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Date: Sep11, 2000

Route To:

Subject: Burned Area Emergency Rehabilitation – Hi Meadow Fire, Final Report

To: Gail Kimbell, Forest Supervisor - Pike and San Isabel National Forests, Comanche
and Cimarron National Grasslands

Attached is the final report for Burned Area Emergency Rehabilitation (BAER) implementation for the Hi Meadow Fire on the Pike National Forest. Seeding, contour felling, directional felling, contour dozer ripping and straw wattle installation was complete as of August 1, 2000. Temporary road obliteration and trail maintenance has since been accomplished. Noxious weed control and post-implementation monitoring are ongoing. Please refer to the table on page 10 of this report for ending costs.

/s/ Ken Kanaan
Incident Commander, Hi Meadow Rehab

Date of Report: 7/25/00/00

BURNED-AREA REPORT
(Reference FSH 2509.13)**PART I - TYPE OF REQUEST****A. Type of Report**

- ☐ 1. Funding request for estimated WFSU-SULT funds
☒ 2. Accomplishment Report
☐ 3. No Treatment Recommendation

B. Type of Action

- ☐ 1. Initial Request (Best estimate of funds needed to complete eligible rehabilitation measures)
☐ 2. Interim Report
 ☐ Updating the initial funding request based on more accurate site data and design analysis
 ☐ Status of accomplishments to date
☒ 3. Final report - following completion of work

PART II - BURNED-AREA DESCRIPTION**A. Fire Name:** Hi Meadow**B. Fire Number:** COS-25184**C. State:** Colorado**D. County:** Jefferson, Park**E. Region:** R2**F. Forest:** Pike-San Isabel**G. District:** S.Platte**H. Date Fire Started:** 6/12/00**I. Date Fire Controlled:** 6/27 Contained 6/20**J. Suppression Cost:** Est. \$4.5-5.0 million**K. Fire Suppression Damages Repaired with -PF12 Funds:**

1. Fireline waterbarred (miles): 24
2. Fireline seeded (miles): 1
3. Other (identify):

L. Watershed Number: 101900020303**M. NFS Acres Burned:** ~5,623**Total Acres Burned:** ~10,970**Other ownership type:** () State () BLM (5,177) PVT**N. Vegetation Types:** PIPO-MUFIL ; PSME-MUMOL**O. Dominant Soils:** Resort, Sphinx, Raleigh series; shallow, somewhat excessively drained**P. Geologic Types:** Pikes Peak Granitic Batholith; granitic, decomposed granitics, rock outcrop

Q. Miles of Stream Channels by Order or Class: 1st order: 22 2nd order 10 5th order: 5

R. Transportation Systems:

Trails: 15 miles Roads: 30 miles

PART III - WATERSHED CONDITION

A. Fire Intensity (acres): 3851 (35%) (low) 4042 (37%) Moderate) 3051 (28%) (high)

B. Water-Repellent Soil (acres): 7093

C. Soil Erosion Hazard Rating (acres):
358 (low) 2095 (moderate) 3051 (28%) (high)

D. Erosion Potential: 22 tons/acre

E. Sediment Potential: 8100 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period: 3-5 years

B. Design Chance of Success: 65-70 percent

C. Equivalent Design Recurrence Interval: 25 years

D. Design Storm Duration: 24 hours

E. Design Storm Magnitude: 2.5 inches

F. Design Flow: 320 cubic feet per second per square mile

G. Estimated Reduction in Infiltration: 50 percent

H. Adjusted Design Flow: 480 cubic feet per second per square mile

PART V - SUMMARY OF ANALYSIS

A. Describe Watershed Emergency:

BAER ASSESSMENT

The fire burned approximately 11,000 acres in generally steep, mountainous terrain in the Pikes Peak granitics on the South Platte Ranger District and Jefferson and small portion of Park County. The North Fork of the South Platte River bisects the fire area nearly in half running roughly west to east. The north portion of the fire is mostly private land and the south predominantly US Forest Service, Pike NF. Many of the drainages flow directly into the North Fork. This area has extensive areas of rock outcrop and highly dissected hillslopes, with relatively high rates of average erosion of the coarse sands and gravels derived from decomposed granitics/granitic bedrock.

The fire is expected to increase the runoff and erosion rates significantly due to loss of vegetative overstory, groundcover, and loss of infiltration capacity of the soil. Hydrophobic soil conditions are extensive in the fire area and are found on nearly all high and medium burn severity areas with some additional areas in some of the lighter intensity areas.

Several residential areas exist in the north portion of the fire and many structures were lost (current estimates are in the 35-50 range). Fortunately many homes were spared but now face further risk from hillslopes runoff, coarse sediment deposition, and torrents produced from storm events over the next several months to few years.

Concern and anxiety is high due to effects from severe storm events in 1996 and 1997 following the Buffalo Creek fire. The geology, soils, and vegetation are largely the same on the Hi Meadow fire as the Buffalo Creek. Fortunately the Hi Meadow fire is more of a mosaic burn with less large contiguous areas of severe burn intensities concentrated in single subwatersheds. The storms affecting the Buffalo Creek fire were of high intensity and the first considered perhaps a 500-year event. High intensity storms are not unusual in the area, however, and considerable risk exists for significant runoff events from average storms during the monsoonal season soon approaching.

Effects to the Denver metro (Denver and Aurora) water supply from the Buffalo Creek fire storm events was significantly with damage estimates running several to tens of millions of dollars. Strontia Springs Reservoir received massive amounts of the fire ash and sediments from the July 1996 and subsequent storms. Plans are formulating to dredge the reservoir to regain holding capacity from the 1996-1997 events. Additional sediment input will add to the project.

B. Emergency Treatment Objectives:

BAER ASSESSMENT

Overall, treatment measures are intended to reduce threat to life, property, water quality, and soil productivity in the more fire-impacted areas where treatment is expected to be most beneficial and cost effective.

LAND:

Treatments are intended to provide surface roughness to decrease overland flow, dissipate energy, and slow transport and delivery of sediment to the stream system. Seeding, contour felling, straw wattling, and sandbag treatments are all designed as prevention measures to slow the movement of mobilized sediments from hillslope positions. The objective is to moderate the effects of expected runoff of ash, soil and stored sediment where soil surface conditions and down woody composition is adverse. The majority of the high and moderate burn area has very little down wood or other materials to provide surface roughness.

Vegetative cover has been lost in the high intensity areas with critical soil surface/hydrological conditions in the identified high burn severity areas. Seeding is intended to provide rapid introduction of viable grass species into critical areas where existing seed sources and rootstocks are most likely to have been destroyed by the fire.

Tractor tracking and surface scarification is intended to break through the hydrophobic soil condition prevalent at the soil surface. Depth of repellency is thin enough for tractor tracks (or in combination with scarification rakes) to disrupt the hydrophobic layer and allow infiltration of overland flow. Seeding, as possible behind the tractor is highly desirable to concentrate seed in fresh seedbed in case weather events since the fire have reduced the seedbed suitability before aerial application occurs.

CHANNEL:

The intent of channel treatments is to provide coarse, woody material and/or other available materials in otherwise deficient channels to slow the movement of sediment-laden flow and deposit a portion of the sediment load throughout the upper drainage areas. Purpose is to increase channel roughness to dissipate stream energy, increase sediment storage, and delay transport of sediment through the stream system.

ROADS AND TRAILS:

Objective of road and trail treatments is to reduce road failures including-loss of fill and surface material- and dissipate to a greater degree concentrated runoff from the road prism and associated damage.

STRUCTURE:

Treatment objectives primarily intended to reduce the risk of failure of existing retention structures on private land where construction methods and maintenance are suspect. Large amounts of stored sediment and fill material may be lost and directed into the S. Platte should they fail.

C. Probability of Completing Treatment Prior to First Major Damage-Producing Storm:

Land 60 % Channel 70 % Roads 75 % Other %

D. Probability of Treatment Success:

	Years after Treatment		
	1	3	5
Land	80	85	90
Channel	75	80	85
Roads	80	85	90
Other			

E. Cost of No-Action (Including Loss): \$17,500,000.00

F. Cost of Selected Alternative (Including Loss): \$2,429,908

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input type="checkbox"/> Geology	<input checked="" type="checkbox"/> Range	<input checked="" type="checkbox"/> Water Chem./Muni. Water
<input checked="" type="checkbox"/> Forestry	<input checked="" type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input checked="" type="checkbox"/> Engineering	<input type="checkbox"/>
<input type="checkbox"/> Contracting	<input checked="" type="checkbox"/> Ecology	<input type="checkbox"/> Research	<input checked="" type="checkbox"/> Archaeology	<input type="checkbox"/>

Team Leader: Craig R. Busskohl/ Tim Sullivan initiation phase

Phone: 541-278-3817

Email: cbusskoll@fs.fed.us; tsullivan@fs.fed.us

Contacts: Jerry Freeouf Regional BAER Coord. USFS 303-275-5095
Herman Garcia NRCS 303-236-2886 ex. 210

H. Treatment Narrative:

General:

The vegetative type associated with the south facing slopes leading into the North Fork South Platte River are dominated by the tree Ponderosa pine and Mountain mahogany as the shrub component. The additional understory of the grasses Slimstem muhly, Blue grama, Arizona fescue, and Little bluestem. The forb component includes Buckwheat species, Indian paintbrush, Asters, and Yellow Sweet Clover. Other species associated with the site include Douglas fir, Quacking aspen, Rocky mountain juniper, Wax currant, Sagewort, Dotted gayfeather, Lupine, Needleandthread, and Western wheatgrass. The current annual production of air-dry vegetation ranges from 100 to 200 pounds per acre for the south exposure site.

The north facing slopes are dominated by the Ponderosa pine and Douglas fir with an understory of Mountain mahogany, Wax currant, and Kinnikinnick. The understory grasses include Fescue species, Slimstem muhly, Western wheatgrass, Candy bluegrass, Needleandthread, and Blue grama. The current annual production of air-dry vegetation ranges from 400 to 600 pounds per acre for the site.

The vegetation in the drainage bottoms and mostly riparian areas are diverse and support the Willow species, Western Birch, Twinleaf Alder, Wood's rose as the tree and shrub component. The grasses and grass-like include Mountain Brome, Western wheatgrass, Elk Sedge and Rush species. During the time of investigation, the grasses were beginning re-growth from the base and buried modified stems (rhizomes). Therefore, re-growth for the bottoms is expected within 5-10 days after burn under current conditions. The shrub components such as willows should show emergence above the ground at the 10-day time frame and are expected to rebound and prosper after burn. The current annual production of air-dry vegetation ranges from 900 to 2000 pounds per acre for the site.

Recommended Treatment:

Treatment includes two seed mixtures with the North aspect being comprised more of cool season plants and the south aspect containing additional warm season plants. The mix will include a White oats as an immediate cover for one year. The dead root masses and foliage residue of this plant will last into the second year and bind the soil plus protect it from rain impact. The Slender Wheatgrass, variety San Luis, in the North aspect mix is also relatively short-lived at approximately 5-7 years. Both of these species are included because of their quicker germination and partial replacement to the pine needles that have been removed by the fire.

The North aspect, which is predominately USDA Forest Service, may be applied at a more expedient manner as time will not be required to receive a large number of landowner permissions to seed large areas by aircraft. There are a few individuals in the area and USDA NRCS and the sponsors should prioritize these first to accommodate this area as the first in application. This will allow 2-3 days before beginning the area north of the North Fork South Platte River.

The majority of the treatment area will be applied by aerial seeding. Landowners can do follow up raking on the contour to insure good seed to soil contact after aerial applications. The concentrations for raking should be along the bottoms and drainage slopes. The Forest Service property and private landowners in this area should joint venture in applying the seed in big blocks for quicker application. The property owners who wish not to have the seed aerial applied can have seed provided on an individual basis and hand seeded. The area delineated as habitat for the Pawnee montane skipper will have an additional specie, Dotted gayfeather, provided for hand seeding. The shrub Mountain mahogany will also be provided for hand seeding in critical mule deer habitat that was intensely burned. The seed should be raked into the soil to insure good seed to soil contact. Additionally any ground disturbing practice such as raking, seed spread, and tree felling should be done on the contour.

The aerial seeding should be applied on the contour without threat to safety of the flight plan. The flight plan should avoid the ridges and knolls that are rocky as these areas among the high intensive burn. The burn in many cases traveled in oblong circles with the edges identified as moderate to light with only the center needing seeding.

Seeding Mixture:

North Aspect

Species	Variety	CAT ¹ #PLS	%mix	PLS#/Ac.	\$/PLS#	\$/Ac.
Slender wheatgrass	(San Luis)	11	25	2.8	2.75	7.70
Western wheatgrass	(Arriba)	16	40	6.4	6.5	41.60
Arizona fescue	(Redondo)	4.5	<u>35</u>	<u>1.6</u>	15.10	<u>24.16</u>
Sub total			100	10.7		\$73.46
TOTAL ²						\$147.00

South Aspect

Species	Variety	CAT #PLS	%mix	PLS#/Ac.	\$/PLS#	\$/Ac.
Western wheatgrass	(Arriba)	16	25	4.0	6.5	26.00
Blue grama	(Lovington)	3	35	1.1	10.90	11.99
Little bluestem	(Pastura)	7	15	1.1	14.00	15.40
Arizona fescue	(Redondo)	4.5	<u>25</u>	<u>1.1</u>	15.10	<u>16.61</u>
Sub total			100	7.2		\$70.00
TOTAL ²						\$140.00

Application Helicopter	\$10.00Ac.
Cover Crop (White Oats ~\$20.00/Cwt) applied at 30#	\$ 6.00Ac.

TOTAL COST: North Aspect	\$163.00Ac.
South Aspect	\$157.00Ac.

Wildlife Habitat reestablishment:³

Mule Deer seed Mountain Mahogany on 500Ac.	0.5	60.00	\$30.00Ac.
Butterfly seed Dotted Gayfeather on 900Ac.	0.1	450.00	\$45.00Ac.

1. Terminology PLS Pure Live Seed
2. Double the Critical Area Treatment (CAT)for broadcasting
3. These species will be provided for South Aspect treatment to land owners (Non-USFS) for broadcast with other seed mix should they fall within the habitat area.

TREATMENT NARRATIVES:

The following recommendations are meant to reduce flooding and erosion/sedimentation resulting from summer thunderstorms. Efforts will concentrate on the severely burned areas which are accessible. The primary objectives are to 1) reduce surface erosion by breaking up the hydrophobic layer, and providing surface roughness, 2) reduce the rate of sediment transport through the stream system by reducing stream energy and providing roughness in the ephemeral channels to slow the transport of sediment through the stream system, and 3) reduce synergistic effects

of increased runoff and erosion from burned areas and the existing road system. See associated maps for the areas identified for the following treatments.

1) Contour felling or straw wattles

- Method: Fall trees or place straw wattles along the contour every 50-100 feet. Trees/ wattles need to be in contact with the soil surface, but extensive trenching is not necessary. The steeper the slope, the closer the structure spacing
- Purpose: Add roughness to surface layer to decrease overland flow, dissipate energy, and slow the transport and delivery of sediment to the stream system.
- Limitations: Rocky slopes.

2) Mechanical scarification

- Method: Use small cat or trail cat with scarifying teeth and/or grousers on tracks along the contour spaced 50 feet apart.
- Purpose: Breakup hydrophobic layer which will increase infiltration
- Limitations: Rocky or slopes steeper than 25%

3) Channel roughness

- Method: Drop trees that are at least 5" DBH and 10 feet long in headwater channels/ephemeral draws. Place logs in channel at 45-degree angle pointing upstream in an alternating herringbone pattern spaced 50-100 feet part. Where possible, use trees with crowns to increase roughness and sediment trapping capacity. Use cat where accessible to help place logs and key into bank.
- Purpose: Increase channel roughness to dissipate stream energy, increase sediment storage, delay transport of sediment through the stream system.
- Limitations: Areas not needing treatment: 1st or 2nd order channels identified by USGS blue-lines, or channels with evidence of riparian vegetation such as river birch, alder, or sedge having been present prior to fire, and/or presence of surface water.

4) Road Drainage Improvements

- Method: Maintain existing drainage structures to ensure proper function. Add additional waterbars to reduce distance water travels on road. In small ephemeral draws with gentle slopes, pull culverts that appear inadequate to handle significant water/sediment flows; replace with hardened low-water ford with sufficient cross-sectional area to pass significant water/sediment flows. Where drainage area too large or slope too steep, develop low 'overflow' channel so that if culvert plugs, excess water and sediment cross road at hardened low spot and prevent washing out of road and/or water from running down road surface.
- Specifics: FDR 552 lower end: Road runs directly down stream channel and is fed by several ephemeral draws in addition to upstream drainage area. The problem area drains directly into the NFSP ¼ mile below identified problem area. If possible, it is recommended that this section of road be closed. If the road needs to remain open for private land access etc., consider relocating outside of the stream channel.

Where FDR 552 crosses Beaver Gulch, culvert appears inadequate. Recommended to provide hardened low water 'spillway' adjacent to culvert so that if culvert plugs, water and sediment wash across the road without washing out road.

- Purpose: Reduce the effects of roads and potential for increased damage associated with the road system.

Limitations: None.

Wildlife Resources:

Threatened and Endangered Species

The Pawnee montane skipper (*Hesperia leonardus montana*) is the only federally listed threatened or endangered species known to use the burned area. Burned areas lying north of the North Fork of the South Platte River and west of Elk Creek are the high priority areas of concern for the skipper. This area is largely on private land. Blue grama (*Chondrosum gracile*) and Gayfeather (*Liatris punctata*) are two plant species important to the skipper. These species are generally found under ponderosa pine and tend to be more frequent on south facing slopes. Blue grama should be a significant part of seeding mixtures for south facing slopes. *Liatris* could either be included in the seed mix or be planted later by individual landowners.

Wildlife

The overall, long-term effect of the fire should be beneficial on most of the commonly found wildlife species in the burned area. The fire intensity was varied across the total burn area, so the resulting landscape effect is a mosaic of light, moderate, and heavy intensity burns throughout the area. A small part of the burned area in the area around Pine Valley Ranch and northward onto private land is mapped by Colorado Division of Wildlife as severe winter range for mule deer. Intensely burned areas in this severe winter range area should be re-established to native, site specific shrubs such as mountain mahogany. Some small mammals such as Abert's and fox squirrel, chickaree, ground squirrels/chipmunks, mice, voles may be displaced from intensely burned areas. The most detrimental loss to the small mammals is the loss of ponderosa pine canopy in the moderate and intensely burned areas for species such the ponderosa pine dependent Abert's squirrel. There is no practical way to mitigate this habitat loss for Abert's squirrel. Several reports of direct mortality to birds and mammals were reported to the team by landowners.

Birds include raptors, hummingbirds, crows, nuthatches, chickadees, woodpeckers, grosbeaks, finches, sparrows, towhees, and warblers. Because birds are mobile, there should be little effect on most species in the area. The burn may have a beneficial effect on the habitat and food availability for scavenger birds such as crows, turkey vultures, and raptors. Insects will be more prevalent in an area where burned trees are decaying, so woodpeckers, flickers, and other insect eating birds might be expected to use the area. The action of woodpeckers and flickers should create cavities for cavity nesting birds such as nuthatches. Bird habitat will be best if snags that don't pose a threat to safety are left standing.

Fisheries

The primary effect of the fire on fisheries is the potential for soil erosion to deposit sediment in the North Fork of the South Platte River, in Pine Valley Ranch Lake, in several smaller water bodies in the burn area, and in downstream impoundments such as Strontia Springs reservoir. These waters currently maintain a cold water fishery that could be negatively affected by a large influx of sediment that could occur if a significant rainfall event occurs before slopes revegetate. The negative effect comes when ponds trap sediment, decreasing their depth and resulting in shallower water. Shallow water tends to heat up more than deep water throughout the summer. Warm water contains less dissolved oxygen than cold water, so the overall effect on water quality could be detrimental to cold water species that require high concentrations of dissolved oxygen. A large influx of sediment from burned areas could also affect the fishery by interfering with growth and reproduction of aquatic macro invertebrates and their larvae, common trout foods. Sediment can also coat fish gills, interfering with respiration.

Noxious Weed Management

The inclusion of Noxious Weed Management is to prevent the aggressive spread and competition of the weeds after fire. The species found are Canada thistle, Musk Thistle, Leafy Spurge, Yellow Toadflax, and Diffuse Knapweed. The treatment area will include 30 Acres of USFS and 20 Acres of Private mapped areas will qualify for treatment. Treatment will utilize approved chemical herbicide and meet all labeled and state and federal requirements.

Cost of Treatment: \$125.00 per Acre.

PART VI - EMERGENCY REHABILITATION TREATMENTS AND SOURCE OF FUNDS
BY LAND OWNERSHIP

Line Items	Units	Unit Cost \$	NFS Lands		Other Lands		All Total \$
			Number of Units	WFSU-SULT \$	Number of Units	Fed \$	

A. Land Treatments

Seeding	Acres	182	1,028	186,846	0	0	0	201,794
Contour log terrace	Acres	552	921	508,108	0	0	0	105,000
Contour sandbag terrace	Acres	0	0	0	0	0	0	0
Contour straw wattles	Acres	939	662	621,624	716	349,050	116,350	660,400
Machine scarification and seeding	Acres	74	439	32,493	149	27,938	9,312	274,750
Hand raking, scarification	Acres	0	0	0	567	340,200	113,400	453,600
Noxious weed control	Acres	125	30	3,750	20	1,875	625	6,250
Wildlife habitat planting	Acres	30	0	0	500	11,250	3,750	15,000
T&E Butterfly habitat planting	Acres	45	0	0	200	6,750	2,250	9,000
Structure debris containment	Each	1,600	0	0	30	36,000	12,000	48,000
Hazardous tree felling	Each	25	0	0	250	4,688	1,562	6,250
Subtotal				\$1,352,821				

B. Channel Treatments

Energy dissipators	Each	0	0	0	211	6,963	2,322	30,185
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C. Roads and Trails

Drainage improvement	Miles	1,200	6	4,396	8	7,200	2,400	16,800
Low water crossings	Each	5,000	10	30,489	13	48,750	16,250	115,000
Subtotal:				34,885				

D. Structures

Water Impoundment Structures	Each	0	0	0	10	60,000	20,000	80,000

E. BAER Evaluation/Administrative Support

Salary, Travel, Etc. NRCS						19,600	8,400	28,000
Monitoring (3 years)				25,000				

F. Total Request

\$1,412,706

PART VII - APPROVALS

1. /s/ Abigail R. Kimbell 7/24/00
ABIGAIL R. KIMBELL
Forest Supervisor Date

2. DeAnn Zwight for _____ 7/25/00
 LYLE LAVERTY
 Regional Forester Date

Cc: Jerry Freeouf, R2 R.O. BAER Coordinator
Cc: Tim Sullivan, R2 R.O. BAER Coordinator

BAER -MONITORING NEEDS

HI MEADOW FIRE PIKE SAN ISABEL NATIONAL FOREST JEFFERSON AND PARK COUNTIES

General: track effects from precipitation events on burn area beginning immediately and subsequently for at least the next 3 years. Monitor installation and effectiveness of planned treatments. Assess response of treatments against expected response, and effects in untreated areas.

Monitoring is needed to:

- 1) Ensure proper installation and location of treatments during and after completion
- 2) Assess whether installation was feasible as initially determined during BAER team rapid initial field assessments
- 3) Track initial and ongoing effectiveness of (the) various treatments, especially initial germination and survival of seed applications
- 4) Provide for immediate storm tracking/monitoring to find and ameliorate developing problems before they can get worse, e.g. Road culverts
- 5) Visit burn area as snowmelt occurs the 1st spring following ('01) and subsequent (minimum) 2 years
- 6) Assess regrowth/sprouting of existing vegetation in untreated areas to comparing expected response against actual responses
- 7) Monitor duration of hydrophobicity in treated and untreated areas based on burn intensities, vegetation types, location, etc.
- 8) Cooperate with and assist research as needed for site selection and sample collection and other needs. Likely research agencies likely could include, Colorado State University, USFS Rocky Mt. Research Station, USGS, and others.

It is anticipated that monitoring activities will be carried out by the various affected agencies including the Pike-San Isabel National Forest, Region 2 USFS, Denver Water, NRCS, Jefferson and Park Counties in addition to and/or in cooperation with the above research facilities depending on needs. Documentation of field visits and observations on Forest Service lands should occur as visits are made and compilation of findings made as determined by the Region, Forest, or District.