Multi-Party Monitoring for the Uncompahgre Plateau Collaborative Restoration Project

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Background on the Uncompahgre Plateau Collaborative Restoration Project

The Forest Service and partners for the "Uncompahgre Plateau Collaborative Restoration Project" are working to enhance the resiliency, diversity, and productivity of a priority landscape in the Rocky Mountains. The Plateau is located within five counties on the Western Slope of Colorado and includes key watersheds that feed the Colorado River. This Project builds on previous landscape-scale collaboration on the Uncompahgre Plateau, and applies a science-based ecosystem approach to restore vital forest health and the communities of western Colorado.

"Relationship building" on the Grand Mesa, Uncompahgre and Gunnison National Forest (GMUG) has yielded many acres of NEPA-ready projects, and action has begun. This "Uncompahgre Plateau Collaborative Restoration Project" is cradled in science, creates jobs while supporting local industry; reduces fuels and ultimately restores a landscape that will support large-scale beneficial fire. Adaptive management based on locally informed evidence guide our actions, and monitoring is fundamental to improving our work. We aim to eventually reduce forest management expenditures (including wildfire suppression costs); support local industry; and promote new economic opportunities. This project develops active management of forests and rangelands, and creates greater resiliency to natural and man-caused disturbances; this progress will be particularly important if future climates shift toward warmer, drier conditions.

This Uncompahgre Plateau Collaborative Restoration Project proposed active restoration projects on 160,000 acres of NFS lands from 2010 through 2020. These treated areas will influence fire risks across 555,300 acres of the Plateau (out of a total 1.5 million acres). Treatments will include: prescribed burns, mechanical treatments, timber harvesting, invasive species treatments, re-vegetation with native seed, trail and road relocations to reduce sediment, riparian restoration, and improvements for Colorado River cutthroat trout. Multi-party monitoring efforts are proposed for 68,000 acres.

Cooperative relationships on the Western Slope of Colorado have been developing over the past 15 years beginning with the formation of the Public Lands Partnership and Uncompahgre Partnership (UP) in the mid-1990s. Strong bonds and trust have been created among community members, public land managers, environmentalists, academia, agency researchers, recreation groups, local governments, energy industry, ranchers, timber companies, and the general public.

As of 2013, most of the mechanical treatments have been done in the 17,000 acre Unc Mesas restoration project, and we are ready to begin implementation of treatments in the 130,000 acre Escalante Project. We also have a native seed program with many species of grasses and forbs ready to apply to the landscape; an existing and active invasive species eradication program; a Travel Management Plan and Fire for Resource Benefit Plan in place; and we still retain the two largest remaining Forest Products Industries in the State to make this effort economically possible. The on-going Uncompahgre Plateau Collaborative Restoration Project is the next step in engaging everyone in the future of this landscape.

The landscape strategy will apply the UP's model "Uncompahgre Mesas Collaborative Forest Restoration Demonstration Project" (Unc Mesas Project) as a guide for future restoration efforts on NFS lands. This model, which has brought numerous diverse partners together, effectively working in a manner of trust, is partially responsible for the major accomplishments on the Plateau.

Two energy corridors cross the southern reaches of the Plateau. The Tri-State Generation and Transmission Association (Tri-State) line (a 115 kV transmission-class line) delivers power to local and regional energy providers such as Delta-Montrose Electric Association (DMEA) and San Miguel Power Company. Western Area Power Association (WAPA) line is a 345 kV line transmitting power generated from federal hydroelectric

facilities in Colorado to high demand areas from Nevada to California. The UP Project has collaborated in major fuel reduction projects along the powerline corridors.

The UP's Native Plant Program has been a national leader in development of native seed production. Comparison and production studies have resulted in the collection and propagation of 13 species of native seed (grasses and forbs), which have now been released to commercial growers. As seed is produced, it will be available for restoration projects on the Uncompahgre and Colorado Plateau. These species are considered key components of native ecosystems in the Colorado Plateau area. There are currently three Coordinated Weed Management Area Plans on the Uncompahgre Plateau landscape. These Weed Management Plans use multiple techniques to control the spread of invasive noxious weeds, including chemical and biological control measures critical to restoration and preventive measures to control invasive species.

The towns of Montrose and Delta lie at the base of the Plateau and are home to the last remaining large sawmills in Colorado. Intermountain Resources, located in Montrose, processes everything brought in from two states. Delta Timber utilizes most of the aspen cut in Colorado and is important to work on Sudden Aspen Decline. A locally sustainable supply of wood products from the Western Slope is critical to the economics of the Intermountain mill and meeting forest health and safety objectives (bark beetle issues) across the State of Colorado.

The GMUG National Forests completed the Uncompahgre Plateau Travel Management Plan in 2002, and its vision is important to restoration efforts across the Plateau. Proposed treatments include decommissioning 130 miles of road, relocating 1.5 miles of road to benefit riparian habitat, and erosion control on 100 miles of trails. All travel management decisions have been made and are ready for implementation.

Previous NFS restoration efforts on the Uncompahgre Plateau have been limited and concentrated around private inholdings and infrastructure to provide fuels reduction, WUI protection benefits and mule deer habitat enhancement. In addition, several weed management areas have been intensively treated for invasive species, including spotted knapweed, yellow star thistle, and others. In 2004, NEPA analysis for Spring Creek/Dry Creek Landscape was completed and fulfilled a variety of on-the-ground restoration and vegetation management treatments. These combined treatments, totaling 20,000 acres on NFS, BLM and private lands, represent a major success for active management at ambitious scales. The work supported by the Collaborative Forest Landscape Restoration Program will build on this success to dramatically enhance the future forests, woodlands, and rangelands of the Uncompahgre Plateau.

Goals and Objectives for the Uncompahgre Plateau Collaborative Restoration Project

Collaborative efforts spanning the past decade and a half have led to the development of a set of six goals for improving the future landscapes of the Uncompahgre Plateau:

1. Enhance the resiliency, diversity and productivity of the native ecosystem on the Uncompahgre Plateau using best available science and collaboration.
2. Reintegrate and manage wildfire as a natural landscape scale ecosystem component that will reduce the risk of unnaturally severe or large crown fires.
3. Restore ecosystem structure, composition and function to encourage viable populations of all native species in natural patterns of abundance and distribution.
4. Preserve old or large trees while maintaining structural diversity and resilience; the largest and oldest tress (or in some cases the tress with old-growth morphology regardless of size) should be protected when feasible from cutting and crown fires, focusing treatments on excess numbers of small young trees where this condition is inconsistent with Historical Range of Variability (HRV) conditions.
5. Reestablish meadows and open parks and re-establish grasses, forbs, and robust understory communities.
6. Manage herbivory. Grass, forbs, and shrub understories are essential to plant and animal diversity and soil stability. Robust understories are necessary to restore natural fire regimes and to limit excessive tree seedling establishment. Where possible, defer livestock grazing after treatment until the herbaceous layer has established its potential structure, composition, and function. Project partners will work with the CDOW to manage big game populations to levels that will contribute to successful restoration treatments.

Specific treatment objectives for the major vegetative communities within the project area as well as examples of proposed types of projects include:

Sagebrush. Restoration treatments are needed to improve the understory, increasing available forage for both wildlife and domestic livestock. The GMUG will work closely with the CDOW to target key Gunnison sage-grouse habitat areas as well as take advantage of biomass potential of pinyon-juniper in reestablishing key openings. At least 1,800 acres of sagebrush treatments are planned in the next decade, mostly with mechanical treatments.

Pinyon-Juniper (PJ). The PJ cover type is currently the largest cover type on the Plateau. A comparison between 1937 and 1994 showed that PJ expanded into areas formerly dominated by shrublands and grasslands, and the density of PJ stands has increased. These changes have decreased the amount of available forage for both wildlife and domestic livestock and have degraded habitat for Gunnison sage-grouse. The landscape restoration project plans to reduce fuels and enhance the patchy mosaic of vegetation types (and ages) by masticating trees on 2,500 acres. The treatment units will also be designed to reduce invasion into other cover types.

Mountain Shrub (MS) (oak/service berry/mountain mahogany). Mastication projects with follow-up prescribed burning are proposed on 7,000 acres to mimic natural fire disturbances, and result in a patch mosaic with 10 to 15 percent of MS in early seral stage. The resulting mosaic will improve forage and grazing and also limit the size of large crown fires when they occur.

Ponderosa Pine (PP). Restoration in the PP cover type will reduce tree density by cutting large numbers of small-diameter trees relative to larger trees; improve spatial heterogeneity possible; protect old-growth

ponderosa pine; increase long-term structural diversity (within stands and across landscapes); and create fuel conditions that reduce the likelihood of uncharacteristically sever fires, by reestablishing the high-frequency, low-intensity historic fire regime. Both commercial and noncommercial treatments will be accomplished with mechanized equipment. Post-harvest prescribed fire will be used as part of our strategy to reintroduce fire as an active part of the landscape. We will design treatments to reduce surface and ladder fuels, create conditions favorable to the growth of grasses, forbs, and shrubs, and then to continue using wildfire as a management tool to maintain these ecosystems. 7,700 acres of PP treatments are NEPA-ready, and over 15,000 acres of PP treatments are proposed for the decade.

Mixed Conifer (MC) (Ponderosa Pine/Aspen/Douglas Fir/Blue Spruce/Engelmann Spruce/Sub-alpine Fir). Restoration treatments in the MC cover types will reduce tree density and develop more open conditions characterized by multi-age structure and multi-species tree composition. Treatments will increase diversity of forest structures within stands, including variety in spatial arrangement of residual trees and development of small (0.1 to 0.5 acre) meadows. Because the future is expected to be hotter and drier, treatments will create conditions favorable to Douglas-fir, ponderosa pine, and aspen regeneration over blue spruce. Prescriptions will generally favor the perpetuation of aspen on the landscape by encouraging regeneration. Both commercial and noncommercial treatments will be accomplished with mechanized equipment. Most areas will receive follow-up broadcast burning. The fire regime in the cooler, moister mixed-conifer forest was undoubtedly a less-frequent mixed severity regime; fire in places would creep through mixed conifer forest, consuming little fuels and killing only small trees while in other areas torching and killing groups or patches of large trees. The reduction in surface, ladder and canopy fuels will result in a lower risk of stand-replacing fire and will create the conditions necessary to reinitiate the historically safer, mixed-severity fire regime. Over 4,000 NEPA-ready restoration projects include the Unc Mesas Project and treatments along Western power lines; over 11,000 acres of MC treatments are included in this proposal.

Aspen. There is an urgent need to treat aspen stands. Only one-fourth of the stands are younger than 90 years which are predominantly 80 to 120 years old and therefore less resilient to Sudden Aspen Decline (SAD). SAD is a relatively recent phenomena, not described by regional insect and disease experts until 2007. Foresters estimate that approximately 37% of the aspen cover type on the Plateau is impacted by SAD; about one-fourth of the standing aspen trees on the Plateau are dead. Mortality is having the greatest impact on medium-size trees (3-9" dbh); this combines with the dramatically low rates of establishment of new aspen trees to create a high risk of major reductions in aspen on the Plateau. Young aspen trees are rare across the Plateau, as are young stands of aspen. Approximately 11,000 acres of NFS aspen projects are planned, including over 600 NEPA-ready acres. Restoration treatments in other vegetation types will also favor aspen, but severe browsing may pose a severe challenge.

Spruce-Fir (SF). The Plateau has very few young spruce-fir forests; historically we expect young (<75 years) stands would have comprised 20 to 70% of the spruce-fir forests of the Plateau (varying in response to major fires across decades). Although any single acre of spruce-fir forest would not be outside the historical range of variation that would have been common for spruce-fir forest, the overall landscape of the Plateau is probably well outside historical conditions. The near-absence of young spruce-fir forests results in a low diversity in age, size and seral conditions, with large implications for wildfire spread and insect/pathogen outbreaks. The potential for biomass utilization and stewardship contracting are excellent, providing both an opportunity for restoring a missing part of the forest landscape and provided funds (from commercial harvests) to help offset the cost of restoration work in the ponderosa pine and mixed-conifer. Approximately 4,000 acres of SF are proposed for treatments, of which 550 acres are NEPA-ready in 2010.

Approach to Multi-Party Monitoring

Monitoring is a vital component of our landscape restoration approach. It allows the partners to assess how effective restoration treatments achieve our objectives, and whether any unintended outcomes (such as proliferation of noxious weeds) developed. We have developed a "multi-party" approach to monitoring that ensures high quality information that supports high confidence among all collaborators. The three key pieces of our monitoring approach are:

1) Collaborative development of goals and specific objectives for each major project;
2) Collaborative design of general approaches to monitoring, leading to detailed designs by appropriate experts and stakeholders on behalf of all collaborators;
3) Conducting field measurements; sometimes these are performed by agency personnel as part of normal operations, and other times by combinations of agency personnel, outside experts, and stakeholder volunteers.
4) Synthesis of monitoring data to inform all collaborators about what we have learned, and to support insightful discussions about what we might modify to improve our restoration work.

Our multi-party monitoring approach will evolve as we gain experience working together. Baseline data will be recorded prior to treatments. Monitoring will continue periodically over 15 years, following completion. Permanent transect markers will be established to continue monitoring efforts indefinitely. Colorado Forest Restoration Institute (CFRI) will compile, analyze and store the monitoring data.

In the early winter of 2011, all stakeholders were invited to discuss our monitoring priorities for this year, based on anticipated funding. We also tentatively decided that an "all hands on deck" monitoring meeting should occur at least once during the winter, and once (in the field) during the summer. Many important details will need to be developed and addressed throughout the year, so we will use a Monitoring Guidance Committee (MGC) for operational details. The MGC will include key Agency personnel, the Colorado Forest Restoration Institute, and other key people needed for particular projects. The work of the MGC will be very transparent, with prompt communication to all stake holders about issues, decisions, etc.; everyone's input is welcome at all times, though no one is asked to volunteer for all the time-demanding tasks.

Some projects related to landscape restoration were described in previous years and are now complete, such as the monitoring of the Burn Canyon site and the Biomass Assessment that was led by Nate Anderson of the Forest Service's Rocky Mountain Research Station. For 2013, available funding supported work on 12 projects (see other UP documents for details):

- Uncompahgre Mesas Monitoring Plots (Forest condition assessment)
- Unroaded old-growth on Unc Mesas
- Aspen Browse
- Website Development and Citizen Science web page
- Invasive Species
- Riparian habitat improvement
- Travel Management
- North Uncompahgre prescribed burning monitoring
- Landscape-scale monitoring
- Developing national indicators for restoration
- High resolution airborne imagery for the Escalante Project area
- Economic monitoring of restoration projects
- Historical conditions for pinyon/juniper woodlands
- Native seed monitoring

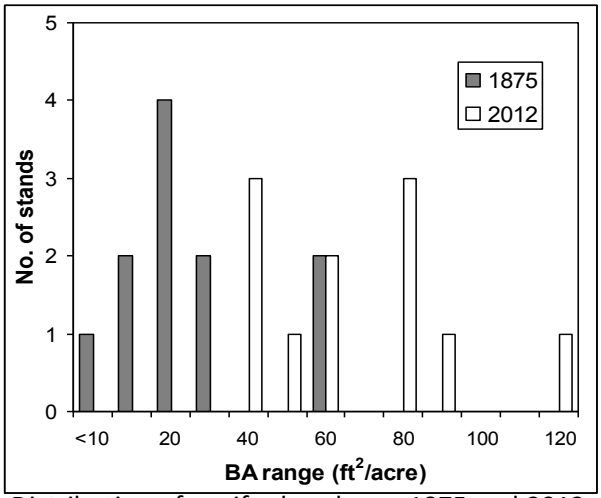
Project name: Uncompahgre Mesas Monitoring Plots (Forest condition assessment)

Leadership people:
Matt Tuten (USDA Forest Service), Rusty George (Montrose High School)

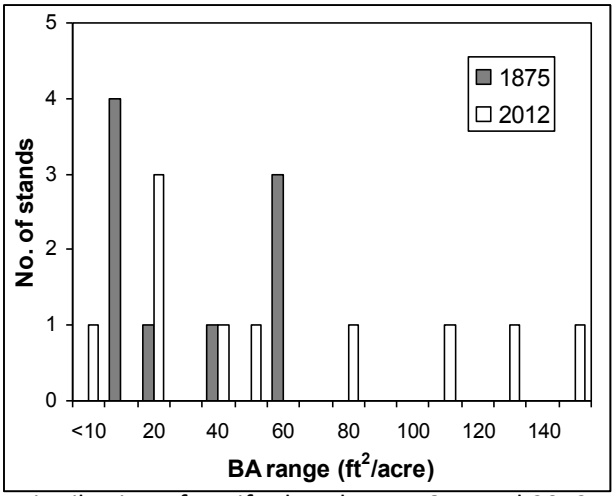
Overall goals and objectives:
Restore ecosystem structure, composition and function.
For ponderosa pine type forests, these goals include:
20 to 90 ft^2/acre, often clumped (20-100 ft. radius) with mini-meadows; uneven-age structure, fostering old, large trees.
For mixed-conifer type forests, these goals include 25 to 130 ft^2/acre basal areas; clumped in some places (20-100 ft radius), but not everywhere; some mini-meadows (0.1 to 0.5 acres), uneven-age structure, favoring Douglas-fir, ponderosa pine, and aspen regeneration

Objectives for 2013 monitoring:
The objectives this year include continued use of the "forensic forestry" protocol from the historical reconstruction work to 1) assess the Unc Mesas treatments relative to historical forest structure, and 2) provide additional historical reconstructions to support the expansion in the Escalante Project. We also will assess the value and limitations of the rapid approach for multi-party assessments of historical stand structure by comparing the basic insights from the UP protocol with research-grade characterizations of plots undertaken by Peter Brown of the Rocky Mountain Tree Ring Laboratory.

2013 findings:
Additional rapid-assessment/forest forensic plots within the Escalante Project area showed similar results to plots from the Unc Mesas areas. Historical forests were characterized by much lower basal areas, with substantial areas in small meadows. The mechanical treatments in the Unc Mesas units recreated stand structures that were well within the historical ranges (see photos next page). Low basal area in mixed conifer stands in 2012 were all locations dominated by aspen, and we do not have a way to reconstruct historical aspen basal area.

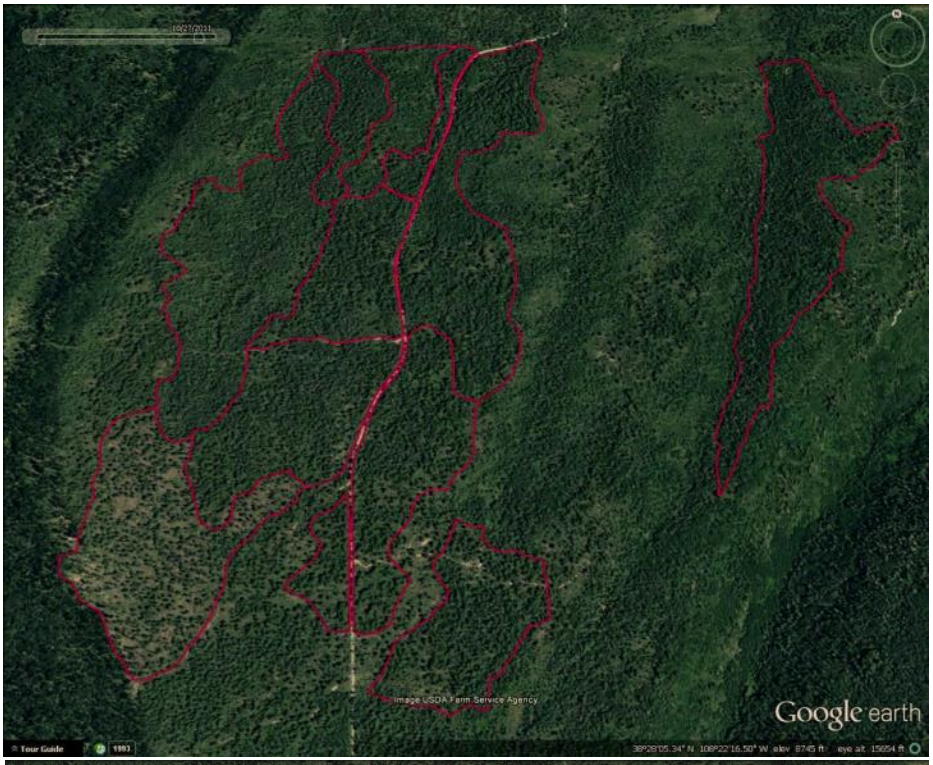


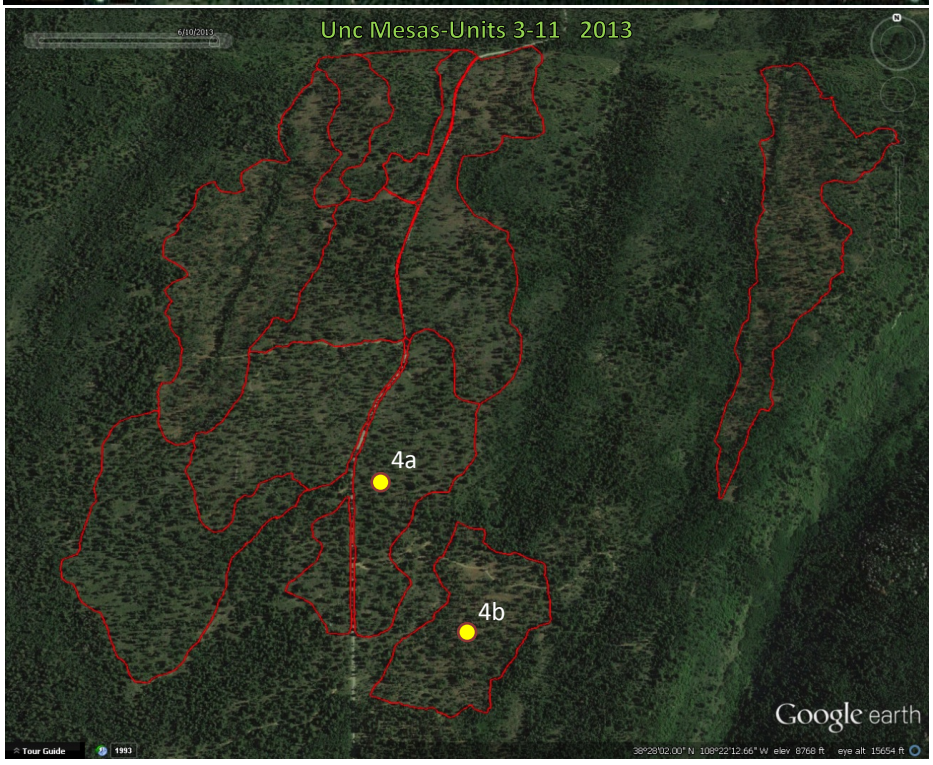
Distribution of conifer basal area 1875 and 2012 in ponderosa pine stands.



Distribution of conifer basal area 1875 and 2012 in dry-mixed conifer stands.

We sampled 18 stands in the Front Range of Colorado using our rapid-assessment/forest forensic protocol, centering each plot on a plot previously sampled by Peter Brown. Dr. Brown's research-grade assessment included directly aging cores from living and dead trees, whereas the UP approach cores some trees and estimates others. Our comparison of methods will be completed early in 2014.





Key questions to be examined:

Did treatments move the ecosystems toward the restoration goals?

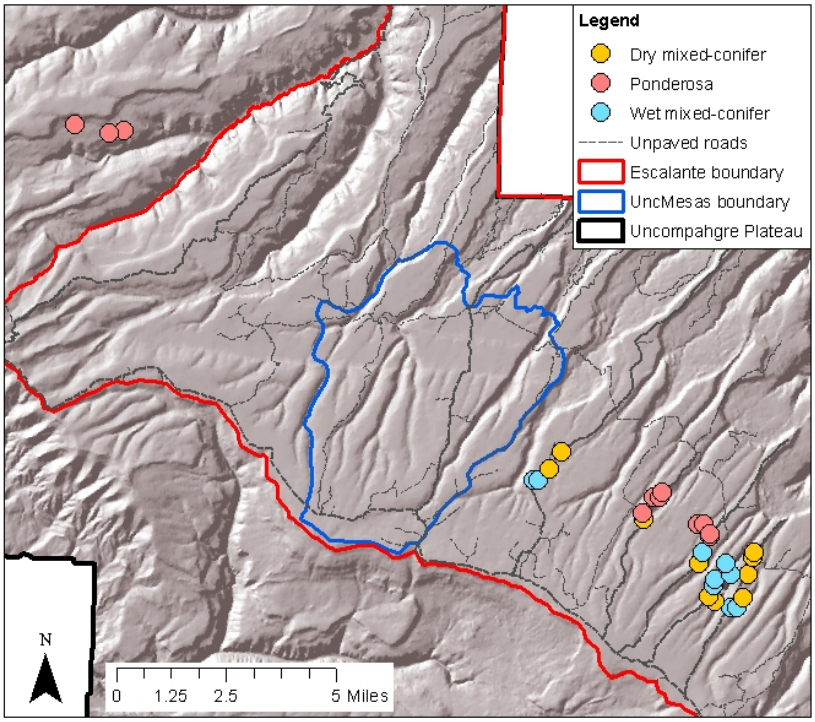
Were any unintended consequences important (such as invasive weeds)?

How might the efficiency and effectiveness of the treatments be improved in the future?

Protocol:

Spatial scale of the area under consideration

Orignially 17,000 acres for Unc Mesas, now expanded to over 135,000 acres for the Escalante Project. We have assessed forest structure in over 30 stands located within or nearby the Escalante Project area:



General approach

Active restoration treatments envisioned for up to half (or more) of the Unc Mesas area (and expanding to the Escalante Project Area), substantially modifying landscape-scale structure and function (including fire hazard)

Locations assessed

12 new plots were added in the Escalante Project area, giving us about 50 plots to inform us on historical stand structure.

18 plots were measured in the Front Range for the method comparison.

Measurements taken at each location

Stem-mapping of live post-treatment trees

Mapping of signs of historical (1875) forest structure for the historical condition plots

People engaged in measuring (agency, volunteers, etc.)

Dan Binkley (CSU), Megan Matonis (CSU), Matt Tuten (USDA Forest Service), and UP collaborative volunteers

Data management plans

Data are stored as Excel files and .jpg photo files

Data archiving plans

Data will be archived at CFRI

Plan for communicating findings to collaborators, line officers

Finding are presented to collaborators and line officers during field trips on the Plateau, and during meetings.

A final report on historical stand structure will be published in 2014, updating our original document prepared in 2008.

Project name: Forest structure on Unroaded Mesas

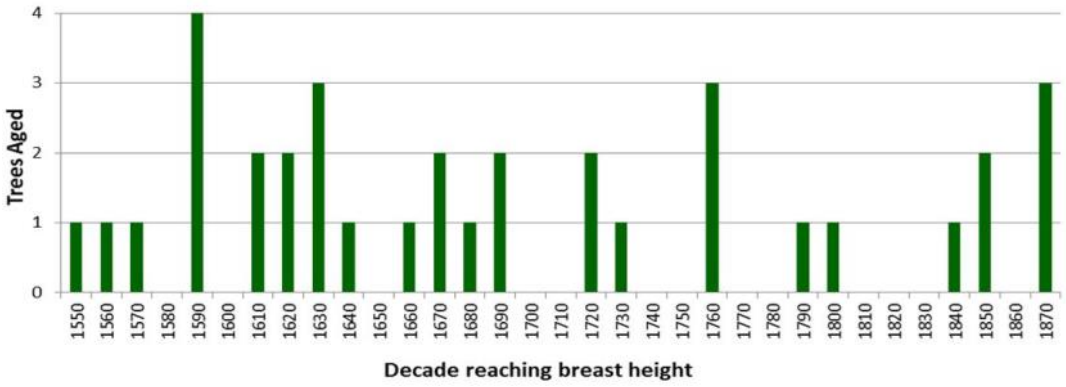
Leadership people:
Steve Hasstedt (CSU and USAF), Dan Binkley (CSU)

Overall goals and objectives:
To determine the current and historical structure of forests on three unlogged mesas (Free, Motley, Goodtimes), including the importance of soil depth in determining fire impacts and the presence of large "legacy" conifers.

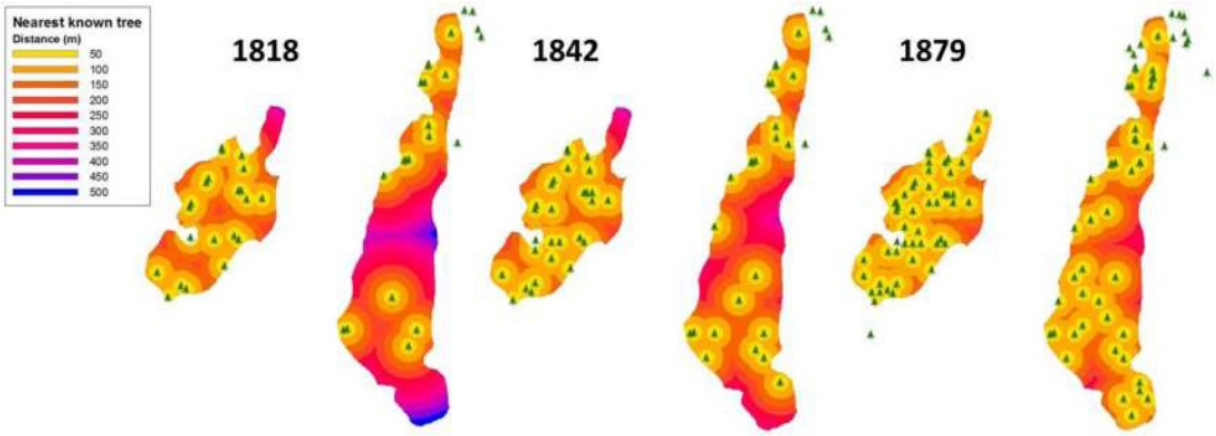
Objectives for 2013 monitoring:
Determine ages of trees across the mesas, and develop insights about historical fire timing and severity.

2013 Findings:

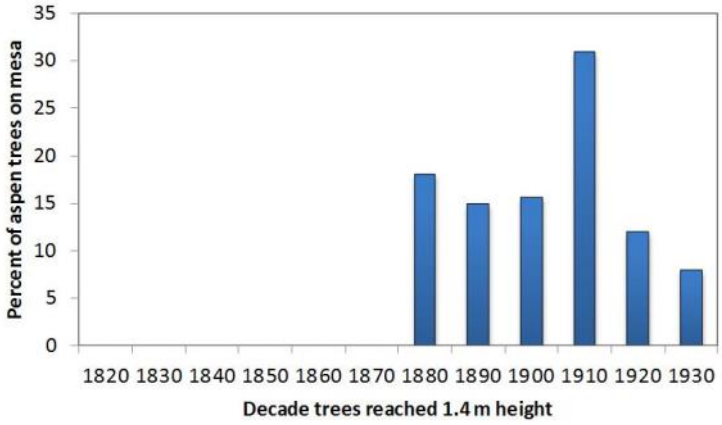
- 80% of plots on soils less than 6" deep had one or more heritage tree, compared with 20% of the deep soil plots; heritage trees are much more likely to be found on shallow soils.
- Many of the larger trees predate the known fire years of 1842 and 1879, indicating that fire intensity did not reach stand-replacing levels at the scale of the unroaded mesas (~250 acres).



- The current spatial pattern of surviving heritage trees shows that most of the area remained within 50 m of surviving conifers after the 1879 fire. This spatial pattern is important for providing seed for post-fire tree establishment.



- Aspen trees did indicate stand-replacing fire intensity with the 1879 fire (and perhaps earlier fires, but the 1879 fire removed any evidence for aspen stems).



Key questions to be examined:
(1) Are heritage trees largely restricted to areas of shallow soil, where low biomass accumulation would have led to lower severity fires, allowing higher survival?
(2) What was the dominant fire regime for these mesas?

Protocol:

Spatial scale of the area under consideration
The ponderosa pine and dry mixed-conifer forests on the eastern side of the Plateau.

General approach
Systematic plots covering the mesas, determining the species, size, and ages of dominant, old trees.

Locations to be assessed
Primarily the three unroaded mesas, with some ancillary plots on Sawmill, Love, and Kelso Mesas.

Measurements to be taken at each location
Species, size, and ages of dominant, old trees

People engaged in measuring (agency, volunteers, etc.)
Steve Hasstedt, Dan Binkley

Data management plans
Xcel spreadsheets

Data archiving plans
Copies of the data will be stored on the UP and CFRI websites.

Plan for communicating findings to collaborators, line officers
The results of the study will form the core of Steve Hasstedt's PhD dissertation, and will be published in scientific journals. The results have been shared with UP collaborators as they developed, including a draft report to support the EA for the Escalante Project.

Project name: Aspen Browse

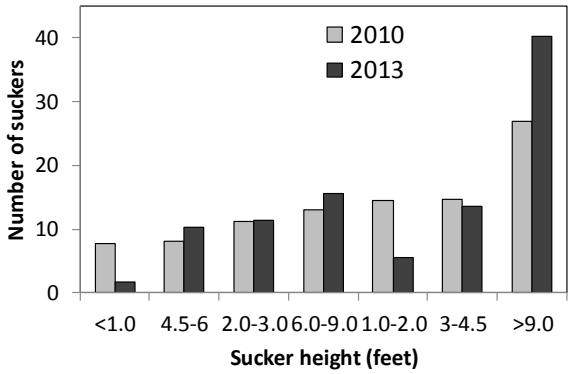
Leadership people: Dan Binkley (CSU), Bill Romme (CSU), Tim Garvey (GMUG)
Overall goals and objectives:
1. Determine how substantial the effects of browsing on aspen regeneration (to tree-size recruitment)
2. Determine to what extent browsing impacts result from cattle versus deer and elk?
3. Determine the pattern of browsing impact across the Plateau, and are there any apparent explanations for the pattern (elk populations within local areas; season of use by elk or cattle; basic site factors (such as elevation, forest type, conifer basal area)
4. Determine how recent patterns of aspen regeneration differ over the course of the past 200 years? Does aspen regeneration improve in the future, both inside and outside exclosures?

Objectives for 2013 monitoring:
1. Followup monitoring of aspen regeneration in exclosures set up in 2010

Key questions to be examined:
See #1-4 under goals and objectives

2013 Findings:

The heights of aspen suckers inside the fenced exclosures did not differ very much between 2010 and 2013 (with 4 growing seasons), even for the locations where browsing on aspen suckers appeared moderate or heavy outside the exclosures (see figure). Next year we will do a thorough assessment of plots inside and outside the exclosures,, as well as the transect plots through the forest. At this point our conclusion is that browsing does not appear to hold back height growth on aspen suckers over the majority of the Plateau.



Protocol:

Spatial scale of the area under consideration: entire Plateau where aspen trees occur.

General approach
Multiple approaches:
A. Plateau-wide survey with prism cruises (in 9 plots/ triangle location) to determine aspen size and age structure.
B. Plateau-wide survey to quantify aspen regeneration (vertex plots of prism triangles)
C. Various exclosures to determine ability of aspen suckers to develop into tree-size classes, in intact stands (pure aspen, aspen-conifer) and SAD-affected stands (pure aspen, aspen-conifer)
D. Exclosures established in the past in clearcuts will be measured to demonstrate the impacts of browsing on aspen regeneration.

Locations assessed

A. Over 60 triangle plots were chosen randomly across the Plateau for aspen size/age/regeneration quantification; report completed in 2011.
B. Twelve exclosure sites, chosen to represent pure aspen and aspen/conifer types, with and without substantial recent death of overstory aspen.

Measurements to be taken at each location

A. Triangle plots: aspen basal area and stem dbh (both living and dead); qualitative aspen regeneration for 9 points of each triangle; measurement of aspen sucker numbers by height class in 3 fixed-area plots in each triangle location.
B. At each of 12 exclosures, measure number of aspen suckers by height classes inside and outside, early and late in the growing season; measure aspen suckers by height class in 6 plots along a transect extending from each exclosure to document browsing impacts (and if possible, time of browsing).

People engaged in measuring (agency, volunteers, etc.)

Summer 2013: Bill Romme, Dan Binkley

Data management plans

Data entered and analyzed in Excel spreadsheets; synthesized and reported by Dan and Bill

Data archiving plans

Copies of master data sets will be stored with Dan, with Bill, with the Ouray District, and with CFRI.
Copies of photos from each exclosure will be stored in the same locations

Plan for communicating findings to collaborators, line officers

Presentations at UP collaborative meetings
Summary report/CFRI publication with major findings (4 pages)
Scientific journal article in 2014 (or so).

Project: Citizen Scientist Webpage

Leadership people:
Greg Newman, CSU and NREL

Additional People
Russ Scarpino, CSU and NREL

Overall goals and objectives:
Develop a website in support of community based monitoring activities among a wide array of stakeholders across the Uncompahgre Plateau. The goals are to: (1) support high school student weed mapping and monitoring activities as desired by the team and that may include Montrose High School (Rusty George, teacher), (2) support community-based citizen science monitoring activities for forest health monitoring as desired by stakeholders, and (3) ensure that all monitoring data are easily entered into the web portal, that they can easily be visualized and are updated as new data are submitted, and that these data can easily be downloaded in a variety of formats and in such a way to facilitate vetting of these data and eventual submittal to USFS data management systems (e.g., NRIS, Terra Grid, etc.).

Objectives for 2013 monitoring:
Ensure basic weed mapping data entry forms are in place for spring 2014 monitoring activities.

2013 findings and progress:

- Current website / project page (a project within the citsci.org system) can be seen here: http://www.citsci.org/cwis438/Browse/Project/Project_Info.php?ProjectID=331
- We have developed the ability for Leigh and/or high school teachers (e.g., Rusty George) to create weed monitoring data entry sheets. At this time it is up to project managers to define which species they would like students to map and monitor and to themselves create their own data sheets as needed for such monitoring.
- We added the ability for project managers to be able to define "pre-defined monitoring locations" so that project members/participants can easily pick a location they monitored from a drop down of pre-defined locations defined by the project manager.
- We added the ability for project managers to invite project members by entering in the email address of trained members; the system automatically register's the new user, creates a password for them that they may change, adds them as an approved data contributor for the specified project, and sends them an email with their login and assigned password (this works much like an eVite system).
- We improved the performance of the project profile map of all project data to support an unlimited number of observations and draw them all quickly. Our approach was to draw clustered points when total number of observations exceeds 10,000 and then make it so one clustered point becomes many points when the user zooms in on the map.
- We are finishing the design of a customizable data analysis and visualization tool that we hope to be available May 2014 that will enable project managers to create custom analyses/visualization by selecting from the data measurements they have identified for their volunteers to measure and then selecting as dependent and independent variables for graphs.

Key questions to be examined:
Can trained community members collect and submit quality forest health monitoring data?

Protocol:

Spatial scale of the area under consideration
The Uncompahgre Plateau

General approach
Agile website development approach

Locations to be assessed
Weed monitoring plots (TBD)

Measurements to be taken at each location
Presence/absence of noxious weeds and percent ocular cover

People engaged in measuring (agency, volunteers, etc.)
Volunteers and high school students

Data management plans
Available upon request

Data archiving plans
Available upon request

Plan for communicating findings to collaborators, line officers
Online approaches (transparent and freely open)

Project name: Invasive Species (not updated for 2013)

Leadership people:
Kelley Liston, Briand Hoefling, Matt Tuten, Barry Johnston (USDA Forest Service)

Overall goals and objectives:
To minimize invasive species on the Plateau, through early identification and treatment of new hotspots, and sustained efforts to impede expansion from other sites.

Objectives for 2012 monitoring:
Continue with weed monitoring/treatment programs as in previous years
Focus on assessing road, treated stands to determine impact of restoration on invasive weeds
Record spatial locations and percent cover of Colorado Listed Noxious Weed populations and other species of management concern using NRIS Data Recording Protocols for Invasive Species Management.

2012 findings:

Key questions to be examined:
Where are critical invasion hotspots?
How do restoration treatments affect success of invasive species?
How might restoration treatments be modified to reduce invasive risks?

Protocol:

Spatial scale of the area under consideration
The entire Uncompahgre Plateau

General approach
Occular monitoring during routine travel on the Plateau
Soliciting observations from livestock permittees and others
Develop a "10 Least Wanted" booklet to broaden the number of people who can help identify new hotspots

Locations to be assessed
Phase 1:
100% inventory of high probability infestation areas in the Sawmill and Uncompahgre Mesas Contract Areas within 100 feet of:

- All National Forest System roads (with exception of Delta Nucla Road)
- National Forest System Trails
- Existing decommissioned roads
- Any identified existing old skid trails or landings
- Fenclines
- Large Meadows
- Low slope drainages impacted by harvesting/thinning or burning in Unc Mesa/Sawmill Mesa Contracts
- Ditches

Phase 2:
100% inventory of entire contract units:
- Where significant weed populations have been identified
- Harvested Units (Unit 7, Unc Mesas Stewardship Contract Area)

Measurements to be taken at each location
Location, species, and notes on extent

People engaged in measuring (agency, volunteers, etc.)
USDA Forest Service staff; county weed experts; permitees; other volunteers

Data management plans
Spatial Survey:
- Locations of weed populations will be surveyed with Garmin handheld GPS receivers. The center of isolated individual weeds smaller than 0.1 acres shall be recorded as point features and a radius of the infestation area will be recorded on the attribute data sheet.
- Larger distinct populations will be recorded using a track file to survey the areal extent of the weed population.
- Survey units and/or contract units will serve as the spatial location for widely dispersed populations with very low cover (i.e. less than 3% cover).
- A unique spatial identifier will be associated with each distinct weed population. These identifiers will be compiled and indexed using NRIS business rules after survey completion for incorporation into the NRIS invasive weed population database.
- Shapefiles of weed populations indexed with NRIS compatible identifiers will be created from GPS and track and point files and uploaded into the NRIS enterprise database.

Attribute Data:
- All required data fields from the NRIS Data Recording Protocols for Invasive Species Management will be completed for each identified weed population including X additional optional fields
- NRIS Data Recording Protocols for Invasive Species Management data forms will be used for data recording purposes
- Spatial attribute identifiers will be recorded the data forms for each and every distinct weed population surveyed.
- This data will be uploaded into attribute fields of the NRIS invasive plant database.

Standards:
- Data will be recorded at accuracies less than ±30 feet.
- NRIS Data Recording Protocols for Invasive Species Management will be followed to the greatest extent possible. Any deviation from the protocol will be recorded and discussed with monitoring work crew members as soon as possible.

Data archiving plans
Data uploaded into DRIS invasive plant database; copy also stored in GMUG database and CFRI

Plan for communicating findings to collaborators, line officers
Summary report on "State of the Weeds on the UP", updated annually (??)
Presentation at annual UP CFLRP collaborators meeting

Project name: Riparian restoration (not updated for 2013)

(National Forest Foundation article: http://www.nationalforests.org/blog/post/50/science-and-engineering-apprenticeship-providing-students-a-hands-on-education)

Leadership people:

Clay Speas, Barry Johnston (USDA Forest Service), Robin Liston (Delta High School)

Overall goals and objectives:

To assess the current condition and trend of streambanks, channels, and streamside vegetation
To determine if livestock grazing management strategies and other land management actions are making progress toward achieving the long-term restoration goals and objectives for streamside riparian vegetation and aquatic resources.

Objectives for 2012 monitoring:

Implement MIM protocols for initial assessment of two reaches of Dominguez Creek
Provide summer internships for local high school students, informing them about career potential in natural resources.

2012 Findings:

Key questions to be examined:

What is the current condition of the riparian ecosystems in each reach?
What factors have contributed to any observed problems?
What management opportunities need further work to achieve restoration goals?

Protocol:

Spatial scale of the area under consideration

Initially the project focuses on two reaches of Dominguez Creek, with plans to expand to other riparian systems on the Uncompaghgre in the future.

General approach

Using the MIM protocol, the project will assess seven indicators of long-term riparian condition:

1. Greenline composition
2. Woody species height class
3. Streambank stability and cover
4. Woody species age class
5. Greenline-to-greenline width
6. Substrate
7. Residual pool depth and pool frequency

Protocol details can be found in: http://www.rmsmim.com/Portals/2/MIMdoc.pdf

Locations to be assessed

Two reaches of Dominguez Creek

Measurements to be taken at each location

(7 indicators above)

People engaged in measuring (agency, volunteers, etc.)

Clay Speas, Kelley Liston (USFS)
Robin Liston (Delta High School teacher) and students

Data management plans
Excel spreadsheet (part of MIM protocols)

Data archiving plans
Data will be archived in the GMUG database, and also at the Colorado Forest Restoration Institute.

Plan for communicating findings to collaborators, line officers

Students will present findings to the CFLRP Monitoring Group

A written summary report will be posted on the webpages for the Uncompahgre Partnership and CFRI

The results will be presented at UP meetings, including one or more field trips.

Project name: Travel management (needs to be written)

Leadership people: Loren Paulson?

Overall goals and objectives:
Conduct monitoring of the rout-by-route travel implementation on the three Ranger Districts
Protocol established in 2012 by Loren Paulson will be used to conduct said monitoring.

Objectives for 2013 monitoring:

2013 Findings:

Key questions to be examined:

Protocol:

Spatial scale of the area under consideration
The entire Uncompahgre Plateau

General approach

Locations to be assessed

Measurements to be taken at each location

People engaged in measuring (agency, volunteers, etc.)

Data management plans

Data archiving plans

Plan for communicating findings to collaborators, line officers

Project name: North Uncompahgre Prescribed Burning Monitoring (needs to be written)

Leadership people:

Overall goals and objectives:

Objectives for 2013 monitoring:

2013 Findings:

Key questions to be examined:

Protocol:

Spatial scale of the area under consideration

General approach

Locations to be assessed

Measurements to be taken at each location

People engaged in measuring (agency, volunteers, etc.)

Data management plans

Data archiving plans

Plan for communicating findings to collaborators, line officers

Project name: Landscape Scale Monitoring, Fire Risk

Leadership people:
Megan Matonis, Justin Ziegler, Dan Binkley (CSU), Carmine Lockwood, Tammy Randall-Parker (USDA Forest Service)

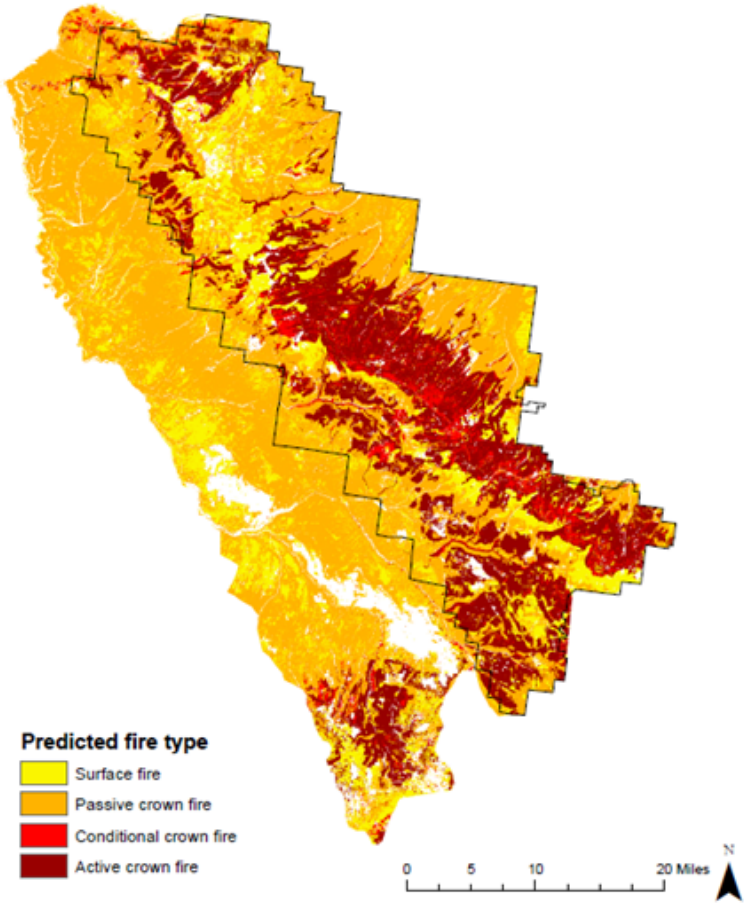
Overall goals and objectives:
Enhance the resiliency, diversity and productivity of the native ecosystem on the Uncompahgre Plateau using best available science and collaboration.
Reintegrate and manage wildfire as a natural landscape scale ecosystem component that will reduce the risk of unnaturally severe or large crown fires.
Restore ecosystem structure, composition and function.
Preserve old or large trees while maintaining structural diversity and resilience.
Reestablish meadows and open parks and re-establish grasses, forbs, and robust understory communities.
Manage herbivory. Robust understories are necessary to restore natural fire regimes and to limit excessive tree seedling establishment.
Evaluate the landscape-scale changes brought about by restoration treatments, including both the local scale (treated stands) and landscape scales (such as fire propagation potentials).

Our initial guiding questions include:
- How can stand-level restoration treatments, and other stand treatments, be used to interrupt the spread of fires?
- How extensive are invasive weed problems across the Plateau, and how can their spread be contained (and reversed) across the landscapes?
- How is vegetation changing in relation to disturbances (treatment, roads, fires, climate change)? We have a lot of interesting data but we are not developing an integrated set of landscape-scale insights from the information.
- We know that fire was more frequent and extensive on the Plateau prior to 1880. The UP collaborators agree that an increased role of fire is a key goal for landscape-scale restoration, but how much more fire (and what sorts) do we need?
- How resilient are the functional processes of the Plateau's ecosystems? Are historical and current conditions sustainable if the climate sifts?
- What is missing from the plateau? Is the Plateau lacking in young forests? The 2005 GMUG assessment likely has a majority of the information we need, but the we need to create a clear interpretation of this information for our landscape goals.
- How effective are various treatments at achieving stand-level goals, and at influencing landscape-level issues?
- What are the implications of our current populations of deer, elk and livestock for the future ecosystems of the Plateau, and how will restoration activities impact the ability of the ecosystems to support animals?

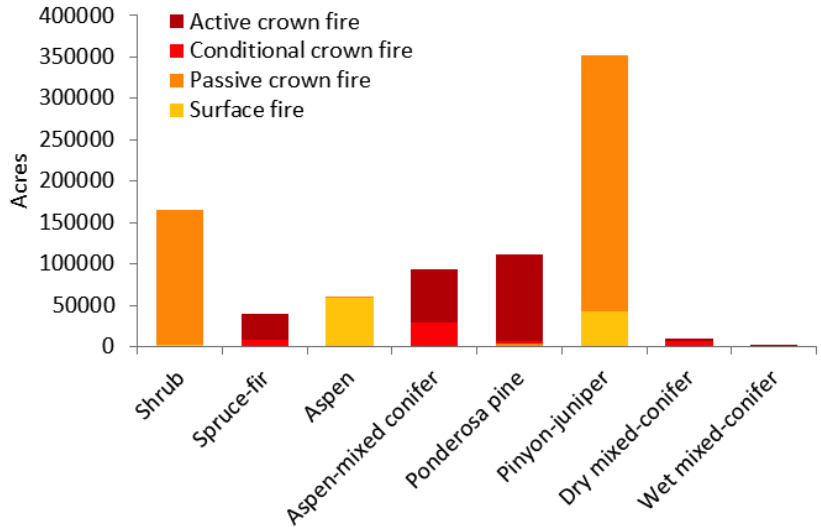
Objectives for 2013 monitoring:
To improve the spatially explicit representation of fire risk for the Plateau using a variety of fire models.

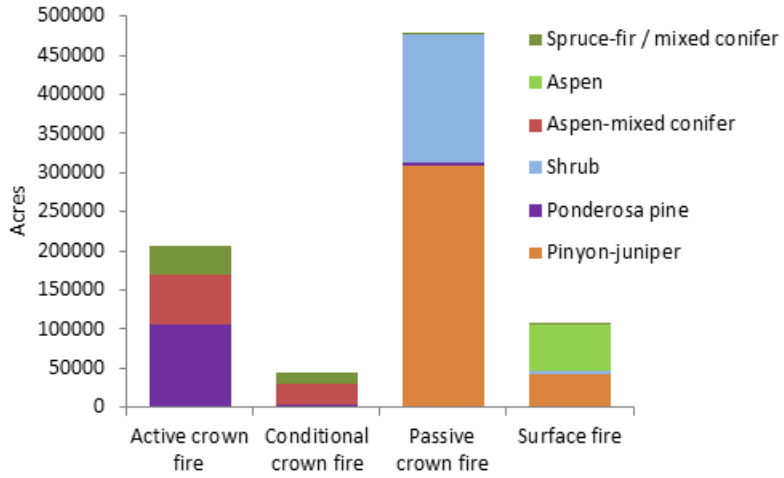
2013 Findings:

One of the major concerns for landscape scale restoration is the severity of potential fires, and propagati0n across the Plateau. The NEXUS model was paramertized to assess the current risk of surface fir and crown fires across the Plateau:



Predicted fire behavior across the Uncompahgre Plateau under 97th-percentile weather conditions.





Over 871,200 acres on the Uncompahgre Plateau are capable of propagating active crown fire based on predictions from NEXUS (see Appendix B for details). In addition, about 189,000 acres are predicted for conditional crown fire, 2,022,400 acres for passive crown fire, and 776,400 acres for surface fire. This analysis excluded grasslands, riparian vegetation, and developed portions of the Plateau.

The conditions that the collaborators would like to avoid (and therefore serve as indicators) are summarized as:

Key questions to be examined:
How can we effectively assess the impacts of stand-level treatments on landscape-scale features such as fire hazard, wildlife habitat, and economic resource development?

Protocol:

Spatial scale of the area under consideration
The entire Uncompahgre Plateau

General approach
Use existing vegetation maps (LANDFIRE) to parameterize fire models and simulate fire risks. For the broader issues of landscape-scale monitoring, further discussion is needed.

Locations to be assessed
The entire Plateau.

Measurements to be taken at each location
No new measurements at this time
People engaged in measuring (agency, volunteers, etc.)
No field measurements at this time
Data management plans
Under development; likely based on using USDA Forest Service FACTS database
Data archiving plans
Under development; likely based on using USDA Forest Service FACTS database; additional data archiving with CFRI is likely.
Plan for communicating findings to collaborators, line officers
A broad suite of approaches will be used, including field trips, an annual meeting that covers progress and develops plans, various reports and outreach products.

Project name: Monitoring of national indicators

Leadership people:
Megan Matonis (CSU), Leigh Robertson (UP), Barry Johnson (USFS), Clay Speas (USFS)

Overall goals and objectives:
Identify desired and/or undesirable future conditions on the Uncompahgre Plateau for the four national monitoring indicators: wildfire, watersheds, wildlife, and invasive species.
Design a monitoring framework to track and report these indicators over the next 10 years.

Key questions to be examined:
What key features of the landscape does the Uncompahgre Partnership want to restore over the next 10 years?
What outcomes do we want to avoid related to wildfire, watershed condition, invasive species, and wildlife habitats / populations?
What is the least amount of information we need to effectively monitor our movement away from undesirable conditions and/or towards desired conditions for wildfire, watershed, invasive species, and wildlife indicators?
What ongoing monitoring projects can we leverage to address the national indicators? What additional data collection is needed?

Objectives for 2013 monitoring:
Create four working groups to tackle each of the four national indicators. Develop draft goals and protocols for the national indicators. Share products with the Uncompahgre Partnership for feedback.

2013 Findings:
Wildfire indicators—The wildfire working group used local knowledge of fire behavior and vegetation cover to update LANDFIRE data. They used this updated dataset and the fire behavior model NEXUS to assess crown fire risk across the Plateau. The group also summarized data on the extent of natural, historic fires in ponderosa pine forests to inform undesirable future conditions for wildfire. See more details in the summary of Landscape Scale Monitoring.

The conditions that the collaborators would like to avoid (and therefore serve as indicators) are summarized as:

Ponderosa pine and dry mixed-conifer forests

Conditions we seek to move away from / avoid through management:

Undesirable condition #1: Active crown fires are likely across >300 contiguous acres or in patches >30% of burn units under 90th percentile weather conditions.

Spatial / temporal scale: Landscape / 10 years

Undesirable condition #2: We are overly cautious with prescribed fires. We fail to burn in over half of the units we mechanically treat, and when we do burn, we burn areas smaller than historical fires (about <500 acres).

Spatial / temporal scale: Landscape / 10 years

Undesirable condition #3: We implement treatments that fail to reduce crown fire hazards. We leave ladder fuels covering >30% of the stand, and crown continuity remains high because we didn't create treeless openings (0.25 to 0.5 acres) across the stand.
Spatial / temporal scale: Stand / 2 to 3 years post-treatment

Undesirable condition #4: Prescribed burning kills >10% of residual ponderosa pine and Douglas-fir trees >8" dbh. *Spatial / temporal scale:* Stand / 1 week

Undesirable condition #5: Post-fire browsing by livestock and wildlife reduces regeneration to less than 50 aspen suckers / acre in stands capable of supporting aspen.

Spatial / temporal scale: Stand / 3 years

Spatial / temporal scale: Stand / 3 years

Spruce-fir forests

Conditions we seek to move away from / avoid through management:

Undesirable condition #1: Less than 10% or more than 30% of the area occupied by spruce-fir is in young, regenerating forests due to natural or management-induced disturbances (i.e., insects, fire, or cutting).

Spatial / temporal scale: Landscape / 10 years

Undesirable condition #2: Over 80% of our treatments in spruce-fir forests are very unlike historical disturbances, creating numerous, small forest patches with linear boundaries. We fail to experiment with alternatives to this approach, such as the judicious use of prescribed fire to create young spruce-fir forests.

Spatial / temporal scale: Landscape / 10 years

Undesirable condition #3: Post-fire browsing by livestock and wildlife reduces regeneration to less than 50 aspen suckers / acre in stands capable of supporting aspen.

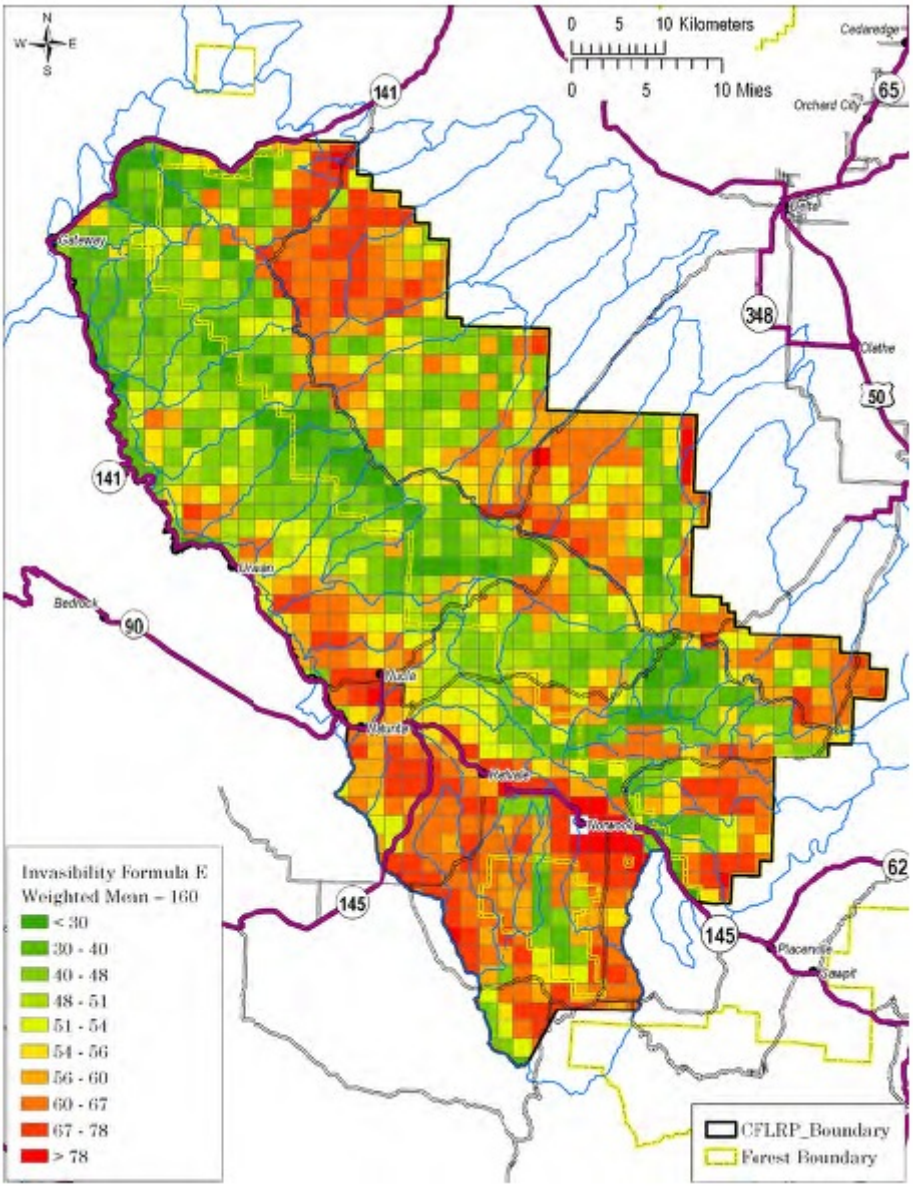
Spatial / temporal scale: Stand / 3 years

Watershed indicator—Improving the condition of watersheds is important to the Uncompahgre Partnership, but it is not the top focus of our restoration projects. The watershed working group decided not to use the Watershed Classification and Assessment Tracking Tool (WCATT) because the tool is too coarse to show changes in watershed conditions based on the projects we have planned. They propose summarizing data we already collect regarding riparian restoration, travel management, and forest restoration.

Wildlife indicator—The wildlife working group is proposing a habitat-based approach for the wildlife national indicator. They decided that many wildlife-related goals in the Forest Plan and other GMUG documents are unrealistic and too difficult to monitor (e.g., "Self-sustaining populations of Gunnison sage-grouse thrive on areas of suitable habitat"). Returning forests to more natural, historic conditions should increase the diversity of habitats on the Plateau and benefit bird, ungulate, rodent, and feline species.

Invasive species indicator—The invasive working group created maps with the location of invasive plants and the relative risk of invasion across the Plateau. This information can help us prioritize treatments and focus ongoing monitoring in high-risk locations.

Invasibility index in 2 x 2 km square grids across the Uncompahgre Plateau:



Protocol:

Spatial scale of the area under consideration

Wildlife and wildfire indicators—The entire Uncompahgre Plateau, with data summarized by forest type.

Watershed and invasive species indicators—The entire Uncompahgre Plateau, with data summarized for each HUC6 watershed.

General approach

Wildfire indicators—Use NEXUS and updated LANDFIRE data to monitor changes in crown fire hazards across the Plateau. Assess pre- and post-treatment crowning index for forest restoration projects. Map the location of prescribed burns and compare their extent and distribution to data on natural, historic fires in different vegetation types.

Watershed indicator—Summarize data we are already collecting for riparian areas, travel management, and invasive species across the Plateau.

Wildlife indicator—Use pre- and post-treatment monitoring at the stand and landscape scale to inform the wildlife national indictor, as well as data collected on native Cutthroat Trout as part of ongoing riparian monitoring. Historic reconstructions of forest structure and compositions can inform general targets for restoration projects that improve wildlife habitat.

Invasive species indicator—The invasive working group developed an "invasibility index" to identify locations on the Uncompahgre Plateau with the greatest risk from invasive plants. Data on vegetation cover, aspect, slope, elevation, and road density are combined to create a relative score of invasibility ranging from 9 to 98. The group also developed maps of invasive species occurrence using data from the Forest Service and Bureau of Land Management. Species assessed include Russian knapweed, spotted knapweed, whitetop, several invasive thistles, oxeye daisy, hound's-tongue, yellow toadflax, sulfur cinquefoil, and tamarisk.

Locations to be assessed

Wildfire and wildlife indicators—The entire Plateau, with a focus on restoration treatment areas.

Watershed indicator—The entire Plateau, with a focus on areas with decommissioned roads and riparian restoration.

.

Invasive species indicator—Locations with a high invasability index and treatment areas.

Measurements to be taken at each location

Wildfire and wildlife indicators—Forest structure (basal area, trees per acre), the spatial arrangement of trees, and estimates of surface fuels.

Watershed indicator—See summary of monitoring for Riparian Restoration, Travel Management, Invasive Species, and Landscape Scale Monitoring.

Invasive species indicator—The location and cover of invasive species.

People engaged in measuring (agency, volunteers, etc.)

Highschool students with the Forestry Internship Program and Riparian Monitoring Program.
Forest and rangeland staff for the Forest Service.
Citizens involved with the Uncompahgre Plateau.
Students and field technicians with the Colorado Forest Restoration Institute.

Data management / archiving plans

Under development; likely based on using USDA Forest Service FACTS database; additional data archiving with CFRI is likely.

Plan for communicating findings to collaborators, line officers

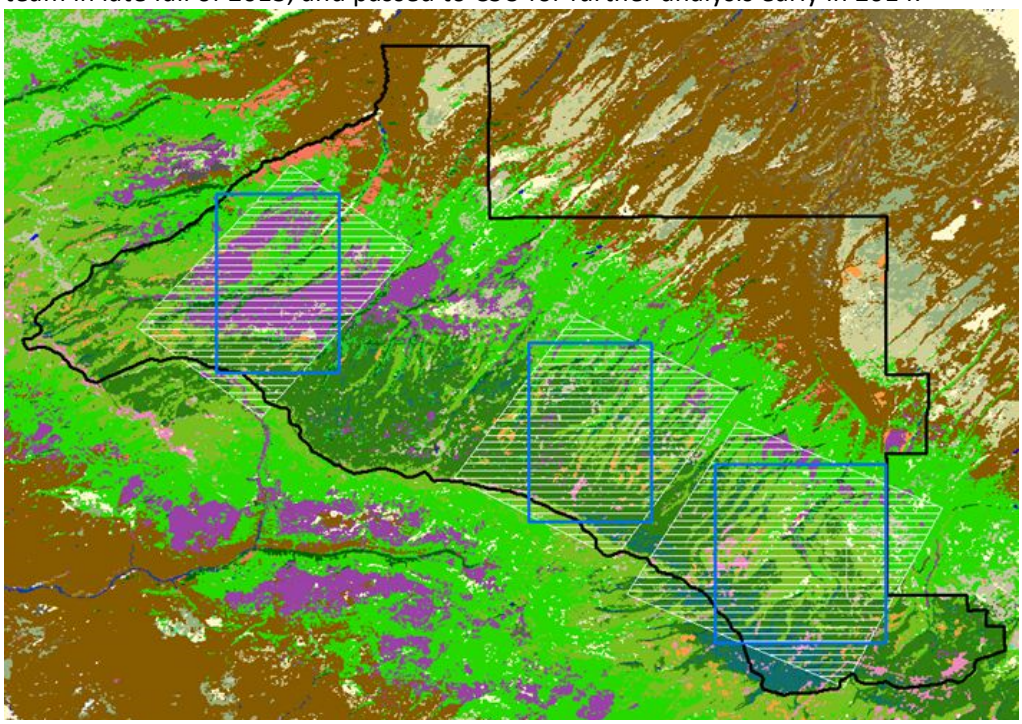
We will summarize data for each of the four indicators as part of the 5-year and 10-year report to the Washington Office of the Forest Service.

Project name: High resolution airborne imagery for the Escalante Project area

Leadership people:
Dan Binkley and Michael Lefsky (CSU), John Musinsky (NEON-AOP)

Overall goals and objectives:
To obtain state-of-the-art data on the composition and structure of the forests and landscape of the Escalante Project area, using the Airborne Observation Platform of the National Environmental Observation Network. The AOP provides high-resolution images; multi-spectral data; and lidar (height) data at 1-3 m scale resolution. Our goal is to have very high precision information on forest composition and structure, and to follow changes after forest restoration (including information to allow for simulation of fire behavior).

2013 Findings:
The AOP flew one-third of the planned area (three blocks outlined in blue) in the summer of 2013, covering parts of Love Mesa and Lockhart Mesa. Data will be processed by the NEON team in late fall of 2013, and passed to CSU for further analysis early in 2014.



Objectives for 2013 monitoring:
To obtain AOP characterization for three large portions of the Escalante Project area, and interpret forest composition and structure.

Key questions to be examined:
1) which tree species comprise the forests within each area?
2) what is the vertical fuel structure of the forest?

Protocol:

Spatial scale of the area under consideration
Three large areas of the Escalante Project area

General approach
Obtain coverage when possible, beginning in 2013 and continuing into the future, and to interpret current forest composition and structure, as well as changes over time.

Locations to be assessed
Three large blocks in the Escalante Project area (see map above)

Measurements to be taken at each location
High resolution imagery, hypspectral coverage, and lidar – all combined for each 1 (to 3) m pixel to provide an information system that allows almost any sort of question to be asked in a spatially explicit context.

People engaged in measuring (agency, volunteers, etc.)
Dan Binkley, Michael Lefsky, John Musinsky

Data management plans
Data will be collected by NEON AOP, initially processed and then passed on to Michael Lefsky to oversee further interpretation.

Data archiving plans
Copies of the study results will be stored on the CFRI website.

Plan for communicating findings to collaborators, line officers
The results will be presented at UP meetings, including one or more field trips.
Presentations at professional meetings and at least one peer reviewed scientific publication will be produced

Project name: Economic monitoring of restoration projects

Leadership people:
Tony Cheng, Kathy Mattor, Torston Lund Snee (CFRI/CSU)

Overall goals and objectives:
To assess the economic benefits of the CFLRP project to Western Colorado.

Objectives for 2013 monitoring:
Collect necessary information, begin synthesis.

2013 Findings:
Under development

Key questions to be examined:
What impact have the restoration activities on the UP had on the economies of surrounding communities?

Protocol:

Spatial scale of the area under consideration
The entire Uncompahgre Plateau.

General approach
Us TREAT data and modeling to account for the full spectrum of impacts

Locations to be assessed
All restoration treatment areas

Measurements to be taken at each location
Economic information on costs and benefits, including multiplier effects

People engaged in measuring (agency, volunteers, etc.)
Tony Cheng, Kathy Mattor, Torston Lund Snee

Data management plans
Data files and models

Data archiving plans
Copies of the study results will be stored on the CFRI websites.

Plan for communicating findings to collaborators, line officers
Results will be communicated at collaborator meetings, and in CFRI reports. Agency colleagues will be routinely brought up to date through frequent conversations as well.

Project name: Historical conditions for pinyon/juniper woodlands

Leadership people:
Bill Romme (CSU)

Overall goals and objectives:
Through a literature review, determine PJ and sagebrush historical patterns and vegetative conditions on the Uncompahgre Plateau, identifying important gaps where follow up field work will be important.

Objectives for 2013 monitoring:
Collect necessary literature and information, begin synthesis.

2013 Findings:
Under development

Key questions to be examined:
What are the ranges of historical conditions that characterized pinyon/juniper woodlands and sagebrush shrublands?
What geographic features influenced the historical differences in community distributions
How much change has occurred in these communities in the past century?
What key issues and risk warrant consideration for the future of the Plateau?

Protocol:

Spatial scale of the area under consideration
Lower elevations of the Uncompahgre Plateau.

General approach
Compile and assess available information from a variety of sources.

Locations to be assessed
No field sites

Measurements to be taken at each location
None

People engaged in measuring (agency, volunteers, etc.)
Bill Romme

Data management plans
Not applicable

Data archiving plans
Not applicable

Plan for communicating findings to collaborators, line officers
Results will be communicated at collaborator meetings.

Project name: Native Seed Monitoring at Calamity Basin

Leadership people: Julie Grode, Grand Valley Ranger District

Overall goals and objectives: (from Decision Memo)

1. Help to maintain and improve browse and forage quality for big game, wild turkey and sagebrush associated species
2. Help to reduce natural fuel loading
3. Make browse species such as Gambel oak more available to big game by lowering the canopy level and stimulating new growth of desirable browse species
4. Facilitate improved distribution of big game species and domestic stock through the project area by creating a mosaic of structural stages and size classes of vegetation
5. Increase acreage of sagebrush by opening up mature piñon-juniper stands
6. Maintain existing mule deer habitat and sage-associated species by treating the encroaching piñon-juniper
7. Maintain existing stands of ponderosa pine
8. Reduce the natural fuels within the project area, to lower the risk of large catastrophic wildfires
9. Promote forest stand resilience by diversifying age classes across the landscape

Objectives for 2013 monitoring:

1. Measure success in meeting management goals.
2. Determine effectiveness of aerial seeding with native species before treatment.

2013 Findings: (summarized from the report[1])

1. The treatments were completed in May, 2012, during and after which there was a severe drought on the northern Uncompahgre Plateau. During the spring and summer of 2012 there was over three months without any measurable precipitation in this area. When the precipitation did come, it was too late for many herbaceous plants, and many apparently died. Shrubs experienced widespread mortality. The winter of 2012-2013 was mild, and there was little rain until mid-July 2013 – thus the drought lasted over a year.
2. In the treatment areas in July, 2013, Shrub cover ranged 7 – 29%, averaging 14.6%, mostly Gambel oak (*Quercus gambelii*)[2] and Utah serviceberry (*Amelanchier utahensis*), both of these sprouting from the root crown.
3. Some of the sagebrush had been damaged by heavy equipment during the treatment, but it seems to be recovering somewhat.
4. Graminoid cover was much more than expected given the drought conditions that preceded my sampling. Graminoid cover ranged 6 – 53%, averaging 20.0%. Species such as prairie junegrass (*Koeleria macrantha*) and mountain brome (*Ceratochloa marginata*) were often conspicuous, both of these in the seed mix (Table 1). But species not in the mix were also conspicuous, such as needle-and-thread (*Hesperostipa comata*) and bottlebrush squirreltail (*Elymus elymoides*). Seeding before the mastication apparently had a beneficial effect; but the moisture-holding capacity of the mulch produced by mastication was also beneficial.
5. There was noticeable cheatgrass (Anisantha tectorum) at most of the transects. Cheatgrass cover is now at relatively low levels, but it must be remembered that it is a spring annual, and the last two springs have been very dry, not favorable for this species. We can expect more cheatgrass cover in years with normal late winter and spring moisture.
6. The three forbs in the seed mix were not observed along any of the transects, although a few isolated plants of each were seen as I walked through the treatment units. It may be

[1] Johnston 2013

[2] Plant species names follow Weber and Wittmann 2012.

that these plants will appear later. Forb cover was fairly low, ranging 3 – 27%, averaging 7.3%.

Key questions to be examined: (Recommended Further Work)

1. Resample these transects and retake all photos next year and five years after the treatment.
2. Consider establishing a few transects in untreated areas to serve as a control.
3. Co-sponsor a symposium or workshop on management of Gambel oak, to include discussion of treatment options, fire history, and fire behavior.

Protocol:

Spatial scale of the area under consideration Three treatment units, totaling about 120 acres (Fig. 1).

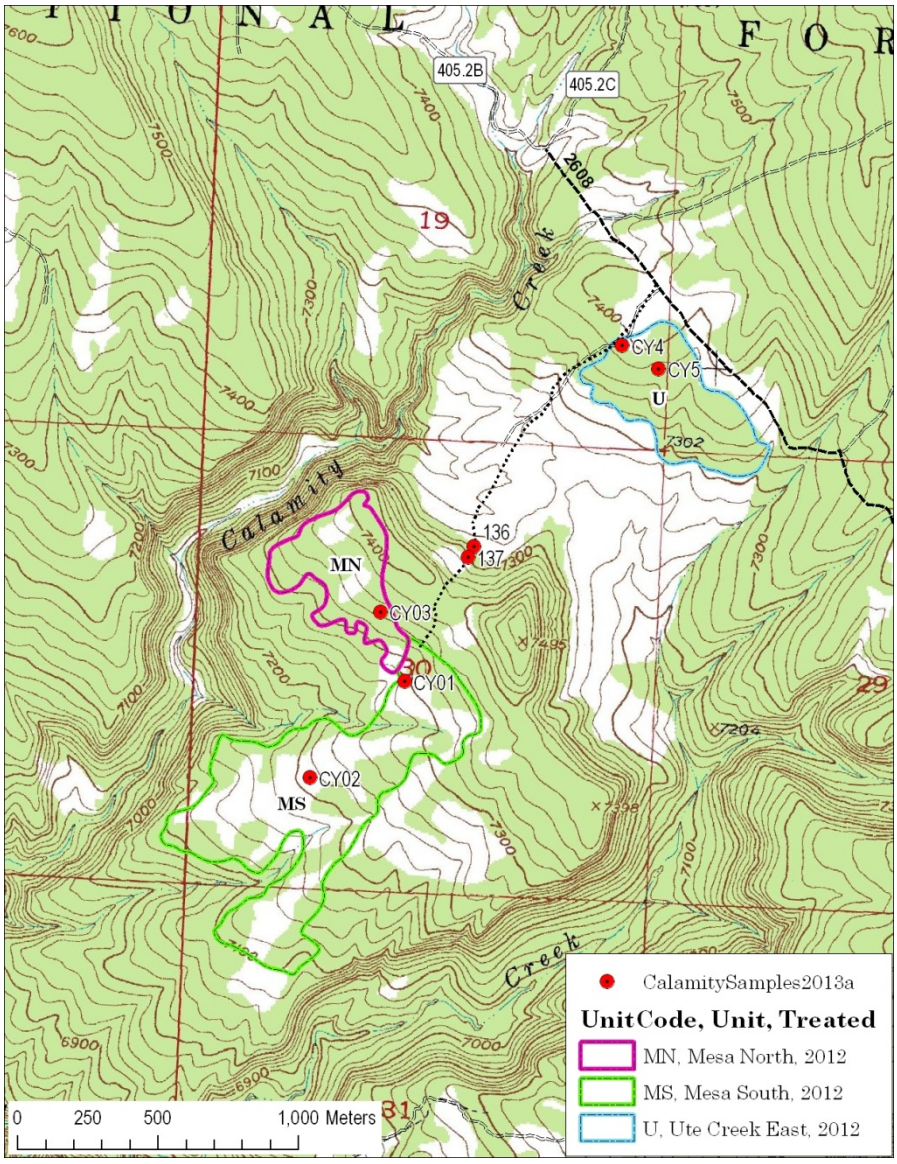


Figure 1. Units treated in 2012 as part of the Calamity Basin 2 Project.

General approach Subjective sampling, to characterize stands treated, "subjective with no preconceived bias" (Mueller-Dombois and Ellenberg 1974).

Locations to be assessed: Five locations within the areas treated, nine transects.

Measurements to be taken at each location: Standard cover-frequency transect (metric), 30 m long with 20 Daubenmire microplots evenly spaced in each – cover by each plant species in microplots (estimate cover within circular plot with 30 m diameter); cover by each natural layer; cover by ground cover categories (bare soil, litter and duff, etc.). Transects permanently marked on the ground. Consistent protocol for photos (around 30 photos for each transect).

People engaged in measuring (agency, volunteers, etc.): 1 agency person

Data management plans: Summarize cover by species and ground cover for each transect, display in association table. Individual document for each transect, showing photographs, cover data, and summary statistics.

Data archiving plans: Grand Valley District office, Forest Service corporate data bases.

Plan for communicating findings to collaborators, line officers: Regular reports (Johnston 2013). Initial report has been delivered to Grand Valley Ranger District.

Literature Cited

Johnston, Barry C. 2013. Report on monitoring for the Calamity Basin 2 Mastication Project 2012. Report to Grand Valley Ranger District, Grand Junction, Colorado. Gunnison, Colorado: Grand Mesa, Uncompahgre, and Gunnison National Forests, 19 pp. September 24, 2013. Plus individual reports on each of the nine transects.

Mueller-Dombois, Dieter; and Heinz Ellenberg. 1974. Aims and methods of vegetation ecology. 547 pp. New York, NY: John Wiley and Sons.

Weber, William A.; and Ronald C. Wittmann. 2012. Colorado flora: Western Slope, Fourth Edition. 532 pp. Boulder, CO: University Press of Colorado.

Project name: Monitoring Sanborn Park Mastication Project

Leadership people: Judy Schutza, Norwood Ranger District; Glenn Webb

Overall goals and objectives: (extracted from the Decision Notice)

1. Reduce hazardous fuels in the wildland urban interface around Sanborn Park and along the Western Area Power Administration's power lines.
2. Protect from destructive wildfire the wildland urban interface around Sanborn Park and along the Western Area Power Administration's power lines.
3. Initiate a progressive change, so that over time, unplanned fires can be used more effectively over a larger percentage of the landscape during hotter and drier conditions without exceeding the desired fire severity.
4. Reduce risk to grazing permittees by achieving a desired range of fire associated benefits while allowing them to plan their out-year grazing based upon the implementation schedule of planned projects.
5. Create vegetation conditions that are more resilient to wildfire and epidemic insects and diseases.
6. Reduce threats to life and property from destructive wildfire and epidemic insects and diseases.

Objectives for [2013] monitoring: (multi-year monitoring project)

1. Determine whether goals are being met in the Sanborn Park area.
2. Determine whether aerial seeding by native species is effective at reducing soil loss and reducing influence of noxious weeds.

2013 Findings:

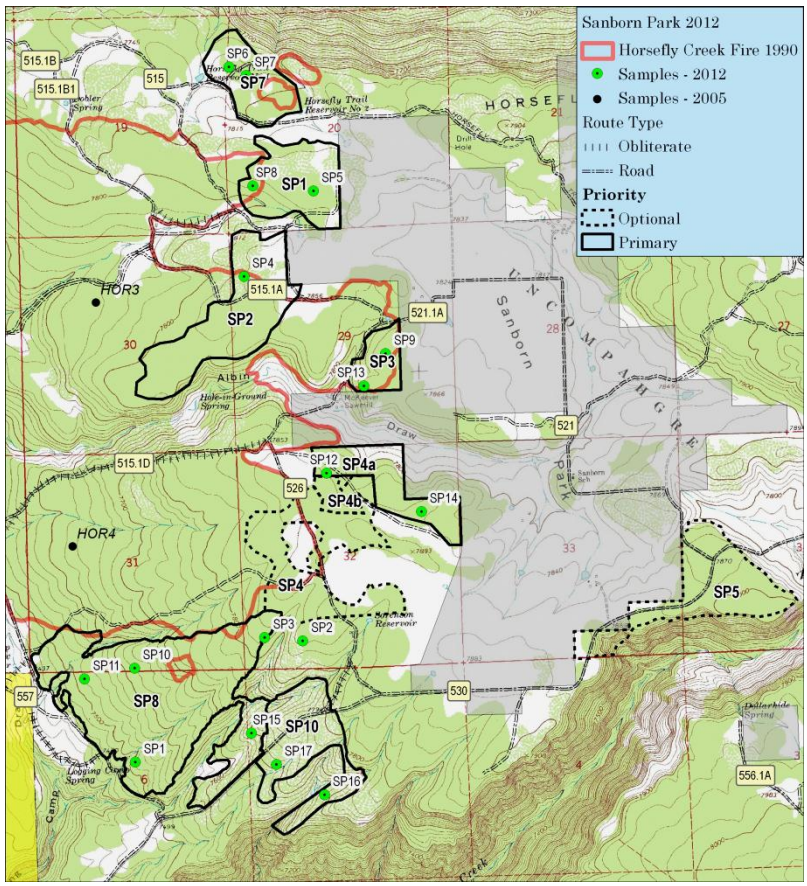
1. Based on three transects re-measured in 2013, the project was very successful at meeting fuels reduction, destructive fire prevention, permittee risk reduction, resiliency, and insect-disease risk reduction goals.

Key questions to be examined: (in future)

1. Determination that project met goals will take more sampling across whole area.
2. Determination of success of aerial seeding, since aerial seeding had not yet begun by the end of the 2013 season.

3. Protocol:

4. Spatial scale of the area under consideration: Ten treatment units, over 1,170 acres total (Fig. below)



General approach: Subjective sampling, to characterize stands treated, "subjective with no preconceived bias" (Mueller-Dombois and Ellenberg 1974).

Locations to be assessed: Seventeen pre-treatment samples (Figure above).

Measurements to be taken at each location: Standard cover-frequency transect (metric), 30 m long with 20 Daubenmire microplots evenly spaced in each – cover by each plant species in microplots (estimate cover within circular plot with 30 m diameter); cover by each natural layer; cover by ground cover categories (bare soil, litter and duff, etc.). Transects permanently marked on the ground. Consistent protocol for photos (around 30 photos for each transect).

People engaged in measuring (agency, volunteers, etc.): Three agency employees, two volunteers.

Data management plans: Summarize cover by species and ground cover for each transect, display in association table. Individual document for each transect, showing photographs, cover data, and summary statistics.

Data archiving plans: Norwood District office, Forest Service corporate data bases.

Plan for communicating findings to collaborators, line officers: Regular reports. 2013 report is in preparation.