Vegetation Resources Assessment

OBJECTIVES

The objectives of this vegetation assessment covered four general themes: 1) evaluate the consequences to vegetation related to the possible loss of soil productivity and hydrologic function; 2) evaluate the presence of, and potential risks from, invasive species including noxious weeds; 3) recommend possible mitigations for these risks including seeding treatments; and 4) evaluate the situation within the burned area for Forest Service sensitive plant species.

ISSUES

Much of the burned area of Twitchell Canyon Fire is at substantially higher elevations than is typical for past fires on the Fishlake. The magnitude of this incident, particularly with contiguous blocks of high burn severity in steeper drainages at higher elevations, presents a major risk to long-term soil productivity and hydrologic function. Loss of these critical values would pose a major threat to significant vegetative components and functions of ecological systems. Major losses of soil from the mountain slopes will compromise these fire adapted ecosystems.

A major vegetation issue identified during field visits included threats to the ecological integrity of the area from the expansion of invasive species in, and adjacent to, the burned area. Cheatgrass has the potential to dominate these areas that burned where pinyon and juniper trees and lower reaches of Gambel oak and other mountain brush species dominated the pre-fire community. Abundant cheatgrass has the potential to change the fire regime and alter the soil structure.

Noxious weeds, particularly Scotch thistle, leafy spurge, and musk thistle pose a threat to the burned area. These three species are particularly aggressive and need immediate attention. Each one has the potential to adversely affect hundreds of acres of public lands. Several other less serious noxious weeds also occur within the burned area.

OBSERVATIONS

Background

The burned area of the Twitchell Canyon Fire is within the northwestern portion of the Beaver Ranger District with elevations from about 6,400 to 11,300 feet. Precipitation generally ranges from 14 to over 35 inches per year. All aspects are well represented.

The area blackened by fire was dominated by spruce/fir, aspen, mountain brush and pinyon/juniper on the slopes below the distinct band of cliffs and steep rocky canyons with mixed-conifer above. The vegetation map of the burned area shows the following proportions of major vegetation types: spruce, subalpine fir, white fir, Douglas-fir, with minor amounts of limber pine, ponderosa pine and aspen (36%); aspen, typically with some conifer (31%); mountain brush (16%); pinyon pine and juniper (7%); Gambel oak (4%); and mountain big sagebrush (3%) along with rock (2%) and riparian (1%).

Aspen provides the dominant cover for a third of the area within the perimeter, and conifer species with aspen as a minor component dominate another third of the burned area. There is potential for aspen to have a positive response with root suckers in nearly two-thirds of this area. At least two dozen fire adapted species also add to the potential positive vegetative response. The Fire Effects Information System (FEIS) includes this information about aspen. The Fire Ecology section stated, “Quaking aspen is highly competitive on burned sites. Even where quaking aspen was a barely detectable component of the prefire vegetation, it often dominates a site after fire.” The Fire Effects section adds, “Moderate-severity fire does not damage quaking aspen roots insulated by soil. Severe fire may kill roots near the soil surface or damage meristematic tissue on shallow roots so that they cannot sprout. Deeper roots are not damaged by severe fire and retain the ability to sucker.”

The recent publication, *Pinon and Juniper Field Guide: Asking the Right Questions to Select Appropriate Management Actions* (Tausch, *et al*. 2009), is excellent and applies to the northeastern 15% of this burned area. They discuss areas with increased amounts of juniper in their introduction:

"Both infilling and expansion affects soil resources, plant community structure and composition, water and nutrient cycles, forage production, wildlife habitat, biodiversity, and fire patterns across the landscape. Another impact is the shift from historic fire regimes to larger and more intense wildfires that are increasingly determining the future of this landscape.

"The major goal of woodland management is to reverse these changing patterns by attempting to restore a functioning and resilient ecosystem through a more balanced plant community. … a properly functioning ecosystem is better able to resist dominance by cheatgrass and other exotic weed species after fire or other disturbances. … significant management will also be directed towards treatment following wildfire. Developing a management approach for implementing either preventative treatments or post wildfire restoration can be a difficult task. This is because of uncertainty about how the vegetation, soils, hydrologic function, and wildlife will respond to treatment."

Reconnaissance Methodology

During field reconnaissance trips, visual estimates were made to provide answers to several questions that were considered:

What are the values at risk?

What are the general ages and conditions of the major cover types and dominant species?

What intensity and soil burn severity did the fire have in the various cover types?

What are the general age classes of forest and woodland species in the area?

Is cheatgrass in the area? Is it abundant?

Are noxious weeds in the area? Are any abundant?

Are there native bunchgrass communities in the area? How did this fire affect them?

What was the vegetative response to past fires in this general area?

Rich Jaros, Mark Madsen, Brooke Shakespeare, TJ Clifford, Pete Haraden and Bob Campbell did much of the field work, either in groups, pairs, or by individual forays from the edges of the burn to the high and low interior areas. The field assessment included trips to North Creek; Indian Creek and Manderfield Reservoir basin; headwaters of Trail Canyon, Twitchell Canyon and Line Canyon; the interiors of Fish Creek and Shingle Creek drainages, Sawmill Bench, Mud Flat, Rattlesnake Ridge, Fish Creek Meadows and several trips thru Sevier Canyon. Formal transects and periodic, random tests for soil hydrophobicity were done during the field visits. Most also participated in aerial assessments of the area which confirmed the magnitude of the incident and the extent of the contiguous areas of high burn severity.

Findings

After doing the field assessment of the burned area, and reviewing other resource information from the District Office and the Supervisor's Office, three major values at risk became clearly apparent with respect to the ecosystem integrity and vegetation of this burned area. These include loss of soil productivity, loss of hydrologic function, and potential for noxious weeds and invasive species to spread into and increase dramatically in the burned area. These threats are generalized in this burned area by the integration of precipitation and elevation (see map). The first two threats apply primarily to the nearly 85% of the burned area that receives more than 22 inches of precipitation annually. The threat from invasive species is most compelling in the remaining 15% at the incidents northeastern edge.

Loss of Soil Productivity and Hydrologic Function

The areas of high burn severity in Line Canyon, Fish Creek, Shingle Creek, Sevier Canyon, Twitchell Canyon, Mill Canyon, North Creek, Pole Creek and Pine Creek present the high likelihood of substantial soil loss. We observed minor areas where soils have already washed away and exposed the roots of aspen and other woody species. These burned areas sustained ecosystems with fire-adapted species. **From a vegetation perspective, a major issue is how to keep soils from washing off these high-elevation, steep slopes and rugged terrain for the next 2 to 3 years**. Loss of substantial amounts of soil will expose root systems, remove root crowns and rhizomes that can grow new plants, and remove the soil seed bank including the loss of sometimes century-old dormant seed that requires a heat treatment from fire before germination is possible.

A list of the major species that we saw during the field assessment is almost simultaneously a list of highly fire-adapted and fire-dependent species. Aspen is fire-adapted and will have viable roots remain to give rise to a new generation of aspen sprouts with potential to establish, grow and retain aspen on these slopes. Other fire adapted species that should respond well might include manzanita, snowberry, alder-leaf mountain-mahogany, serviceberry, Oregon grape, mountain lover, Rocky Mountain maple, Wood's rose, Gambel oak, chokecherry, willows, mountain hollyhock, arnica, fireweed, sedges and grasses. A seeding with a higher elevation mixture of cultivars would be an important consideration to help retain soil on these steep mountain slopes. Adding sterile hybrid to the mix might also be a way to "grow mulch on site."

Threat of Expanding Infestations of Noxious Weeds and Invasive Species

The northern and southern edges of the burned area and portions of the western side have potential for cheatgrass invasion. We focused on the northeastern portion of the burned area because of the lower elevations, drier sites, and proximity to large amounts of cheatgrass in the vicinity. Cheatgrass could invade and/or increase rapidly here from modest amounts of cheatgrass already present. The benches and lower drainages in this portion of this burned area have the potential to convert to a sea of cheatgrass. The steeper slopes also have the potential for cheatgrass to establish and move up slope though in lesser abundance.

Cheatgrass is one of the few species that can grow under a juniper canopy. The cheatgrass establishes under the juniper and pinyon pine in low-densities, inconspicuous amounts in the conditions represented in this area, and following a disturbance such as fire, is poised to both increase and spread. It responds quickly, can thrive, reproduce, and dominate a landscape in a sea of cheatgrass in 3-4 years. Cheatgrass is also present under the Gambel oak canopy in small amounts at the lower edge of the oak zone. **Another major vegetation issue is how to prevent a rapid increase of cheatgrass infestation in the lower oak brush and pinyon/juniper zones at the northeast portion of the burned area.**

For these reasons, we will propose a seeding of about 15 pounds/acre that is intended to supplement the post-fire response of the existing grasses and compete well with cheatgrass that is poised to increase rapidly in the burned area if unoccupied space is available. This seeding should counter the potential establishment, spread and increase of noxious weeds.

The landscape of this burned area shows a "relay race" of less desirable species. A weed is a plant out of place. Preburn, pinyon and juniper moved into the mountain sagebrush-mountain brush/grass/forb steppe. After this fire, the area is primed to "pass the baton" and replace the pinyon and juniper with an invasive species and become a sea of cheatgrass. In time, cheatgrass would change the fire regime from the historical 20 to 40 years to 5 to 10 years and alter the soil structure. A subset of invasive species, 'noxious weed' is a political designation that varies from county to county and state to state. Four aggressive noxious weed species in the vicinity need immediate attention: musk thistle, leafy spurge, Scotch thistle, and spotted knapweed. These four species are capable of displacing the native vegetation within portions of the burned area. Also, musk thistle, leafy spurge, and spotted knapweed have the potential to spread, over a period of years, to the top of the mountain. These four noxious weed species can even thrive in, and potentially displace, a sea of cheatgrass. Other less aggressive noxious weed species also occur on forest-administered lands near the burned area: black henbane, bull thistle, dalmatian toadflax, field bindweed (morning glory), houndstongue, Russian-olive, saltcedar (tamarisk), and whitetop.

This burned area is essentially free of noxious weeds. Specifically, there are only a few known locations of noxious weeds within the burned area: one each of musk thistle and dalmatian toadflax in North Creek and some of whitetop in lower Sevier Canyon. However, the area's north and west sides are on the receiving edge of invasive species and noxious weeds. Known occurrences of Scotch thistle, musk thistle, and leafy spurge are located on the Forest north of the burn

perimeter. Several other species of less aggressive noxious weeds are also in the vicinity. This portion of the Forest is a great place to use an early detection/rapid response strategy with the noxious weed program.

The vegetation of this area is described above as fire adapted. However, the advent of cheatgrass at these elevations above 7,000 feet and now the presence of serious noxious weeds represent a changed condition that was not a historical part of these fire-adapted systems. This changed condition require vigilance with early detection and rapid response or the invasive cheatgrass and later more serious noxious weeds will ultimately displace the fire adapted species, shortened the fire return to 5 to 10 years, and ultimately occupy these landscapes completely.

Other Observations about Vegetation

Gambel oak, a fire-adapted species, is a major component of the vegetation cover lower elevation. This oak will sprout from existing roots systems that survived the fire and begin to re-establish a dominant shrub cover on the lower slopes. Gambel oak communities are rich in biodiversity and have a variety of fire-adapted understory species including sego lily and wild onion. Native grass species observed in the area that are expected to re-establish over time include Indian ricegrass, needle-and-thread grasses, and squirreltail. It will be decades before pinyon and juniper begin to dominate the lower benches and slopes between Fish Creek and Mill Creek in the northeastern portion of the burned area.

Research Natural Areas (RNAs)

Research Natural Areas provide these important functions: 1) reference areas for monitoring sustainable ecosystems, 2) protected locations of biological diversity, and 3) areas for research and advanced educational experience at the collegiate level. RNAs in Utah have special designation and fall under the direction of the Director of the Rocky Mountain Research Station (RMRS) in Fort Collins, Colorado.

The Upper Fish Creek RNA, located northwest of Mt Belknap in the headwaters of Fish Creek, includes a total area of 1,718 acres. Thirty percent (524 ac) is outside this burned perimeter. Of the 1,194 acres inside the fire perimeter, 30% (355 ac) are unburned/unchanged, 38% (455 ac) had low burn severity, 32% (381 ac) moderate burn severity, and less than 1% (3 ac) high severity. During the Twitchell Canyon Fire, forest specialists conferred regularly with Dr. Stanley Kitchen, stationed at the Shrub Sciences Lab, in Provo, who is the RMRS's coordinator for all RNAs in Utah. Neither the fire suppression activities had, nor any proposed BAER treatments will have, any direct or anticipated indirect impacts on this RNA.

The Bullion Canyon RNA, located east of Mt Belknap and north of Delano Peak was not affected by this incident.

Rare Plants

There are not any known occurrences of federally listed endangered or threatened plant species known to occur on the Beaver Ranger District. Also, no Forest Service sensitive plant species occur within, or adjacent to, the burned area of the Twitchell Canyon Fire. Furthermore, none of the proposed BAER treatments are likely to pose a threat to any known population of any sensitive plant species.

Substantial Deer and Elk Range

Much of this area is designated by the Utah Division of Wildlife Resources as substantial deer and elk range. Fire consumed many of the shrubs and mountain brush species that comprised key components of this important wildlife range. Establishing new populations of desired browse species will take some time before this range will be restored. Competition from cheatgrass and noxious weeds has the potential to compromise the restoration of this range for wildlife values on the northeastern and southwestern portions of the burned area.

RECOMMENDATIONS

Seeding Treatments

The purposes of the aerial broadcast seedings are to protect the soil productivity, hydrologic function, and ecological integrity of the extensive burned areas. Also, seed areas that will be compromised by an invasion of cheatgrass where the pinyon, juniper and mountain brush cover type burned and resulted in moderate and high burn severity. These later treatments are intended to prevent an alteration of the fire regime. If these lower areas convert to a cheatgrass dominated community, the fire return interval might be nearly 10 times as frequent as the historical fire patterns.

Four themes guided our thoughts on how to identify areas to apply seed on only portions of the forest-administered lands. 1) Seed many of the contiguous high and moderate burn severity areas in the major drainages of the burned area. These areas may have the greatest potential in the burned area to produce flood events. 2) Seed under any areas that are proposed for mulch. 3) Where mulch is not feasible, or possible because of steep slopes, seed with a sterile hybrid to grow mulch on site and protect long-term soil productivity. 4) Be proactive and aggressive with a seed mix, and mulch or sterile hybrid, designed to prevent an infestation of cheatgrass and other undesirable invasive species as well as to protect soil productivity.

<u>Treatments Proposed</u>

Five seed treatments are proposed (see Aerial Seeding Treatment map):

1) Use Seed Mix #1 for lower areas that will be mulched – 844 acres
   This treatment is designed to prevent a cheatgrass infestation.

2) Use Seed Mix #1 plus 20 lbs/ac of sterile hybrid for lower areas that will not be mulched – 1,439 acres
   This treatment enhances Treatment #1 to grow mulch on site to protect the soil and cover the seed.

3) Use Seed Mix #2 for higher areas that will be mulched – 4,239 acres
   This treatment provides a modest amount of 4 native grass species to supplement the expected natural response from fire-adapted species on site.

4) Use Seed Mix #2 plus 20 lbs/ac of sterile hybrid for higher areas that will not be mulched – 7,043 acres
   This treatment enhances Treatment #3 to grow mulch on site to protect the soil and cover the seed.

5) Use sterile hybrid triticale at 40 lbs/ac – 1,234 acres
   This treatment is designed specifically for the steep slopes and less receptive soils of the North Fork of North Creek to protect the slopes and keep the soil from washing off the mountain.

These seed mixes were developed specifically for emergency rehabilitation treatments within the context of Forest Service Manual (2523.2 p. 22; effective 5/26/2004): "Mulching, seeding, or planting of grass, forbs, shrubs, or trees when needed to prevent unacceptable erosion, to stabilize critical or significant natural or cultural resources, to prevent permanent impairment to critical habitat for Federal and State listed, proposed, or candidate threatened or endangered species, or to prevent detrimental invasion by non-native plants. Use only planted materials that should be effective within two growing seasons." We feel these are seed mixes "of species known to be effective for erosion control, adapted to the target area and compatible with future management objectives" (FSH 2509.13,20 p. 13). These seed mixtures will help to keep the soil on the mountain slope and promote hydrologic and ecosystem function. At the northeast portion of the fire protect against the rapid increase of cheatgrass. These mixes contain a strong component of native species as well as some introduced species. In light of Executive Order 13112 (2/3/1999) on invasive species, we considered and determined that the introduced species in this mix <u>will not</u> be "likely to cause economic or environmental harm or harm to human health."

Price estimates were obtained from Granite Seed Company in Salt Lake City. Actual costs may vary depending on availability at time of purchase from the successful bidder. The following table shows the pounds per acre of seed (PLS) that is used in each mix. Cost for aerial application is estimated at $35 per acre.

The seed purchased will be certified to the variety claimed. Also, the mix will be certified that NO noxious weed seeds are present. Pure live seed (PLS) equals the percent of purity times the percent total germination (PLS = % P x % TG).

These seed mixes include the recommendations of District and Forest specialists. We referred to seed mixes previously used with success on the Forest and the Intermountain Planting Guide, from Utah State University Cooperative Extension Service, while designing these seed mixes to achieve the FSM objectives listed above. Dr. Stanley Kitchen from the Rocky Mountain Research Station's Shrub Sciences Lab in Provo also provided input on the seed mixtures.

Seed Mixture #1 will be applied in areas that receive about 14 to 22 inches of precipitation annually and Seed Mixture #2 in the 22+ inch precipitation range. Some of the species in each of these mixes have the ability to dominate a stand depending on the location. The value of multiple species in the seed mix provides the flexibility for different species in the seed mix to thrive in a micro-site that is best suited for that certain species.

Native or Introduced	Species to be Seeded	Seed Mix #1 14 to 22 in. ppt.	Seed Mix #1 14 to 22 in. ppt. +Triticale	Seed Mix #2 22+ in. ppt.	Seed Mix #2 22+ in. ppt. +Triticale	Triticale Only
	< ---- Pounds / Acre (PLS) ---- >					
N	Big bluegrass "Sherman"	0.25	0.25			
N	Bluebunch wheatgrass "Anatone"	1.5	1.5			
N	Snake River wheatgrass "Secar"	1.5	1.5			
N	Canby bluegrass	0.5	0.5	1	1	
N	Sandberg bluegrass (not canbyi)	0.25	0.25			
N	Slender wheatgrass "Pryor"	3	3			
N	Slender wheatgrass "San Luis"			3	3	
N	Mountain brome "Bromar" or "Garnet"	3	3	4	4	
N	Thickspike wheatgrass "Bannock"	1	1	2	2	
I	Crested wheatgrass "Fairway"	2	2			
I	Crested wheatgrass "Hycrest"	2	2			
I	Sterile triticale hybrid		20		20	40

Total Pounds / Acre	15.00	35.00	10.00	30.00	40.00
Total Seeds / ft² 1/	71	76	43	48	10
Estimated Seed Cost / Acre	$44.00	$76.00	$25.25	57.25	64.00
Estimated Cost Seed Mix/Pound	$2.93	$2.17	$2.53	$1.91	$1.60

1/ Recommended rates for broadcast seeding mixes are about 50 – 100 seeds per square foot.

Specific ecological attributes valued for some of the species include the following:

Big bluegrass— "when properly managed, will compete with cheatgrass"

Bluebunch and Snake River wheatgrass— "long-lived, drought tolerant, widespread"

Sandberg and Canby bluegrass— "important for soil stabilization…one of the first grasses to green-up in the spring…excellent in low rainfall native mixes"
(These bluegrasses should be very competitive with cheatgrass.)

Slender wheatgrass— "valuable in erosion control because of its rapid development"

Mountain brome— "will establish and grow on rather poor, depleted soils … recommended sites include weedy openings"

Thickspike wheatgrass— rhizomatous and "adapted to disturbed range sites and dry areas subject to erosion"

Crested wheatgrass— "one of a few grasses that has the ability to compete with difficult to control weedy annuals such as cheatgrass"
— Fairway is reported to fade in abundance sooner than other varieties
— Hycrest is "a hybrid between standard and introduced…outstanding seed producer, excellent seedling vigor, easy to establish under harsh conditions"

Sterile hybrid triticale— "hardy and durable – but, not persistent or invasive…adapts to a wide range of soil and moisture conditions"

There may be opportunities to add other species to the seed mixes. We suggest that District personnel contact the Utah Division of Wildlife Resources prior to actual purchase of the seed. Depending on seed availability and time of seeding, the Division may have seed for forb and browse species that could be added to the seed mix that would enhance both wildlife habitat and diversity in the area (see more detail in Other Recommendations #1 below).

We constrained the total number of acres to be seeded by these guiding factors:

Only seed in disturbed areas located on NFS lands.
Generally, seed suitable areas located within some moderate and high burn severity zones.
Seed areas where pre-burn juniper stands lacked adequate grass seed bank.

The Planting Guide for Utah gives the following information in the "Wildfire Seedings " section.

"Steep slopes and rough areas that are not accessible to conventional ground equipment can be aerial seeded … if it is not possible to cover seed, plant late in the fall and increase the seeding rate ... burned sites, including forest and desert ranges are often seeded within a few days or weeks following the fire, in the mistaken belief that the ash will cover the seed … even if an ash residue or a loose seedbed is present, seed only during the appropriate seasons. Do not plant on a loose dry seedbed … plant in the late fall when seedbeds are firm."

Rest the seeded area, and entire burned area, from livestock grazing for two full growing seasons. This will give the seeded species and residual plants two seasons to grow, set seed and begin to re-establish. When livestock are allowed to return, the treated areas could be grazed late season after seed set. The livestock hoof action would help to work some of the shattered ripe seed into the soil which will continue to extend the value of the treatment.

Noxious Weed Expansion Detection

The purpose of this noxious weed expansion detection treatment is to identify the spread of noxious weeds from any currently known location of noxious weeds. This is an early detection and rapid response strategy. Three aggressive noxious weeds need immediate attention; Scotch thistle, leafy spurge, and musk thistle threaten the area. Also, houndstongue might increase in the area, and whitetop may spread in the lower reach of Sevier Canyon. Several other

species on the State of Utah noxious weed list are present adjacent to the burned area (see Existing Noxious Weed Locations map).

This treatment includes a search for any new individuals of noxious weeds on forest-administered lands for 300 feet inside the fire perimeter along four specific stretches (see Noxious Weed Monitoring and Spot Treatment map). Most of the forest routes in the northeast quadrant of the burned area will be monitored for 150 feet on each side of the route. The Indian Creek and North Creek roads, as well as the dozer line in the South Fork of North Creek will be monitored for 300 feet on each side of the route or line. Also, spike camps, drop points, helispots, and some heliwell locations will be monitored. Individuals of noxious weeds generally will be sprayed with herbicide at the same time they are discovered. New weed locations will be documented with GPS positions and photographed when possible. The search of all locations will occur three times during the growing season, preferably in May, late-June and early August. This frequency should allow individual young weeds to be detected and treated before they reach full maturity and set seed. Monitoring levels may be increased if substantial amounts of young noxious weeds are detected.

Other Management Recommendations

These recommendations do not qualify for BAER funding but were discovered during the assessment process.

1. It would be well to add additional forb and shrub species to seed mixture #1 for wildlife benefit. Species to consider include mountain big sagebrush, antelope bitterbrush, cliffrose, Palmer penstemon, firecracker penstemon and showy goldeneye. Other species to be added will require approval by the Forest Supervisor.

2. Adequate moisture from spring rains will be key to a successful response from the seeding. Forest personnel should anticipate the need to monitor in 2011, and be prepared to seed a second time in late fall 2011.

3. Also, it will be important to monitor the regrowth of vegetation that was on site prior to the burn in the low soil burn severity areas. Are the desirable species establishing or regrowing in the low soil burn severity areas? Is cheatgrass increasing in these areas? If desirable species do not respond reasonably well in the first growing season, it would be important to seed the areas that would be prone to a cheatgrass invasion.

4. It would be well for the Beaver Ranger District's weed specialists to update the weed inventory near the north and west edge of the burned area on, and adjacent to, the Forest.

5. District weed specialists might coordinate with the Beaver County Cooperative Weed Management Area (CWMA) and the South-Central Utah CWMA about the spreading infestation of Scotch thistle near the north, northwest and southwest edge of the burned area and encourage cooperation from adjacent ownerships about controlling the thistle. This is a serious noxious weed issue near the burned area and along major and other well-used travel routes in the Clear Creek, Sulphurdale, Pine Creek, and North Creek areas. These areas underscore the need for continued vigilance and early detection/rapid response to new occurrences on the Forest.

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