

Plantations as a Response to the Creighton Ridge Fire: a Landscape Experiment in Cazadero, California¹

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Abstract

During a period of unusually hot, dry weather in 1972, the Creighton Ridge fire burned 4,452 ha (11,000 ac) of forest and intermixed grasslands, as well as many residences on the recently-subdivided 16 ha (40 ac) ranch holdings in the Cazadero – Fort Ross area, north of San Francisco. In response to the fire, local work crews planted and thinned trees from 1981 to 2000 with State of California economic and technical assistance.

Plantations of ponderosa pine (*Pinus ponderosa* Douglas ex C. Lawson) and Coulter pine (*Pinus coulteri* D. Don) were to serve as ‘nurse trees’ allowing ingrowth of shade tolerant Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) and redwood (*Sequoia sempervirens* (D. Don) Endl.). About a million pines, Douglas-fir and redwood were planted on about 1,214 ha (3,000 ac). Where nurse trees were thinned, the desired forests were achieved. Thinning of these new forests, however, has never been a funded state or landowner priority.

Now the forests are up to 45 years old and growing vigorously as dense stands. This paper evaluates several hypotheses testable in this new forest. It also reviews the potential benefits of a forest plan to mitigate plantations’ impacts while creating measurable benefits to the people and ecosystems of the affected watersheds.

Introduction

The Coast Range area of Cazadero – Fort Ross, Sonoma County, California (Coast Ridge) is unique in a host of ways. Adjacent to the Pacific ocean and north of San Francisco Bay, this is the area of the most southern claim by the Russian Empire (Fort Ross in 1812). It was further influenced by Spain and Mexico in the 1820s and 1830s. Originally populated by the Southern Pomo people, land management in this area has been strongly in flux, with the succeeding ‘new owners’ seeking separate and individual management and economic goals. Like many areas opened in the West, the area’s history is one of meeting new goals until the land, or other resource, can no longer provide, is still playing out. The larger area of the Coast Ridge Community Forest is shown in fig. 1.

Geographically, the Cazadero-Fort Ross area has unusual resources for the region. With an annual average rainfall of 1,854 mm (73 inches) (1939 to 1971) (Western Regional Climate Center 2016), the area is among the wettest in the redwood region. Once dominated by redwoods, and later the logging industry, the unique ecosystems of this area have been under extractive pressure since the arrival of Europeans. Because it is part of the San Francisco Bay area, ex-urban privatization and subdivision threaten the ecological integrity of these forests as well. Uses of this land included native burning for food and tools, game habitat, logging for construction, livestock grazing and gardening for homesteads, orchards and viticulture.

Following resource overuse, another use was found for the land. A path of extraction, intentional or otherwise, removes fur-bearing mammals, grizzly bear, salmon, old-growth redwood (*Sequoia sempervirens* (D. Don) Endl.), soil carbon and root mass and, eventually, a portion of groundwater from the ecosystem. Today, most ranches have been subdivided into 16 ha (40 ac) parcels, and the

¹ A version of this paper was presented at the Coast Redwood Science Symposium, September 13-15, 2016, Eureka, California.

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land is a mixture of forests, prairies, agricultural and residential uses, with vineyards expanding across the landscape.

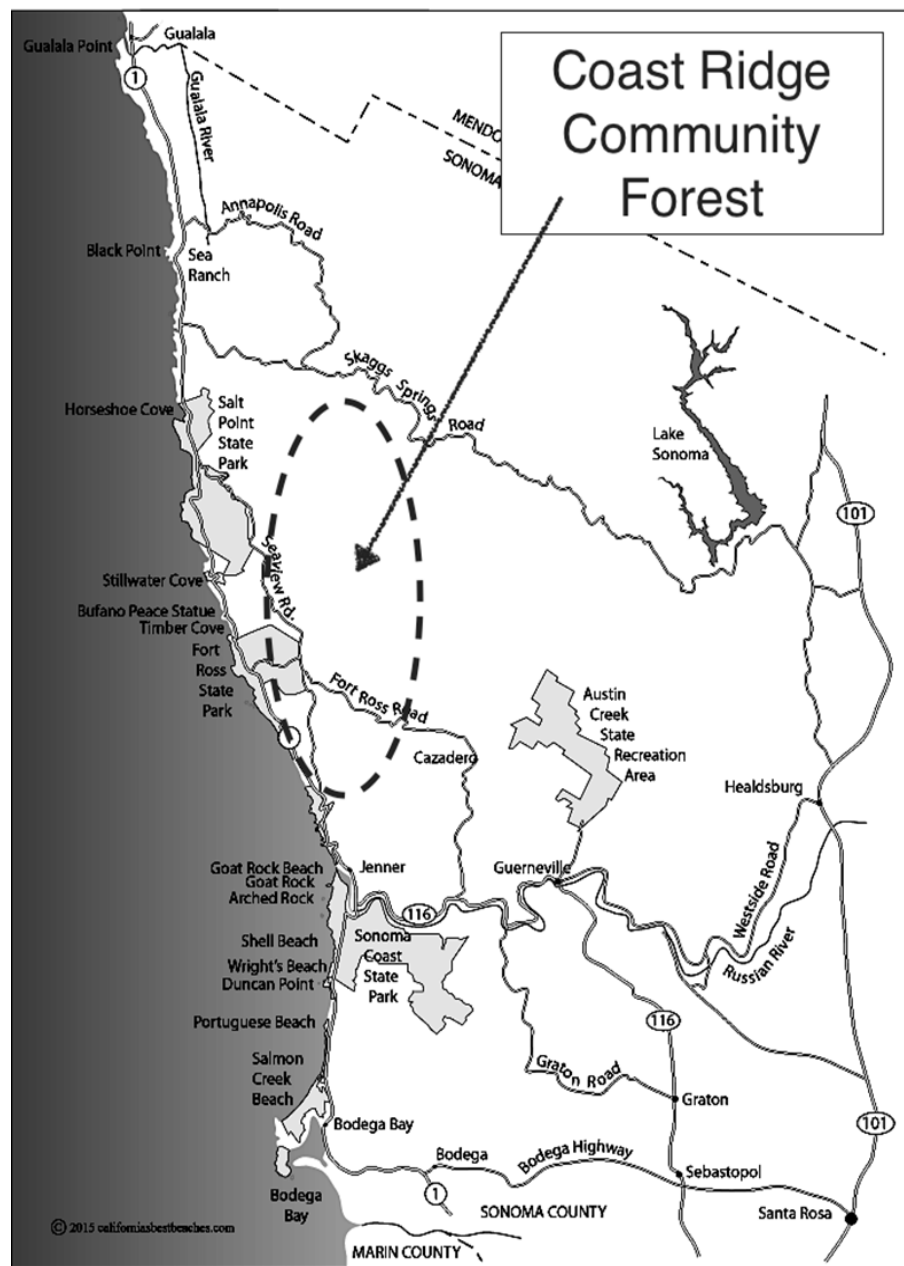


Figure 1—Location of Coast Ridge Community Forest.

Wildfire as a Landscape Pattern

Since the 1950s, seven significant 405 ha (100 ac) wildfires have burned 9,976 ha (24,652 ac) in the Coast Ridge area. Notably, the 1978 Creighton Ridge Fire burned more than 4,452 ha (11,000 ac) and 61 structures. This is not uncommon in the region—extensive logging prior to forest practice rules created an abundance of fuels, annual grasses dominated the rangelands, and the area is remote, served by few roads. Coupled with ‘fire weather,’ in this case easterly breezes which block the ocean influence, the area burns readily in late summer and fall.

Figure 2 shows the array of fire on this landscape, overlapping and frequent. The years 1953, 1954, 1957, 1965 and 1978 all had large fires. Since then, fires have been quickly contained to small areas. One major reason is the development of both an on-site volunteer fire department in response to the 1978 Creighton Ridge fire. In its destruction of the lands, the fire knit the community closer.

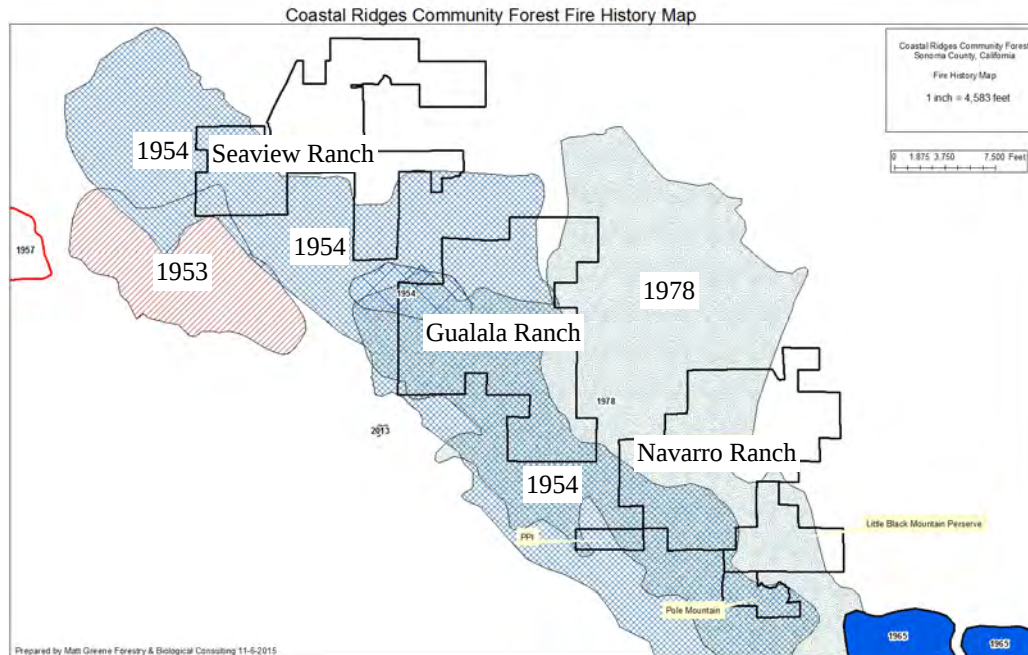


Figure 2—Fire history and subdivision, Coast Ridges Community Forest.

While a tool for natives and ranchers, fire is a devastating event on the landscape of small family farms and residences. In the Coast Ridges, four subdivisions to approximately 16 ha (40 ac) size had been created and populated by 1978: Navarro Ranches, Gualala Ranches, Seaview Ranches and Muniz Ranch. All were designed for the ‘back to the land’ opportunity at that time, with many urban people populating the old ranchlands. Planning for fire, apart from road sizes and turnouts as required by the county, was not in place on any newly subdivided ranch.

The new urban settlers were not cognizant of the dangers and the potential rapid spread of fire, particularly on these discontinuous ownerships. The local ‘building boom’ inadvertently allowed abundant regrowth on the land. When combined with residual slash, this effectively eliminated any fire-safe zones that might have been present on the earlier ranches. The 1978 fire erupted from tool use under bad fire conditions, and quickly grew to catastrophic proportions.

Community Action

After the Creighton Ridge fire, the community came together in a suite of ways. The organizational pathways for community protection have developed over time, to now include:

- Fort Ross Volunteer Fire Department
- Fort Ross environmental restoration
- Ranch associations
- Disaster preparedness points of dispensing (PODs)
- Coastal Hills community project
- Coastal Hills Land Trust
- Coast Ridge community forest
- Agency and organization partnerships

The goals of all these social outcomes are to provide fire protection, a landscape pattern of safety, community stability, and caring for the older generation. It became clear that road and vegetation management, and communication, are the critical factors in the survival of the Coast Ridges as a viable community.

The Coast Ridge Community Forest⁵ describes the timeline of interactions:

1972: Fort Ross Volunteer Fire Department founded.

1978: Creighton Ridge fire burns more than 4,047 ha (10,000 ac).

1978 to 1980: Local residents join forces with Circuit Riders (a local non-profit) to restore and reforest the area devastated by the Creighton Ridge fire.

1980: Cazadero Forest Workers established to continue the reforestation work initiated by Circuit Riders and local residents.

1990 to present: Fort Ross Environmental Restoration, a cooperative corporation, established to promote sustainable forestry practices for local individuals and landowners. Projects include reforestation, restoration, forest management, and fisheries restoration.

2002 to present: Fort Ross VFD receives grant funding from Bureau of Land Management to fund three vegetation management projects within its boundaries.

2007: Coastal Hills Land Trust founded.

One of the first neighborhood actions was to start Fort Ross Environmental Restoration, a worker-owned cooperative to reforest and afforest the landscape. This group enabled the Department of Forestry to fund, with a cost-share of 90 percent, the restoration and supply it with plants from the Department seedling nurseries. It also addressed landslides and, ultimately, the reconstruction of roads (with Federal and local assistance as well). More than 1 million trees were planted on roughly 1,214 ha (3,000 ac) (David Passmore, 2016, personal communication). In addition, many individuals and organizations took advantage of this program outside of the workers' cooperative.

The rest of the landscape, which was not afforested, reforested itself with native redwoods, Douglas-fir, tanoak (*Notholithocarpus densiflora* (Hook. & Arn.) P.S. Manos, C.H. Cannon, & S.H. Oh) and madrone (*Arbutus menziesii* Pursh). Tanoak reforested the vast majority of untreated area, and, at a landscape scale, may be seen as the control in this experiment. The repopulation of tanoak has been extraordinary—a very large number of sprouts from root crowns, developing into a forest of small stems and a few larger trees. The nature of this forest is changing, however, with the natural and gradual introduction of the pathogen *Phytophthora ramorum*, the cause of sudden oak death (SOD), which preferentially and repeatedly kills tanoak. Managing the tanoak on the Creighton Ridge burn area has been a concern for many years.

As estimated from ground and aerial photo imagery, the Coast Ridge area is currently comprised of 20 percent pines, 20 percent tanoak, 30 percent Douglas-fir and redwood, and 25 percent grasslands. The remaining 5 percent includes farms, residential pasture and vineyards.

The Tree Planting Experiment

As readers may know, the science of tree planting for restoration has evolved since the 1970s. At that time, the California Forest Improvement Program (CFIP) required a simple management plan and guidelines for planting. Because of the belief that many trees would die in their first years, tree planting was aggressively spaced, at about 988 trees per ha (400 trees per acre), at 3 x 3 m (10 x10 ft) spacing). It was also a concern that Douglas-fir and redwood trees would not survive in the heat of the sun without shade protection, and that manual site preparation was inferior to mechanical intervention (ripping or otherwise disturbing ground).

In retrospect, some of these choices, required by the Department, were mistakes. Heavy equipment created access issues, brought in and spread scotch and French broom, compacted soils, and increased costs. The tree selection, largely ponderosa and Coulter pine with redwood and Douglas-fir, turned

⁵ Website Information at coastridgecommunityforest.org.

out to be very successful, with nearly 100 percent survival (versus the 50 percent anticipated). The trees are invasive exotics to this area, however, and have succeeded in creating a ‘new forest’ which can seed 304.8 m (1000 ft) distant.

The concept of trees as a ‘nurse crop’, into which Douglas-fir and redwood would voluntarily seed and grow, was successful, though only with later intervention (enrichment planting, and thinning). The pines achieved 100 percent crown cover quickly, preventing other trees from growing with vigor unless thinned in a timely manner. Treated stands responded vigorously, with the new layer of duff acting as a mulch. The lack of a program to remove pines froze many stands at original planting dimensions. The result in untreated stands was stagnated forests without a brush layer or vigorous emerging cohort, a fire hazard.

The great benefit of the planting program was its result in community development. This project lasted for years, planting many tens or hundreds of thousands of trees (the actual number was not available for this paper). The community received revenue for hand work and machine site preparation, and a track record was established for continuing work with agencies. In addition, the community learned to work together on fire control and forest management strategies.

Experimental Results

The area not planted, which became forested mostly with tanoak, could be considered as a control. We can track the progress through historical aerial photos, we can look at individual case studies, we can evaluate a broad statistical set of randomized samples. Yet in this instance, it requires less sampling and science and more direct action; the experiment has spoken in form.

After roughly 40 years of growth without management, many current pine and Douglas-fir stands are overcrowded, with touching crowns. Stocking densities approach the original planting density, with diameters at breast height (DBH; 1.37 m) of 20.3 to 35.6 cm (8 to 14 inches).⁶ There is an abundance of ladder fuels; the pine soils are allelopathic, reducing germination of other species. In short, the forests are un-thinned fire hazards spread across the landscape.

The wood produced by the forests is non-merchantable, as there is no local market for small, branchy pine trees. Some pole material and fire wood is created, but it has no commercial value, as the parcels are too small to justify the cost of logging. There is also no infrastructure to process pines, create biochar, generate electricity or otherwise capture the value of the pine. The closest market for whitewood is the Port of Oakland, where it would compete with Douglas-fir for the export market.

If the hypothesis of this experiment was to determine the possibility of growing ponderosa pine, Coulter pine and Douglas-fir in burned areas and meadows of the site location, it was success. The pine-fir forest now covers a large percentage of the Coast Ridge landscape in irregular copses of ponderosa pine.

If the hypothesis of this experiment was to test the ‘nurse tree’ concept of shade tolerant trees volunteering (with some amendment planting) and overtaking the nurse species, the hypothesis is rejected. The small trees were never able to outcompete their nurse crop. A pre-commercial thinning intervention may have assisted in reaching the posited outcome. Figure 3 shows the un-thinned result of successful planting.

⁶ Euphrat, Frederick D. 2015. Unpublished data, SRJC forestry class survey.



Figure 3—Un-thinned planting, year 40.

If the hypothesis was that giving assistance money to a community will be a driving force in recovering from a disaster, the experiment was a success. The establishment of forest management plans, planting, and forestry work was a centralizing force in the community. Other measures, such as the volunteer fire department, the emergency PODS, the road association and its pursuit of upgraded drainage, the land trust and now the Coast Ridge Community Forest have followed with the self-organization of the community.

Associated Ecological Improvement

With the changing uses and parcelization, the soil has become degraded. The local prairie system soil built and managed with regular burning and associated with local old-growth forest soils was replaced with European grasses and western grazing systems, then burned catastrophically a set of times (to rid the grasses of the fir and redwood stumps). That degradation is interpreted as lost tilth, lost carbon, nitrogen and depth. With the passing of the perennial grasses, it is presumed that erosion increased under annuals, which may have also increased the baseline hillslope erosion rate.

To improve the prairie, the Coast Range Community Forest is implementing silvo-pastoral systems using sheep and goats. Multi pastoralism, using electric fences and moving livestock frequently allows for a controlled ecological response, promoting perennial native bunch grasses and incorporating manure into the soil. The increased carbon, tilth, and soil structure from this practice increases the fertility, stability and utility of the prairie areas (Savory 1988, Savory and Butterfield 1999).

Grazing can take place in forests and along their margins, too. The goal of this practice is to reduce invasive pines, Douglas-fir, and limit fuel loading. The selection of animals is critical, as is the grazing time window. Complete eradication of invasive species is not important, as long as enough leader and leaves are removed for reducing apical growth (on the Douglas-fir) and potential ladder fuels (on the hardwoods) (Charles Williams, 2016, personal communication).

Forests have grown abundantly on these sites. Soil has developed quickly under the dense forests, sequestering carbon, and the forests create the influences of cooler air, higher humidity, and resistance from surface erosion and mass wasting. The new forests also create habitat for endemic and introduced wildlife. If the forests are allowed to keep accumulating fuel in a highly flammable manner, these are the benefits that are at risk from fire.

Tools for Landscape-Level Response

The thousands of acres which were afforested are now in need of thinning, a market for their products, and fire prevention treatment. While similar ecologically, much of the land is divided into separate parcels of 16.2 ha (40 ac), too small and with products too low-value for ‘normal’ timber harvest practices. The pine trees from earlier plantings that received thinning have grown to be large and good timber. Unfortunately, these thinned stands are on small parcels that are not part of the commercial forest industry, and do not realize a profit for timber owners.

There are a number of programs which provide landowners cost-share funds for thinning and pruning; these require an outlay of 25 percent or more of the contract work cost. Other possibilities exist under timber harvest plans (THPs), non-industrial timber management plans, ‘La Malfa’ commercial thinning and other exemptions, a working forest management plan (still under review by the Board of Forestry) and a Programmatic Timber Environmental Impact Report (PTEIR). (CAL FIRE 2016).

Of these pathways to utilization of wood and thinning of forests across the landscape, the most reasonable approach may be the PTEIR. It is intended to create local forest rules for unique situations, such as the Coast Ridge. With a PTEIR in place, landowners could modify their forest for commercial purposes with the filing of a much-abbreviated THP.

Intrinsic to harvesting for profit is tools to get the wood from stump to market. In these steep slopes, yarding equipment is needed to bring material up and down hills. Firewood splitters, chippers or biochar equipment will be necessary for low value product. Small sawmills and stud mills would be able to utilize much of the pine product. These are big investments, however, and would be more suited to a private business or cooperative than for individual landowners.

Grazing provides a management tool for the acres of prairie amongst the forest. It creates carbon sequestration, erosion protection, fire protection and limits the spread of unwanted trees.

Realizing these landscape-level goals is the purpose of the Coast Ridge Community Forest, a non-profit membership organization focused on the lands planted in response to fire. Its website states these goals:

“In addition to improving the forest ecosystem, CRCF is striving to generate new forest products, create and expand market opportunities, and provide income opportunities for members. Working together with the overall community, CRCF will also address common land use issues such as roads, watershed, shaded fuel breaks, and invasive plants. This could include issues such as assessments, work plans and funding (CRCF 2016).

Summary

The 1978 Creighton Ridge fire in western Sonoma County, California, was a devastating blow to the community, burning 61 homes and 4452 ha (11,000 ac) of newly subdivided ranch land. The community responded with the support of state and federal agencies, planting thousands of acres and more than a million trees. The planting tested principles of reforestation in a modern context.

Forty years after the fire, there is a clear trend towards overstocking and increased fire danger. The original plantations that were not thinned ended up as very dense, tight forests with little understory success and heavy ladder fuels. The choice of tree may have been appropriate as a nurse crop for other species, but left un-thinned becomes an economic bottleneck for the landowners, and an ecological impediment for more desirable tree species.

While ecological benefits of erosion control and habitat were created, the ironic response to the original fire, planting non-endemic trees with the potential to later increase fire danger, is inescapable. There is present need for thinning and markets for this abundant wood supply.

The Coast Range Community Forest, a non-profit collaborative venture, is focused on reducing the fire danger and creating profitable revenue streams from this landscape. Its goals include management of prairies with grazing, forests with productive revenue sources, and multi-ownership projects with cooperative utilization of forest tools. The use of a PTEIR to achieve these goals may be the most functional in these small ownerships and unique ecological conditions.

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