Front Range CFLRP Monitoring Jam Session 2015 Summary

General Overview

On April 8th, 2015, members of the Front Range Roundtable's Landscape Restoration (LR) team gathered to review ecological monitoring data and evaluate progress toward desired conditions for Front Range Collaborative Forest Landscape Restoration Program (CFLRP) projects. Known as the monitoring "jam session," the day is intended to provide LR team members the opportunity to address key questions posed by Aplet et al. (2014) in the Front Range CFLRP's adaptive management diagram: Are treatments contributing to desired conditions; are we monitoring the right things; is monitoring effective? The overall goal of the jam session is to provide a forum for the LR team to discuss strengths and weaknesses of treatment implementation and monitoring practices, as well as to develop collaborative recommendations for continual improvement of the program. This document summarizes the activities and main outcomes of the 2015 jam session and suggests next steps that the LR team pursue in order to facilitate adaptive management.

The 2015 jam session focused primarily on aspects of the monitoring program that could not be addressed during the 2014 jam session due to lack of available data. The 2014 jam session focused on evaluating Common Stand Exam (CSE) data for assessing changes in forest structure and composition before and after treatment. Spatial heterogeneity, landscape-scale monitoring, and wildlife monitoring were not addressed during the 2014 jam session and thus became the emphases for the 2015 jam session. CSE data analyzed previously were also revisited during the 2015 jam session primarily for the purpose of continuing to evaluate the use of the data for spatial heterogeneity monitoring, as well as conducting a power analysis to gain a better sense of optimal sample sizes for CSE sampling.

Main Presentations and Outcomes

Spatial heterogeneity monitoring

Monitoring spatial heterogeneity continues to be a challenging aspect of the CFLRP's monitoring program, though significant advances in aerial imagery-based methods were made in 2014 that are summarized in the LR team's 2014 spatial heterogeneity monitoring report (Dickinson et al. 2014). Main outcomes of the analysis include:

> "At the stand scale, the treatments have reduced forest cover, increased canopy patch density, decreased canopy patch size (max and mean), increased distances and range of distances among canopy patches. However, the heterogeneity of canopy patch sizes (range and standard deviation of patch area) has decreased, which is counter to the current desirable trends. However, we recommend that this desirable trend be revised to allow some reduction in the heterogeneity of patch sizes, while specifying an acceptable minimum. Furthermore, the CFRLRI should continue to focus on creating a range of patch sizes at the stand-scale through adaptive management." (Dickinson et al. 2014)

The findings of Dickinson et al. (2014) were presented and discussed at the jam session, but the group felt that more time was needed to adequately digest and evaluate the data, in part because the FRAGSTATS-derived metrics are still somewhat foreign to the group. The metrics need to communicate what they are measuring in simpler, more understandable terms to the extent possible. There may also be opportunity to reduce the number of metrics being used if redundancies among metrics are

identified (e.g. perimeter to area ratio and edge density measure similar things and therefore only one of these metrics may be needed).

The group would like to see distributions of patch sizes presented (as opposed to means), and would like to see openings incorporated into the analysis (note: openings were not explicitly analyzed with the aerial image analysis so this may require additional time). The group would also like additional information about the classification accuracy of the image analysis, as well as additional information about how some of the key metrics are related to elements of prescriptions that may have intentionally been changed over the timeframe of CFLR treatments. No concrete conclusions regarding progress toward desired conditions for spatial heterogeneity were made during the jam session, and it was determined that a follow up meeting of the Spatial Heterogeneity sub team was needed to further evaluate the results of the analysis. This meeting has been scheduled for May 26, 2015.

Landscape-scale monitoring

Significant advances were made with the landscape-scale monitoring effort in 2014 as well that are also summarized in Dickinson et al. 2014. Main results from this analysis include:

"Changes at the landscape scale were also encouraging, with small reductions in dense canopy cover and increases in sparse canopy cover across the landscape. Some artifacts in the results due to the methods were identified, however the overall conclusions in terms of the trends are robust. Therefore, we recommend that these results be provisionally accepted, and the methods be further refined to address these concerns for future monitoring cycles. To date, the changes at the landscape-scale have been relatively small as expected because the projects are currently relatively small and widespread across the region. However, as further projects are completed over the coming years, a greater proportion of each landscape will be treated and landscape-scale forest complexity will increase." (Dickinson et al. 2014)

These results were presented and discussed at the jam session, but as with the spatial heterogeneity effort, more time was needed to adequately review the data in order to make conclusions about progress toward desired conditions. Additionally, the group expressed concern about the use of different data sources for quantifying canopy cover within treatment areas versus outside of treatment areas. The team agreed to take this issue up as well within the Spatial Heterogeneity sub team meeting scheduled for May 26.

Wildlife (placeholder for Casey)

The wildlife working group updated the LR team on the CFLRP's history of wildlife monitoring and reviewed the process by which priority wildlife species were selected for monitoring. High priority species ("Tier 1") selected for monitoring include several avian species and 2 tree squirrel species (Abert's squirrel and pine squirrel). All Tier 1 avian species and pine squirrel are effectively sampled using a standard avian sampling approach. The 2014 field season represented the first year of implementing the avian sampling approach, and a pilot project to determine field techniques to monitor Abert's squirrels was also completed.

The sampling effort for forest avian species and pine squirrel included 120 1-km^2 grid cells (1414 individual point counts) completed by the Rocky Mountain Bird Observatory using the Integrated Monitoring of Bird Conservation Regions (IMBCR) protocol. These grid cells were spatially balanced across both USFS administrative boundaries and across both treatment and control areas. A treatment grid cell is defined as having greater than 30% of the area in prescribed CFLRP forest treatments by the end of the FR CFLRP project. Results of these surveys yielded occupancy estimates with coefficient of variation of less than 50% (i.e., high levels of confidence) for 54 forest passerine bird species and 4 out

of 6 priority bird species identified by the wildlife working group as Tier 1 priority species for monitoring. Golden-crowned kinglet is one species that might not be a good representative for the FR CFRLP based on its primary habitat affinity with the Spruce-Fir forest type, rather than the ponderosa-dominated forest type.

The pilot sampling effort for tree squirrels was conducted on a subset of 40 IMBCR sites. These sites were spatially balanced across both USFS administrative boundaries in both treatment and control strata. Sampling involved camera traps at bait sites to determine occupancy rates of both Abert's squirrels and pine squirrels. Site habitat data was also collected at each site as information on general habitat requirements for both tree squirrel species. Results were presented on detection probabilities of the two tree squirrel species and corresponding occupancy rates. Occupancy rates for Abert's squirrel and pine squirrel across all sampling was 0.19% and 0.25%, respectively. This approach shows promise but the first year pilot sample size was relatively small. In addition to the camera trap sampling, a protocol was developed to sample Abert's feeding sign in conjunction with the avian sampling. This feeding sign survey approach will be formally piloted during 2015 and potentially integrated into the next year of avian monitoring, scheduled for 2016.

Power analysis to determine sample sizes for the Common Stand Exam approach

The group evaluated results from a power analysis conducted to determine how many plots are needed per project in order to adequately detect change from pre to post treatment. The intent of this analysis was to determine if the CSE approach could be scaled back, thereby freeing up additional funding for other aspects of the monitoring program such as wildlife and understory monitoring. As a demonstration, the group looked at the probability of reliably detecting a basal area difference under a variety of scenarios. For example, in one scenario, we wanted to detect a minimum basal area difference of 20 ft^2/acre, with a standard deviation of 30, and alpha of 0.1. Under this scenario, we could detect the 20 ft^2/acre difference in basal area 90% of the time with 38 or more plots. In other words, 90% power was achieved at about 38 plots. However, if we wanted to detect a basal area change of 10, we could not achieve 90% power until about 140 plots were sampled. The group generally agreed that a difference of 20 ft^2/acre would be the minimum we would want to detect, and that a 38 plot minimum per project would be reasonable. This discussion was not completed, however, and is scheduled as a follow up agenda item for the May LR team meeting. The group needs to determine the size of the difference we want to detect and the variables we want to measure, and subsequently the number of plots needed for each project.

Additional Discussion Topics
Tree ages – ratio of old to young trees

The CFLRP monitoring plan specifies a desire to increase the ratio of old trees (>200 years old) to transitional and young trees through retention of old trees and removal of young trees, yet we do not have adequate information to address this desired trend, in part because it is time-consuming to collect tree age information. Contractors on the Pike/San Isabel NF have been estimating trees ages (in tree age classes) based on morphological characteristics, but this data is not in the Forest Service corporate database and has not been provided to the LR team. Members of the LR team responsible for data analysis should follow up with FS managers to get this information. The LR team needs to have additional discussion about this metric. If we retain it as a metric, we should make a more concerted effort to gather the data necessary to evaluate it. We should evaluate whether an age "rating" system could be adopted based on morphological characteristics. Data collected by the Front Range Historical Stand Reconstruction Project could help inform the use of morphological characteristics in evaluating age.

Landscape fire behavior modeling

While restoration treatments are conducted for multiple resource benefit, one of the core objectives of treatments is to modify landscape fire behavior. To date we have struggled with understanding how our forest structure-based approach to restoration may (or may not) influence landscape fire behavior in desired ways. The LR team should continue to explore the use of landscape fire behavior models such as Flammap to model treatment effects on landscape fire behavior, and should make every effort to monitor wildland fire behavior when wildfires occur and burn through treatment areas.

Fire effects monitoring

With the potential for increased use of prescribed fire for CFLRP projects in the future, the LR team should consider developing a fire effects monitoring component to the existing monitoring protocol. This protocol would most likely be aimed at evaluating effects of fire on understory vegetation, tree regeneration, and surface fuel loads. As mentioned above, post-fire effects of wildfires burning through treatment areas should also be monitored as part of this effort.

Data summaries tailored to individual project objectives

The LR team agreed that a table with information about all projects completed with CFLRP funds would be useful in order to better understand the context around individual projects. This table would include information about when the project was planned, contracted, and completed; the project objectives; the project prescription; and any other relevant information. This would allow for a much more nuanced evaluation and interpretation of monitoring data than is currently possible. This table should be accompanied by a map of project locations.

Hypothesis testing framework

Prior to the jam session, several members of the LR team discussed the need to develop a hypothesis testing framework in order to give the group more quantitative footing in evaluating progress toward desired conditions. For example, instead of asking ourselves questions such as "did treatments reduce basal area," we might reframe the questions as hypotheses. If we want to reduce density by 30%, then our hypothesis is this: post-treatment forest density is not significantly different from 70% of pretreatment forest density. While the LR team did not have time for an in-depth discussion of this topic at the jam session, it was agreed that it is a worthwhile avenue to pursue. An effort to better define ecological significance (versus statistical significance) would be included here as well.

LR team schedule for evaluating monitoring data

The LR team has outlined an annual schedule for implementing adaptive management, which includes the jam session among other activities. It was clear from this year's jam session, however, that more than a single day is needed to evaluate monitoring data. As opposed to years past when data were relatively limited, we now have a large amount of data to work with to answer our monitoring questions. We need to revise the jam session approach to allow the group more time to digest the data and think about what it means. We discussed using more of the LR team meetings throughout the year to look at monitoring data, but preferably without a return to the somewhat piecemeal approach of data presentation in place prior to the jam session development. One option may be to have a multi-day event, or host a series of meetings concentrated throughout the spring months as a "jam season." This topic will be taken up again at the June LR team meeting.

Data integration and database needs

We discussed the possibility of combining all data (CSE, aerial imagery and cover classification, transect-based sampling for spatial heterogeneity, and wildlife data) for selected areas to see how the different methods compare to one another and can inform each other. For example, how does the transect method of measuring openings compare to the aerial imagery methods for measuring canopy patch sizes? Can the CSE and aerial imagery analyses be combined with the wildlife surveys to develop a more integrated, comprehensive analysis? Additional integration with other components of the monitoring program beyond ecological monitoring (e.g. social-economic monitoring) has been discussed by the group as well. The group continues to follow a default system that individual members or groups are responsible for the subsets of data which they or their agency collected and/or analyzed. Data have not yet been consolidated into an appropriate centralized database. The database being developed by the Wildlife sub team through work with the Rocky Mountain Bird Observatory may provide a model that other sub teams could follow for housing data. However, further discussion and planning will be needed to identify when and how data should most effectively be shared, published, combined, etc.

Summary reporting

To date the various components of the monitoring program have reported separately from one another based on individual contract requirements. For example, CFRI is required to report results of the CSE analysis under their contract with the Forest Service. Likewise, the Rocky Mountain Bird Observatory will present results of their summer 2014 field work in a stand-alone wildlife report. This reporting structure is necessary to satisfy deliverables associated with individual contracts, but as a result the LR team ends up with several individual and disparate reports. There is a need to extract main findings from each of the individual monitoring reports and develop a summary report that highlights the main outcomes from each of the monitoring program components.

The LR team could also improve the way in which it reports information to the Roundtable and the general public. Reporting at this level should highlight main findings and outcomes of the LR team's work, and should emphasize *why* we are doing the work we do, and why it's important in the context of forest and fire policy in Colorado and throughout the western U.S. The Crown of the Continent CFLRP may provide a good example for us to follow in reporting and presenting to audiences such as the general public.

Clarifying the relationship between the LR team and the Roundtable

Several members of the LR team have expressed a need for clarifying the role of the Roundtable in overseeing the work of the LR team. Is the LR team asking the Roundtable for approval on any aspects of the team's work, or is the team responsible primarily for keeping the Roundtable updated on LR team activities? The LR team should attempt to identify roles for the Roundtable in communicating and dispersing the work of the LR team to improve overall outreach.

All lands restoration and monitoring

The emphasis of the LR team to date has largely been on evaluating treatment effects on federal lands under the CFLRP. The team should make a more concerted effort to incorporate private lands in the data evaluation process in addition to federal lands to better understand overall landscape-scale effects of treatments. Funding to support monitoring efforts on private lands should continually be sought as well so that data is available for evaluation.

Qualitative review from field trips

A fieldtrip feedback form was introduced by the LR team during the 2014 summer fieldtrips with the goal of improving our documentation of field trips and increasing the amount of qualitative information available for evaluating treatment effects. In addition to the feedback form, an after-action review session should take place in order to review the feedback forms as a group (the September LR team meeting would be a good time for this).

The field trips themselves should be structured in a way that better engages the group. Field trip sites could be selected in order to address specific questions or areas of uncertainty. For example, the group could be asked to provide feedback about a specific treatment technique. Site selection may be informed by the jam session as well, especially if there are particular projects where the monitoring data suggested departures from desired trends. A sub group of the LR team is planning to get together to discuss and refine the format of the field trips and to begin planning the summer 2015 trips.

Next Steps

- Spatial heterogeneity sub team to reconvene to continue evaluating metrics being used to evaluate heterogeneity and to discuss issues encountered with the approach to the landscape analysis. A meeting of the team has been scheduled for May 26, 2015.
- Additional discussion about the schedule for evaluating monitoring data is scheduled for the June LR team meeting. One option the group might consider is a monitoring "jam season" as opposed to a single-day event. This could be a multi-day event or a series of more concentrated meetings throughout the spring months.
- Summer 2015 field trips need to be planned. A subset of LR team members will get together before the June LR team meeting to develop an initial plan for the team's field trips. The team may want to edit the field trip feedback form developed for the 2014 field trips to improve the mechanism for capturing input from the field trips.

References

Aplet, G., Brown, P., Briggs, J., Mayben, S., Edwards, D., and T. Cheng. 2014. Collaborative Implementation of Forest Landscape Restoration in the Colorado Front Range. Colorado Forest Restoration Institute, Colorado State University, Technical Brief CFRI-TB-1403, Fort Collins, CO. 9 p.

Clement, J. and P. Brown. 2011. Front Range Roundtable Collaborative Forest Landscape Restoration Project 2011 Ecological, Social and Economic Monitoring Plan. Colorado Forest Restoration Institute, Colorado State University, Fort Collins, CO. 51p.

Dickinson, Y., Giles, E., Pelz, K., and Howie, J. 2014. Stand- and landscape-scale forest heterogeneity on Colorado's Front Range: Monitoring report of the spatial heterogeneity subgroup for the 2010-2013 restoration treatments. Colorado Forest Restoration Institute, Colorado State University, Monitoring Report CFRI-MR-1501. Fort Collins, Co. 177 p.

Front Range CFLRP Monitoring Jam Session 2015: Information and Agenda

Date/Time: April 8, 2015, 10:00 am to 3:00 pm

Location: Jefferson County Building ("Taj"), 100 Jefferson Parkway in Golden, Kittridge/Pleasantview rooms (1563/1564)

Meeting Purpose: Collectively review ecological monitoring data and evaluate progress toward desired conditions for Front Range forest restoration at stand and landscape scales.

Agenda

Time	Topic	Details	Responsibility
10:00 am	Introduction and meeting overview	Review meeting purpose in the context of adaptive management; review desired conditions and trends from the CFLRP monitoring plan; introduce hypothesis testing framework; describe treatment implementation progress to date.	Rob
10:30 am	Forest structure at stand and landscape scales	Provide overview of available data and results to date for stand metrics (tree density, species composition, spatial heterogeneity, understory vegetation, and fuels) and landscape patch metrics.	Kristen, Rob, Jenny
11:15 am	Progress in achieving desired conditions	Interactively evaluate progress toward desired conditions using poster-sized printouts of data per project.	Full group
12:15 pm	Lunch	Pack a lunch or visit the cafeteria	
1:00 pm	Wildlife monitoring	Status of wildlife monitoring, progress from 2014 field season, initial review of the data.	Rick, Jenny, Casey
1:45 pm	Information needs and next steps	Discussion of statistical versus ecological significance and additional information needed to determine ecological significance; plan for report out to the Roundtable; preview of summer 2015 field activities; discussion of summer field trips.	Rob, Kristen, Jenny facilitating full group discussion
3:00 pm	Adjourn		

Attendees of the 2015 LR team monitoring jam session

Name	Organization
Rob Addington	The Nature Conservancy
Greg Aplet	The Wilderness Society
Heather Bergman	Peak Facilitation
Jenny Briggs	U.S. Geologic Survey
Peter Brown	Rocky Mountain Tree Ring Research
Casey Cooley	Colorado Parks and Wildlife
Dick Edwards	U.S. Forest Service
Jonas Feinstein	Natural Resources Conservation Service
Jim Gerleman	U.S. Forest Service
Chad Julian	Wildland Urban Interface Center, CSU
Paige Lewis	The Nature Conservancy
Mark Martin	U.S. Forest Service
Kristen Pelz	Colorado Forest Restoration Institute
Rick Truex	U.S. Forest Service
Jeff Underhill	U.S. Forest Service
Carine Vadala	U.S. Forest Service
Brett Wolk	Colorado Forest Restoration Institute
Amarina Wuenschel	U.S. Forest Service
Kevin Zimlinghaus	U.S. Forest Service