Chapter 13: Applying GTR 220 Concepts on the Sagehen Experimental Forest

P. Stine[1] *and S. Conway*[2]

Introduction

Applying science to the practice of forest management is a difficult process. Scientific results tend to be expressed in terms such as variances, confidence intervals, and probability distributions. Rarely does science provide unequivocal information, yet land managers must make definitive decisions on the ground. The General Technical Report "An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests," published by the U.S. Forest Service (hereafter GTR 220) (North et al. 2009) presented some important concepts for land managers to consider; however, implementation of these principles into detailed, site-specific application requires some novel approaches.

Summary of Findings

1. With GIS, **the Sagehen fuels reduction project was partitioned into subunits based on topographic categories, and each subunit was designated with an emphasis** that established a priority for providing habitat, reducing fuels, or restoring forest resilience.
2. **Emphasis areas allow reconciliation of conflicting demands by providing due attention to all of the chosen priorities.** Different prescriptions were developed for each of the different emphases, allowing silviculture to be tailored to each area's priorities.
3. **Field trips and test plots helped ground discussions** so participants could visualize how new prescriptions would alter forest conditions.

Context

The "Sagehen Fuels Reduction Project" began almost 10 years ago with the goal of reducing the risk of a high-severity fire. Over this period, several plans were developed. Early in 2010, the Truckee Ranger District, the Pacific Southwest Research Station, the University of California at Berkeley, and copartners in managing the experimental forest, agreed to take a step back from the internal planning that had been completed to date. In its place, they initiated a collaborative planning process to engage all interested public and private parties to thoroughly examine the issues pertaining to fuels reduction management. Strong encouragement was offered for this idea from Sierra Forest Legacy, a prominent consortium of environmental groups concerned with forest management in the Sierra Nevada. A grant was obtained from the Sierra Nevada Conservancy to support an independent facilitator,

[1] National coordinator for experimental forests and ranges, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, The John Muir Institute, One Shields Ave., University of California, Davis, CA 95616.

[2] Vegetation management office, U.S. Department of Agriculture, Forest Service, Tahoe National Forest, Truckee Ranger District, 10811 Stockrest Springs Rd., Truckee, CA 96161.

and the effort was launched in May 2010. One constraint on this effort was to limit planning to the areas covered by previous planning efforts where a suite of survey activities had already been completed. These required surveys (e.g., of archeological sites) are expensive and time consuming. Opening up the planning process to the entire basin would have added significant costs and time to the project. Thus the collaborative planning team (the team) agreed to view this project as a first step toward a longer term set of objectives that could be developed and implemented over time in the Sagehen basin.

Sagehen presented an ideal test bed for developing innovative ideas for forest management for a number of reasons. Perhaps foremost, almost the entire basin was designated as an experimental forest in 2005. There are 80 experimental forests and ranges throughout the United States, designated specifically to provide an environment where research can examine new forest management methods. The Sagehen basin has also been the home of the Sagehen Creek Field Station of the University of California at Berkeley for over 60 years. A wealth of research information and monitoring data has been collected in this area. In addition, when Truckee Ranger District staff first contemplated some fuels reduction treatments, scientists from the University of California developed a research approach to examine the effects of Strategically Placed Area Treatments (SPLATs), the principle landscape fuels reduction strategy employed by the Forest Service throughout the Sierra Nevada (Finney 2001). Research has a prominent role at Sagehen and offers some important advantages for trying new management ideas.

The Sagehen basin is a 9,000-ac (3642-ha) watershed at the upper reaches of Sagehen Creek, a tributary of the Truckee River just on the east side of the Sierra Nevada range, about 10 mi (16 km) north of Truckee, California. The west end of the basin begins at the crest of the Sierra Nevada at just over 9,000 ft (2743 m) elevation and extends east, ultimately flowing into Stampede Reservoir. Five major vegetation cover types can be found in the basin: herbaceous (fen, wet montane meadow, and dry montane meadow), montane shrub, mixed conifer, true fir, and conifer plantation. The majority of the basin is in mixed conifer (Jeffrey pine [*Pinus jeffreyi* Balf.], incense cedar [*Calocedrus decurrens* Torr. Florin], white fir [*Abies concolor* (Gordon & Glend.) Lindl. ex Hildebr.]) or a true fir (red fir [*Abies magnifica* A. Murray bis] and white fir) at higher elevations. The basin has a Mediterranean type climate with cold, wet winters and warm, dry summers. Monthly average maximum temperature ranges from 39 °F (3.9 °C) in December to 79 °F (26.1 °C) in July; monthly average minimum temperature ranges from 14 °F (-10 °C) in January to 37 °F (2.8 °C) in July. Annual precipitation is about 33 in (83 cm); snowfall accounts for greater than 80 percent of the annual precipitation and averages over 200 in (508 cm).

The basin is almost entirely national forest land within the Truckee Ranger District of the Tahoe National Forest. Portions of the basin have been subject to high-severity fire in the past, most notably the Donner Fire that occurred in the fall of 1960. Staff on the Truckee Ranger District recognize the risk of another high-severity fire and several fuel reduction plans have been in development.

Information Used

To our advantage, we had a fairly rich foundation of data with which to work. Key data sources included vegetation maps (both recent and from ca. 1980), detailed forest stand plot data and stand exam data, American marten (*Martes americana*) survey data (Moriarty et al. 2011), and published research findings and recommendations from several different time periods. Perhaps most important was the planning and execution of two test field plots to demonstrate the ideas of spatial heterogeneity. These test plots provided both visual examples and quantitative data for what dense cover areas and small openings looked like and what the resulting stand composition and structure would be after treatment (fig. 13-1). We even included a prescribed burn for one of the two test plots. This proved very effective in communicating the anticipated outcomes of treatments to the collaboration team.

Figure 13-1—Test plot mechanically thinned and prescribe burned at the Sagehen Experimental Forest to produce a group and gap structure.

Not all localities have this level of information, but, by the same token, every location has limitations in data availability. Even in this situation, as on many national forests, we wanted more data. An important feature of this effort was the presence of a facilitator. Among many tasks, our facilitator particularly helped present a neutral position, kept meetings progressing and the project on pace, and organized efforts to gather and assimilate feedback. We also had a technical working group, particularly the professionals on the district staff, who brought a positive, problemsolving attitude. We encountered many instances in which we had to adjust expectations and address problems, but we always worked within the principle that a solution could be found.

Perhaps the biggest challenge was incorporating the concept of landscape heterogeneity at multiple spatial scales into silvicultural prescriptions.

Implementation

Perhaps the biggest challenge was incorporating the concept of landscape heterogeneity at multiple spatial scales into silvicultural prescriptions. As the team developed approaches to incorporate heterogeneity at different spatial scales (e.g., retention of small patches of dense cover areas embedded within certain emphasis areas), we realized that it would be difficult to translate into a prescription and to write direction for a marking crew. Implementing these ideas using standard silvicultural practices that are grounded in defining and managing toward average conditions of a stand will be difficult. Promoting forest heterogeneity, particularly at multiple spatial scales, is antithetical to some standard forest management practices (e.g., equally spacing between leave trees to maximize growth and resistance to crown fire [fig. 6-2]). At present, there are no simple silvicultural tools available to operationalize this approach. Yet there are considerable benefits (accompanied inevitably with growing pains) to emulating the landscape complexity created by an active fire regime.

Lessons Learned

The innovations that made this project unique and intriguing include some applications that are easily transferable and others that will still need development. The lessons learned offer a starting point for other land managers. New tools have been developed to assess within-stand heterogeneity (chapter 9) and to divide a forested landscape in different topographic categories (chapter 10). Other localities in the Sierra Nevada are exploring ways to implement GTR 220 concepts, but there are still challenges that need to be addressed.

The process was intended to prepare the Truckee Ranger District to move forward with National Environmental Policy Act (NEPA) procedures while providing ample advanced opportunity for satisfying the concerns of all involved parties.

The expectation was to apply the concepts of GTR 220 to accomplish an array of objectives for a single landscape. By discussing and exploring issues in advance of any official NEPA action, the team could collectively reveal and deal with many issues prior to crafting and putting forth a proposed action. The key advantages and discoveries of this process we implemented and that may be transferable to similar forest management planning efforts include:

1. Identify and categorize all potential issues, no matter how small, in advance.
2. Focus attention on the most complex and compelling issues:
    a. Habitat protection and enhancement for a key species of concern, American marten (designated as a sensitive species in Forest Service Pacific Southwest Region).
    b. Ecological restoration to create more resilient forest stands, capable of being sustained through a warming climate, future droughts, and fire.
    c. Restoration of fire resiliency; enabling the forest (throughout the basin) to be better able to withstand wildfire.
3. Craft objectives to address each of the issues that would be used to direct management actions to be taken. The intent was to develop management objectives that were achievable, given the current conditions within the basin, with an understanding that this was the first of perhaps several treatments that could happen over time. While not achieving everything we might strive for, these first treatments would be able to redirect the trajectory of forest structure and composition.
4. Partition the landscape into subunits using topographic variables (aspect, elevation) (chapter 10), one of the key principles in GTR 220, as a determining factor in defining appropriate forest composition and structure, as well as other key sources of spatially explicit information, such as the locations of high-value marten habitat. Not all areas have equal value (as habitat) or have equal ecological potential (for one kind of forest stand or another) or generate equal concern (for fire behavior). Partitioning the landscape enabled us to explicitly address and provide for the landscape heterogeneity that is inherent in this, and most other, project areas.
5. Formulate "emphasis areas" that dictate which objectives would be given priority in a given location (fig. 13-2). Emphasis areas are an important innovation that enabled a purposeful differentiation of the landscape to promote and manage for the notion of landscape heterogeneity.

Formulate "emphasis areas" that dictate which objectives would be given priority in a given location.

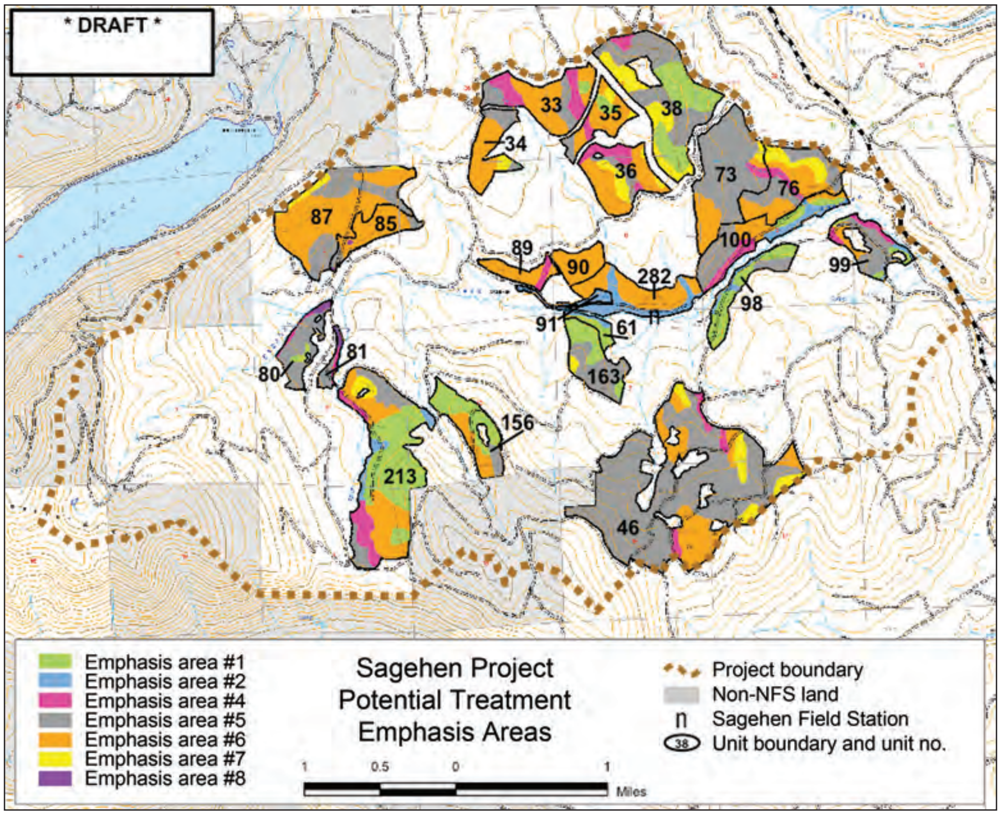

Figure 13-2—Sagehen Experimental Forest with treatment areas classified by emphasis area. Emphasis areas are (1) high-value marten habitat on north-facing slopes, on ridges, and on higher elevation south-facing slopes (above 6,725 ft) (2050 m); (2) drainage bottoms with high-value marten habitat; (3) high-value marten habitat on lower elevation (below 6,725 ft) (2050 m) south-facing slopes; (4) drainage bottoms that do not currently support marten habitat; (5) north-facing slopes that are not currently marten habitat; (6) vegetation types not identified as marten habitat on south-facing slopes; (7) vegetation types not identified as marten habitat on ridges; and (8) aspen stands targeted for ecological restoration. NFS = National Forest System.

6. Partition the landscape into emphasis areas to better reconcile conflicts and provide due attention to all of the chosen priorities. Emphasis areas allowed us to apply sound rationale and understand the collective implications of these choices at a watershed scale.

7. Based on these objectives, craft different silvicultural strategies to meet the needs of each of the emphasis areas. Some of these silvicultural prescriptions employed relatively conventional approaches, whereas others required innovations to achieve the intended outcomes.

A number of details are unresolved, most notably the translation of the written objectives and prescriptions to crews who will mark stands for treatment. This step is always a delicate link in the process; more so with the novel strategies imbedded in this approach. Plans for handling this process include members of the collaborative planning team joining district staff in the exploratory field efforts and subsequent training sessions for the crews. However, experiences from the test plots suggest a fairly quick learning process for understanding the intentions of variable thinning and the other features of this approach. Overall, we see the efforts accomplished to date as a good example of how the principles of GTR 220, combined with an open process with ample opportunity for input from all interested parties, can lead to well-founded forest management strategies.

References

Finney, M.A. 2001. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Science. 47: 219–228.

Moriarty, K.M.; Zielinski, W.J.; Forsman, E. 2011. Decline in American marten occupancy rates at Sagehen Experimental Forest, California. Journal of Wildlife Management. 75: 1774–1787.

North, M.; Stine, P.; O'Hara, K.; Zielinski, W.; Stephens, S. 2009. An ecosystem management strategy for Sierran mixed-conifer forests. Gen. Tech. Rep. PSW-GTR-220. 2nd printing, with addendum. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 49 p.