

Project Number: EMC-2017-xxx

Project Name: Evaluating tradeoffs between riparian buffer regulations, fire hazard, and tree regeneration in the Sierra Nevada

Background and justification

As the understanding of the ecological role that fire plays in sustaining Sierra Nevada forest structure and composition has grown through scientific investigation, new regulations have been developed to address the interaction of forest management and fire behavior on private lands. Examples include post-harvest slash mitigation requirements and the development of fire hazard reduction exemptions. These regulations, which include both new restrictions but also new choices, presumably lead to the positive benefit of lower fire severity across the landscape. Because lower fire severity is more in line with the natural disturbance regime, the regulations may also bring along a host of other ecosystem values when fires do occur.

In riparian forests of the Sierra Nevada, this same type of iterative improvement of regulations and choices on private lands has not occurred. The protection of riparian forest values such as water quality, water yield, aquatic habitat, and riparian vegetation is a critical responsibility of the California Forest Practice Rules. Thus a cautious approach to forest management activity in riparian areas is justified. As with upland forests, however, adjustments in management that incorporate knowledge of the natural disturbance regime and that lowers risks of emerging stressors are eventually needed to improve long-term sustainability of public values. Although it is well known that pre-suppression disturbance regimes included frequent fires in riparian areas, options for feasibly mimicking fire-maintained structures in riparian areas are limited. The result is a continually widening departure from the natural disturbance regime- and the associated structures and compositions that it sustained- in riparian forests.

Ideally, adjustments (or justifications for maintaining the status quo) are informed by experimental trials that reflect feasible alternatives and rigorously monitor their relative effectiveness at enhancing or diminishing various values. Specifically, the trials that are needed for riparian forests are those that have potential to expand those management actions that have a positive impact on fire behavior (i.e. lower fire severity) and those that restore composition (i.e. sustaining species diversity), while also protecting core riparian values. While no adjustments from the status quo may be the best approach, such a determination cannot be made until alternatives are evaluated through experimental investigation.

Objectives and scope

The objective of this project is to establish a network of locations that will be maintained as long-term study sites that evaluate the effectiveness of Watercourse and Lake Protection Zone (WLPZ) regulations in sustaining low fire severity and species diversity. In the short term, we propose to establish pilot sites at UC Blodgett Forest Research Station, with the mid-term (3 years) aim of expanding study locations to other research forests in Nevada County (UC Grouse Ridge Research Forest) and Shasta County (UC Marble Creek Research Forest). In the long-term (5 years), we aim to expand the study locations onto collaborators' lands at additional Sierra Nevada sites on private and state demonstration forest lands. Specifically, the treatments will be designed to reduce fire hazard and regenerate a diversity of species in Class I and Class II riparian areas. In parallel with this proposal, **it will be necessary to apply for the**

study sites to be designated as experimental forest land (PRC § 4526). Specifically, the treatments will be:

1. Control- no treatment will occur
2. Status quo- a selective removal of canopy trees, representing the status quo of no equipment entry and directional tree felling; during phase I, CAL Fire forest practice inspectors will be interviewed to help define the typical level of thinning that occurs in WLPZ's currently.
3. Fire severity reduction- a thin from below to a target basal area, followed by a fuel treatment that reduces surface fuel loading (pile and burn or mastication). **Heavy equipment will enter these treatment areas for both tree removal and to conduct fuel treatments**
4. Fire severity reduction + small gap restoration- in addition to the fire severity reduction treatment described above, small canopy gaps ranging in size from 0.12 to 0.5 acres will be created. **Heavy equipment will be allowed both in canopy gaps as well as in the matrix between canopy gaps.** Canopy gaps will be piled and burned, followed by experimental planting of all native conifer species.

We plan to take advantage of the existing network of riparian monitoring plots that already exist on Class I watercourses at Blodgett. These have been maintained for the last 20 years and were most recently measured in 2014, thus providing a substantial baseline measurement. These plots, when augmented with additional plots on Class II watercourses and other sampling efforts will be designed to measure the following response variables:

1. Light availability- measured with hemispherical photography at channels and within buffer zones
 - a. Question addressed: Does a gap based silvicultural approach create enough resource availability for the regeneration of shade intolerant tree, shrub, and forb species?
2. Stream substrate quality- classifications of stream substrates into run/riffle/pool categories
 - a. Do fuel treatments and gap creations influence stream substrate quality?
3. Sediment transport corridor development
 - a. Do fuel treatments and gap creations in WLPZ's potentially lead to sediment delivery?
4. Understory vegetation dynamics
 - a. How does mechanical disturbance in WLPZ's influence understory vegetation composition?
5. Snag and Coarse Woody Debris dynamics
 - a. How do WLPZ mechanical treatments influence snag and CWD?
6. Planted seedling survival and recruitment
 - a. What is the effect of canopy opening size on the survival and growth of native conifer species?
7. Soil strength, measured along transects perpendicular to watercourses with cone penetrometers
 - a. What is the effect of equipment use on soil compaction?

Treatment replication will occur at the stand level, with alternatives randomly applied to roughly 4 acre plots. The pilot phase will include 16 acres of WLPZ areas, allowing for four replications of each treatment. Expansion to other WLPZ locations both at Blodgett and other forests will be informed by the initial results of the pilot phase (i.e. adjustments to treatment area, sampling design, etc.).

The scope of the project will initially be the central Sierra Nevada mixed conifer forests (i.e. forests representative of Blodgett Forest). Although we are referring to the first two years as the “pilot phase” because of the intention of expansion, it should be noted that there is enough replication and parsimonious design for the pilot phase to be relevant to a broad range of the mixed conifer forest. The existing outreach and demonstration program at Blodgett can be leveraged to extend results to professionals, stakeholders, and policy makers. As other study sites are incorporated, the entire mixed conifer forest should be well represented. The network of UCB forest research stations alone represent significant latitudinal (from the Cascades to giant sequoia groves) and productivity (Site I to Site III) variability.

Critical questions and Relevant Forest Practice Regulations

The critical monitoring questions are those related to WLPZ function and wildfire hazard. The relevant regulations include Sections under Article 6 of the Forest Practice Rules.

Principal Investigator and Collaborators

The PI will be Robert York, PhD and RPF, Adjunct Associate Professor of Forestry and UCB Research Stations Manager.

Collaborators during the initial phase of the project will be:

Bill Stewart, PhD and RPF, Forest Extension Specialist and Co-Director of UC Center for Forestry

Ariel Thomson, RPF, Assistant Resource Manager, Berkeley Forests

Ken Somers, RPF, Manager, Grouse Ridge Research Forest

Ricky Satomi, MF, Forest Advisor, UC Extension

Kate Wilkin, PhD, Forest Advisor, UC Extension

Intern Forester, TBD

Seasonal Forest Resource Assistants (2), TBD

Other science and professional collaborators, to be identified as part of the objective of the pilot phase of the project

Anticipated Timeline

We are requesting funding to conduct the pilot project at Blodgett Forest and to find partners for expansion. The pilot project will require the installation of additional plots and the various pre-treatment measurements, followed by treatment installation and post-treatment measurements. This is anticipated to take 2 years. By the end of the 2-year pilot phase, we will be ready to expand the treatments to the other UCB research forests and will begin planning with other collaborators.

Funding

We are requesting funds to support a share of this project. Specifically, we are requesting funds for an Intern Forester and two seasonal Forest Resource Assistants for two years. All equipment, project supervision, treatment installation, and write-ups of publications and reports will be in-kind. If invited to

submit a final proposal, UCB sponsored projects will assist with detailed budget development and administration. The UCB overhead rate is 25%.

The anticipated amount of requested funds is $\$98,000 + \$24,650$ (overhead) = $\$123,250$. The in-kind contribution is anticipated to be roughly equal to this amount.

Contact Rob York with questions: 530-333-4475; ryork@berkeley.edu; 4501 Blodgett Forest Road – Georgetown, CA 95634.