systems such as Highway 1 and 2 and county roads, and to authorized permitted water systems. The potential for falling rocks and trees poses a threat to human life/safety as well as loss of ingress and egress to landowners if road systems are impacted. Water quality for domestic water sources may be at an increased risk from burnt hazardous material becoming mobilized and entering the streams and or leaching into the ground water. Several private residences exist within the fire area. Coordination and information sharing with landowners, NRCS, MN Department of Transportation, and emergency services is recommended.

2. **Property (P):**
   a. **Low** risk to FS property such as the high value recreation sites in the McDougal Lake Area and at Jackpot ATV Trailhead from threats of hazard trees. Area was cleared of imminent hazard trees during fire repair. Some dead and dying trees remain in the area that are tall enough to fall on infrastructure in the areas. No BAER treatment recommended. This area will need to be assessed for hazard trees prior to reopening.
   b. **Low** risk to FS property such as roads and trails from threats of erosion and loss of hydrologic function within and downstream of the burned area. Given the "mild" terrain within the burned area and overall prevalence of low burn severity, it is unlikely any potential erosion will be extensive. More so, it will be localized and likely associated with a condition that pre-existed the fire. The places that have been identified as vulnerable to erosion are also relatively small in size. No treatment recommended.
   c. **Low** risk to FS property such as the high value recreation sites in the McDougal Lake Area from threats of erosion and loss of hydrologic function within and downstream of the burned area. Given the "mild" terrain within the burned area and overall prevalence of low burn severity, it is unlikely any potential erosion will be extensive. No treatment recommended.
   d. **Low** risk to FS property such as small culverts (<=24") on FS roads especially downstream of beaver dammed areas. "Culvert steaming" work is done prefire annually in the spring to mitigate these effects; depends on melt timing and vegetative regrowth. No BAER treatment recommended.
   e. **Low** risk to FS property such as FS wells. Known well sites appear to not be located in high-risk flooding areas and in areas of low to unburned soil burn severity. No BAER treatment recommended.

There may be an increased threat to private residences within and adjacent to the fire perimeter, to other third-party road systems such as Highway 1 and 2 and county roads, and to authorized permitted features. The potential for hazard trees poses a threat to property as well as loss of ingress and egress to landowners if road systems are impacted. Several private residences exist within the fire area. Coordination and information sharing with landowners, NRCS, MN Department of Transportation, and emergency services is recommended.

3. **Natural Resources (NR):**
   a. **High** risk to native plant communities, endemic sensitive plant habitats, and special botanical interest areas due to the risk of invasive species spread and introduction to uninfested areas from fire suppression equipment. Changes in canopy cover, loss of duff, competing vegetation, and proximity to a vector point adjacent to the newly constructed shaded fuelbreak near Pitcha Lake Rd creates a vulnerable habitat susceptible to invasion by adjacent noxious weed sites. 95% of fuel break is in an Ecological Land Type's (ELT) that are highly susceptible to weed invasion. Treatments recommended include early detection rapid response (EDRR) surveys and natural recovery.
   b. **Intermediate** risk to native plant communities, endemic sensitive plant habitats, and special botanical interest areas due to the risk of invasive species spread and introduction to uninfested areas within and adjacent to the Greenwood Fire. Loss of duff, competing vegetation, and canopy cover in areas with moderate (19%) to high (2%) soil burn severity creates a vulnerable habitat susceptible to invasion by adjacent disturbed noxious weed sites. Treatment recommended is natural recovery.
   c. **Low** risk to native plant communities, endemic sensitive plant habitats, and special botanical

interest areas due to the risk of invasive species spread and introduction to uninfested areas from fire suppression equipment. Successful repair and suppression efforts have been completed to date. Treatment recommended is natural recovery.

d. **Low** risk to Designated Suitable and Critical Habitat for Threatened Canada Lynx. The removal of suitable habitat (i.e., forest for denning and prey) was only within portions of the fire on USFS lands and should only be short-term (first 5-10 years). The species is mobile and widely distributed across the Superior NF with abundant remaining habitat available. Additionally, the burn area is past the breeding stage and young would also be mobile. Also, the percentage of LAUs affected by the fire ranged from a low of 1% to a high of 16%. Treatment recommended is natural recovery.

e. **Low** risk to Suitable Habitat for Threatened Northern long-eared Bat. The shift of potential roosting habitat (i.e., live trees versus dead trees) is only within portions of the fire on USFS lands. The species is mobile and widely distributed across the Superior N.F. with abundant remaining habitat available. Additionally, the burn area is past the breeding stage and young would also be independent. Treatment recommended is natural recovery.

f. **Low** risk to soil productivity, increased erosion, and loss of hydrologic function. Low probability for mass wasting and rill or gully formation due to the predominantly flat terrain, rate of vegetative regrowth, and high surface rock content to break up runoff. Unlikely to see soil loss and sediment transport at a measurable scale, following large storm events, due to the abundant open water and wetland storage within the landscape. Only small, localized areas of erosion and sediment transport are likely to occur. Treatment recommended is natural recovery.

g. **Low** risk to water quality for all statewide 303d listed water bodies. Treatment recommended is natural recovery. However, other proposed treatments will result in benefits to this value.

h. **Low** risk to water quality from impacts of various vault toilets overflow within fire footprint due to the distance of these features from the shoreline. Treatment recommended is natural recovery.

4. **Cultural and Heritage Resources: Low** risk to eligible and potentially eligible cultural and historic sites due to low soil burn severity at most sites, inaccessibility of sites, and low risk of erosion. One eligible site and two potentially eligible sites were identified as critical values. Treatment recommended is natural recovery. However, proposed treatments such as the McDougal Lake Campground closure and road closures result in benefits to this value.**Low** risk to culturally valued natural resources. Moose and wild rice were identified by the team as critical values; while short term impacts are expected to moose and wild rice habitats, no long-term impacts are anticipated. Treatment recommended is natural recovery.

John Ek:

1. **Human Life and Safety (HLS):**
   a. **Very High** risk to human life/safety on NFS land from threats associated with hazard trees and loss of egress/access throughout the burned area, but in particular while camping and visiting Elton Lake campsite #1 in the burn area. Treatment recommendations is a temporary closure of campsite #1 and install warning signage at the site and at entry portals to the burn area and ensure treatments are functioning as intended.
   b. **High** risk to human life/safety on NFS land from threats associated with a burnt latrine at Elton Lake campsite #1. Exposure to biohazards including human waste and burnt fiberglass could be hazardous to human health. In addition, injury caused by stepping in a hole could be particularly problematic given the extremely remote location of the Elton Lake Campsite #1. Treatment recommendations include temporary closures and install warning signage, removal of smaller unsalvageable burnt debris, and stabilization of open hole within this site. This area will need to be assessed for hazard trees prior to reopening.
2. **Property (P):**
   a. **Low** risk to burnt FS property at Elton Lake campsite #1. Latrine is no longer functional. There are other campsites in the immediate area that provide adequate access for visitors to camp and utilize. No BAER treatment recommended. This area will need to be assessed for hazard trees prior to reopening.
3. **Natural Resources (NR):**
   a. **Low** risk to native plant communities, endemic sensitive plant habitats, and special botanical interest areas due to the risk of invasive species spread and introduction to uninfested areas from

fire suppression equipment. MIST tactics were implemented during fire suppression. Treatment recommended is natural recovery.

b. **Low** risk to Designated Suitable and Critical Habitat for Threatened Canada Lynx. The removal of suitable habitat (i.e., forest for denning and prey) was only within portions of the fire on USFS lands and should only be short-term (first 5-10 years). The species is mobile and widely distributed across the Superior NF with abundant remaining habitat available. Additionally, the burn area is past the breeding stage and young would also be mobile. Also, the percentage of LAUs affected by the fire ranged from a low of 1% to a high of 16%. Treatment recommended is natural recovery.

c. **Low** risk to Suitable Habitat for Threatened Northern long-eared Bat. The shift of potential roosting habitat (i.e., live trees versus dead trees) is only within portions of the fire on USFS lands. The species is mobile and widely distributed across the Superior N.F. with abundant remaining habitat available. Additionally, the burn area is past the breeding stage and young would also be independent. Treatment recommended is natural recovery.

d. **Low** risk to soil productivity, increased erosion, and loss of hydrologic function. Low probability for mass wasting and rill or gully formation due to the predominantly flat terrain, rate of vegetative regrowth, and high surface rock content to break up runoff. Unlikely to see soil loss and sediment transport at a measurable scale, following large storm events, due to the abundant open water and wetland storage within the landscape. Only small, localized areas of erosion and sediment transport are likely to occur. Treatment recommended is natural recovery.

e. **Low** risk to water quality for all statewide 303d listed water bodies. Treatment recommended is natural recovery. However, other proposed treatments will result in benefits to this value.

4. Cultural and Heritage Resources:

a. **Low** risk to culturally valued natural resources. Moose and wild rice were identified by the team as critical values; while short term impacts are expected to moose and wild rice habitats, no long-term impacts are anticipated. Treatment recommended is natural recovery.

B. Emergency Treatment Objectives for the Greenwood and John Ek:

a. Reduce the post-fire risks to human life and safety through administrative closures and warning signage. These signs and gates also serve to accelerate natural recovery by preventing and or limiting access to and in high use recreation sites for the Greenwood and John Ek.
b. Protect or minimize damage to high-value NFS investments within the burned area from hazard trees. Minimize damage to key infrastructure at critical NFS recreation sites within the fire boundary for the Greenwood.
c. Protect or mitigate potential post-fire impacts to critical natural resources within the burned area. Implement treatments that minimize threats to water quality for domestic water supplies from the leaching and mobilization of hazardous material associated with burnt infrastructure currently located along or near the shoreline for both the Greenwood and John Ek.
d. Survey and treat invasive plants that are a potential threat to naturalized ecosystems by minimizing the establishment of populations in the burned area and adjacent to the area where soils/vegetation was significantly disturbed as a result of fire suppression activities for the Greenwood.
e. Assist cooperators with the interpretation of the assessment findings to identify potential post-fire impacts to communities and residences, domestic water supplies, public and private roads, and other non NFS infrastructure for the Greenwood.
f. Reduce impacts to water quality and impaired water bodies for the Greenwood and John Ek.
g. Mitigate effects of changed post-fire watershed response on natural resources such as federally listed species, historic properties, and sacred/cultural resources for the Greenwood.

C. Probability of Completing Treatment Prior to Damaging Storm or Event for the Greenwood and John Ek:

Land: 85%
Channel: NA
Roads/Trails: NA
Protection/Safety: 85%

D. Probability of Treatment Success

Table 7: Probability of Treatment Success for Greenwood and John Ek

	1 year after treatment	3 years after treatment	5 years after treatment
Land	75	85	95
Channel	---	---	---
Roads/Trails	---	---	---
Protection/Safety	80	70*	60*
.	*Initially, visitors will heed the warning signs. Complacency is expected after the initial year unless there are continued damaging events		

E. Cost of No-Action (Including Loss):
Greenwood Fire - $3,760,000 is the total estimated *Monetary Value* of the BAER Critical Values (BCVs) within the fire perimeter. $1,226,100 is the total estimated *Monetary Value Loss* for the BCVs within the fire perimeter for the no action alternative with a range of 0.06 - 0.5 Reduction in Probability of Loss as determined from the simplified Cost/Benefit Analysis Worksheet. The simplified Cost/Benefit Analysis tool uses Risk-based Assessment to evaluate cost-effectiveness for proposed treatments to mitigate potential damage to Values-at-Risk (VAR). Analysis in this tool is based on a combination of applying benefit/cost ratios (B/C ratio) for Market and Non-market Value resources.

John Ek Fire - $575,000 is the total estimated *Monetary Value* of the BAER Critical Values (BCVs) within the fire perimeter. $182,500 is the total estimated *Monetary Value Loss* for the BCVs with in the fire perimeters for the no action alternative with a range of 0.05 - 0.5 Reduction in Probability of Loss as determined from the simplified Cost/Benefit Analysis Worksheet. The simplified Cost/Benefit Analysis tool uses Risk-based Assessment to evaluate cost-effectiveness for proposed treatments to mitigate potential damage to Values-at-Risk (VAR). Analysis in this tool is based on a combination of applying benefit/cost ratios (B/C ratio) for Market and Non-market Value resources.

F. Cost of Selected Alternative (Including Loss):
Greenwood Fire - $3,760,000 is the total estimated *Monetary Value* of the BAER Critical Values (BCVs) within the fire perimeter. $385,600 is the total estimated *Monetary Value Loss* of the BCVs for the action alternative with a range of 0.06 - 0.5 Reduction in Probability of Loss as determined from the VAR Worksheet. This leads to a total benefit cost for the treatments of $838,000. Actual cost of the treatments is $39,159. Implementation of recommended response actions listed below is based on market resources only and is economically justified with the following benefit: cost ratio: Greenwood Fire – 19.1

John Ek Fire - $575,000 is the total estimated *Monetary Value* of the BAER Critical Values (BCVs) within the fire perimeter. $51,250 is the total estimated *Monetary Value Loss* of the BCVs for the action alternative with a range of 0.05 - 0.15 Reduction in Probability of Loss as determined from the VAR Worksheet. This leads to a total benefit cost for the treatments of $131,250. Actual cost of the treatments is $4,970. Implementation of recommended response actions listed below is based on market resources only and is economically justified with the following benefit: cost ratio: John Ek Fire – 26.4

The likely probability of loss if treatments are not applied on both the Greenwood and John Ek Fires is based on field observations and estimate of damage or loss with the longer duration precipitation event. For the recommended treatments there is a reduced probability of damage or loss with implementation. The expected loss would not be as costly when implementing the recommended treatments. The VAR analysis focused primarily on market values so potential benefits such as lowering level of risk to human life and safety, natural resources, and cultural resources were recognized in this BAER assessment, but not included in the cost basis for Values at Risk analysis. This analysis can be found in Appendix C for Greenwood and Appendix D for John Ek.

G. Skills Represented on Burned-Area Survey Team for Greenwood and John Ek:

☒ Soils ☒ Hydrology ☐ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation ☒ Fisheries ☒ Wildlife
☒ Other: Forestry

Team Leader: Mary Moore
Email: mary.c.moore@usda.gov **Phone(s)** 719-486-4872
Team Leader (trainee): Anna Plumb
Email: anna.plumb@usda.gov **Phone(s)** 218-335-8660

Forest BAER Coordinator: Dave Morley
Email: david.morley@usda.gov **Phone(s):** 218-308-1211

Team Members: *Table 8: BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	Mary Moore and Anna Plumb (Trainee)
Soils	Dave Morley
Hydrology	Emily Creighton
Engineering	
GIS	Adam Clark and Erica Hahn
Archaeology	Lee Johnson and Rachel Hines
Weeds	Jack Greenlee and Laurie Gawin
Recreation	Ann Schwaller and Cathy Quinn
Forestry	Amanda Skot and Kirsten Rosenberger
Wildlife	Cheron Ferland and Dan Ryan
Aquatics	Jason Butcher

H. Treatment Narrative:

Land Treatments:

EDRR (Early Detection Rapid Response) Surveys (Greenwood)

Conduct Early Detection Rapid Response (EDRR) surveys for the Superior National Forest's target invasive plant species. On the Greenwood Fire approximately 15 acres of newly created fuel break within the fire area will be surveyed. EDRR is a strategy developed to increase efficiency of weed work by combining surveying, mapping, and immediate treatment of new weed infestations as they are discovered. Areas disturbed during fire suppression will be surveyed for new infestations and treated to prevent establishment.

Priority areas will be surveyed in early-mid summer of 2022 when plants are detectable but early enough to treat effectively (prior to maturation and dispersal of seed). Infestations that are detected will be treated with herbicide during the same visit as the surveys.

This treatment is to protect native plant communities, sensitive plant habitat, and wildlife habitat from impacts of invasive plant species. The treatment will prevent establishment of new infestations in locations where propagules were introduced or spread by fire suppression efforts.

L1: Greenwood EDRR Treatment

Treatment	Unit	Unit Cost	# of Unit	Total Cost
Invasive Plant Detection and Treatment Contract	ac	$600.00	15	$9,000.00
Contract admin	day	$485.00	3	$1,455.00

Total	$10,455.00

Channel Treatments: NA

Roads and Trail Treatments: NA

Protection/Safety Treatments:

Administrative McDougal Lake Site Specific Area Closure (Greenwood):

This treatment is a site-specific area closure for the McDougal Lake Area. This area includes a trail, campground, boat launch with parking, etc. The fire burned in and around the McDougal Lake area leaving behind several imminent hazard trees and lots of burned infrastructure. This area closure will include the installation of one gate and closure sign at the entrance to the McDougal Lake Campground area, and road, trail and campground burned area warning signs to caution forest visitors and users of hazards in the burned area.

This treatment for the Greenwood Fire must be combined with a closure order to ensure that it is posted consistent with both the identified hazards as well as the language of the order. One gate has been identified as necessary to enforce a closure order. The gate and sign will be integral to the enforcement of a legal order identified in the Temporary Road Closure. Purchase and install signs and gates at the identified location consistent with Forest Engineering Standards at these locations. This treatment coupled with the Recreation Site Protection and Stabilization treatment manage the short-term unacceptable risk for human life and safe in this area. This area will need to be assessed for long-term restoration needs.

P1: Greenwood McDougal Lake Site Specific Area Closure Treatment

Treatment	Unit	Unit Cost	# of Unit	Total Cost
Program Manager Oversight (GS-11)	day	$380.00	2	$760.00
Closure Signs	each	$50.00	4	$200.00
Closure Gate	each	$4,000.00	1	$4,000.00
Recreation Crew (4)	each	$1,300.00	3	$3,900.00
Gate Signs/Makers	each	$80.00	10	$800.00
Total				$9,660.00

Warning Signs for Roads and Trails (Greenwood):

This treatment will design and install burned area warning signs to caution forest visitors driving and recreating within the burned area. The warning signs will be placed at key entry points along roads and trails into the burn area. It is consistent with the language provided in the BAER Treatments Catalog. The treatment is a component of the overall travel control devices for the burned area (USDA Forest Service-EM7100-15, 2005). The warning signs will identify the types of hazards to watch for roads.

P2: Greenwood Warning Sign Treatments for Roads throughout the burn area

Treatment	Unit	Unit Cost	# of Unit	Total Cost
Purchase of Road Signs	each	$200.00	11	$2,200.00
Recreation Crew (4)	each	$1,300.00	3	$3,900.00
Program Manager or FSR Oversight (GS-11)	day	$380.00	1	$380.00
Vehicle Fuel/Mileage	each	$3.20	100	$320.00
Total				$6,800.00

P3: Greenwood Warning Sign Treatments for Trails throughout the burn area				
Treatment	**Unit**	**Unit Cost**	**# of Unit**	**Total Cost**
Purchase of Trail Signs	each	$50.00	30	$1,500.00
Trail Sign Field Crew (2)	day	$650.00	2	$1,300.00
Program Manager Oversight (GS-11)	day	$380.00	1	$380.00
Vehicle Fuel/Mileage	each	$3.20	30	$96.00
Total				$3,276.00

Administrative Site Specific Closure, Installation of Warning Signs and Hazardous Material Removal and Latrine Site Stabilization (John Ek):

This treatment will include the installation of a campsite closure sign on campsite #1 on Elton Lake and burned area warning signs at six Boundary Waters Canoe Area Wilderness (BWCAW) access and/or entry points to caution forest visitors and users of hazards within the burned area. This treatment is designed to remove the latrine from the Elton Lake campsite #1 to reduce the potential for use of an unsafe structure and hazardous material from being introduced into the water. The fire burned the latrine on Elton Lake campsite #1 within the BWCAW. The burnt infrastructure (fiberglass and treated lumber) is at risk of collapsing into a hole in the ground. This is a year-round water body. Removal and proper dispose of the burned infrastructure from the BWCAW will be necessary to keep forest users and visitors from meeting the unsafe structure and hazardous material from coming into contact with water. Using a Force Account Wilderness crew, the burnt material will be extracted from the area, hauled out, loaded onto a truck, and hauled to disposal site.

P1: John Ek Site Specific Area Closure and Site Stabilization Treatment				
Treatment	**Unit**	**Unit Cost**	**# of Unit**	**Total Cost**
Wilderness Ranger Crew (2)	day	$650.00	5	$3,250.00
Closure Signs	each	$50.00	8	$400.00
Program Manager (GS-9)	day	$350.00	2	$700.00
Vehicle Fuel/Mileage	each	$3.20	30	$96.00
Per diem	5-day trip	$262.00	2	$524.00
Total				$4,970.00

Recreation Site Protection and Stabilization (Greenwood): (Cathy)

The fire burned around the McDougal Lake Campground and associated recreation facilities including the boat launch, picnic area, and hiking trail. Other recreation sites affected by the fire include the Yukon North Snowmobile Trail and the Jackpot OHV Trail and trailhead of which all have received preliminary clearing of downed trees. The treatment is to fall imminent hazard trees at the McDougal Lake campground, the parking area for the McDougal Lake boat launch and at the Jackpot OHV trailhead. The one-mile hiking trail at the McDougal Lake Campground has not been cleared of any windfall and would remain closed until it can be considered safe for foot travel. Removal of nonsalvageable burnt infrastructure would occur at McDougal Lake Campground. The purpose of the treatment is to prevent damage to recreation infrastructure from fire damaged trees and reduce human contact to hazardous materials. The fire burned in the surrounding areas of the campgrounds, boat launch parking area and trailheads resulting in the mortality to pockets of trees in and around the developed sites. A dead tree is considered a hazard tree in a developed area setting. Directionally felling of these trees will prevent further damage to campground structures (undamaged by the fire) and prevent unnecessary injury to the public or their property.

P4: Greenwood Hazard Tree Treatments for McDougal Lake Campground and Boat Launch				
Treatment	**Unit**	**Unit Cost**	**# of Unit**	**Total Cost**

Hazard Tree Field Crew (4)	day	$1,300.00	2	$2,600.00
Miscellaneous expenses (saw gas, tool maintenance, etc.)	one time	$150.00	1	$150.00
Program Manager Oversight (GS-11)	day	$380.00	1	$380.00
Vehicle Fuel/Mileage	each	$3.20	60	$192.00
Total				$3,322.00

P5: Greenwood Hazardous Debris and Site Stabilization Treatment for McDougal CG

Treatment	Unit	Unit Cost	# of Unit	Total Cost
Field Crew Remove Stairway (4)	day	$1,300.00	3	$3,900.00
Miscellaneous expenses (saw gas, tool maintenance, gravel fill, etc.)	one time	$500.00	2	$1,000.00
Demo Materials	yard	$60.00	5	$300.00
Vehicle Fuel/Mileage	each	$3.20	30	$96.00
Archaeologist (GS-9)	day	$350.00	1	$350.00
Total				$5,646.00

I. Monitoring Narrative for Greenwood and John Ek:

Forest personnel will conduct implementation monitoring of the BAER treatments to check that treatments are present and functioning properly.

This report is an initial funding request based on a rapid assessment. If additional treatment needs are identified through more site specific on the ground investigation in cooperation with interested agencies, or through further field analysis location or noxious weed detection surveys, interim requests for additional funding will be filed. These funding requests will identify the purpose for each treatment, and specific treatment specifications, locations, and number of each treatment. A detailed implementation and treatment effectiveness monitoring plan will be submitted as a separate document for each fire to the Regional BAER coordinator.

Additionally, the team recommends annual monitoring of soils, vegetation, and hydrology characteristics within portions of peatlands that experienced high soil burn severity. The disturbance observed in these areas indicate significant impacts to soil productivity and native plant community recovery. It is uncertain if these areas will recover naturally or how long it will take them to recover. Monitoring will also provide useful information relative to climate change and carbon storage.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

Greenwood Fire

			NFS Lands				Other Lands				All
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	$		units	$	Units	$	$
A. Land Treatments											
L1: EDRR	acres	697	15	$10,455	$0			$0		$0	$10,455
				$0	$0			$0		$0	$0
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Land Treatments				$10,455	$0			$0		$0	$10,455
B. Channel Treatments											
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Channel Treatments				$0	$0			$0		$0	$0
C. Road and Trails											
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Road and Trails				$0	$0			$0		$0	$0
D. Protection/Safety											
P1: Area Closure	each	9,660	1	$9,660	$0			$0		$0	$9,660
P2: Warning Signs (roads)	each	618	11	$6,800	$0			$0		$0	$6,800
P3: Warning Signs (trails)	each	109	30	$3,276	$0			$0		$0	$3,276
P4: HTrees (Area)	one	3,322	1	$3,322	$0			$0		$0	$3,322
P5: Debris Removal	one	5,646	1	$5,646	$0			$0		$0	$5,646
				$0	$0			$0		$0	$0
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Protection/Safety				$28,704	$0			$0		$0	$28,704
E. BAER Evaluation											
Initial Assessment	Report	$60,000	1	---	$0			$0		$0	$0
				$0	$0			$0		$0	$0
Insert new items above this line!				---	$0			$0		$0	$0
Subtotal Evaluation				$0	$0			$0		$0	$0
F. Monitoring											
				$0	$0			$0		$0	$0
				$0	$0			$0		$0	$0
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Monitoring				$0	$0			$0		$0	$0
G. Totals				$39,159	$0			**$0**		**$0**	**$39,159**
Previously approved											
Total for this request				**$39,159**							

PART VII - APPROVALS

1. CONSTANCE CUMMINS Digitally signed by CONSTANCE CUMMINS Date: 2021.10.18 17:04:35 -05'00'

Forest Supervisor (signature) Date

2. _____ _____

Regional Forester (signature) Date

Line Items	Units	Unit Cost	# of Units	BAER $	Other $	# of units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$0	$0		$0		$0	$0
B. Channel Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$0	$0		$0		$0	$0
D. Protection/Safety										
P1: Stablization	one	4,970	1	$4,970	$0		$0		$0	$4,970
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Protection/Safety				$4,970	$0		$0		$0	$4,970
E. BAER Evaluation										
Initial Assessment	Report	$30,000	1	---	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$0	$0		$0		$0	$0
F. Monitoring										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$4,970	$0		**$0**		**$0**	**$4,970**
Previously approved										
Total for this request				**$4,970**						

PART VII - APPROVALS

1. CONSTANCE CUMMINS Digitally signed by CONSTANCE CUMMINS Date: 2021.10.18 13:28:20 -05'00'

Forest Supervisor (signature) Date

2. _____

Regional Forester (signature) Date