March 2019 Proposal for Updating CA Forest Practice Rules Stocking Standards from the William Main Seminar Research Group

Prepared for the March 2019 Board of Forestry Management Committee Meeting
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Introduction

The 1973 Z'Berg-Nejedly Forest Practice Act required restocking of California commercial forests after harvest such that minimum average point count or basal area levels were met in order to ensure a "cover of trees of commercial species" that properly utilize the growing space remaining after harvest. This requirement complemented the stated intent of the legislation: that "the productivity of timberlands is restored, enhanced, and maintained", and that the goal of high forest productivity for timber was achieved while also protecting the co-benefits forests provide. At the time this Act was passed, there was significant concern that low minimum restocking levels following harvest could lead to understocked forests with sub-par long term growth rates. In the time since its passage, changes in planting practices, genetic stock, fire frequency, insects and disease, and climate have led to the minimum point count requirements becoming out of alignment with optimal forest productivity across a wide range of attributes. Research from multiple agencies as well as empirical evidence from California's private landowners has shown that these requirements are in need of updating. In 2014, the California state Board of Forestry was given a directive via AB 2082 (Dahle) to adopt alternative stocking standards to address "variables in forest characteristics and achieve suitable resource conservation." Modifications are to be assessed in terms of a forest's capacity to produce high-quality wood products and to address fuels management, carbon and water dynamics, and resilience and sustainability objectives. The goal of this proposal for revised Forest Practice Rules (FPR) stocking standards requirements for California is to better reflect present and anticipate future conditions.

In 2017 and 2018, representatives from the University of California's William Main Seminar Research Group, the California Licensed Foresters Association (CLFA), and the California Forestry Association (CFA) reviewed the evidence on how California's stocking standards reflect

the current status of forest ecology and forest management. We considered four different lines of evidence to guide this initial proposal to revise the point count stocking standards:

1. How long-term timberland owners reforest after severe wildfires when the FPR stocking standards do not apply to their large-scale voluntary reinvestment in reestablishing high productive forests and they are therefore allowed to apply new and innovative approaches.
2. Whether the FIA remeasurement data used in the AB 1504 reports presented to the Board of Forestry provide any support for the hypothesis that higher initial stocking standards are consistently related to desired higher net growth rates.
3. Feedback from Registered Professional Foresters (RPFs) regarding changes in the survival rates of seedlings, management techniques up to the time of the first commercial thinning, changes in the cost of conducting pre-commercial thinning, the future demand and price for precommercial thinnings (PCT) products as a bioenergy feedstock, and the increasing need to implement significant reductions in ladder fuels to at least slow the rapid increase in the prevalence of severe wildfires in timberlands.
4. A comparison of current and proposed California stocking standards compared to other more mesic Western States (OR, WA, ID) with similar forests, wildfire risks, and other mortality drivers.

1. <u>Post fire reforestation practices in California</u>

It is well documented that the probability of wildfires in California's conifer forests and other vegetation types has increased considerably since the 1970s when the current stocking standards were codified. All evidence also points to an unfortunate situation where losses from forest fires will only increase unless there are substantial changes in vegetation management or fire suppression practices. CAL FIRE's 2018 Strategic Fire Plan notes that the average annual acres of forestland burned in the 1970s was 50,000 in contrast to the average between 2010 and 2017, which was 250,000 acres – quintuple the land area burned when the Z'berg-Nejedly Forest Practice Act was authored. Trends identified in the Strategic Fire Plan also indicate that

wildfire is only increasing, not just in area burned, but also in number of ignitions, fire severity and impacts to ecosystems.

The following figure summarizes recent research on the trends in wildfire probabilities for different land types in California.

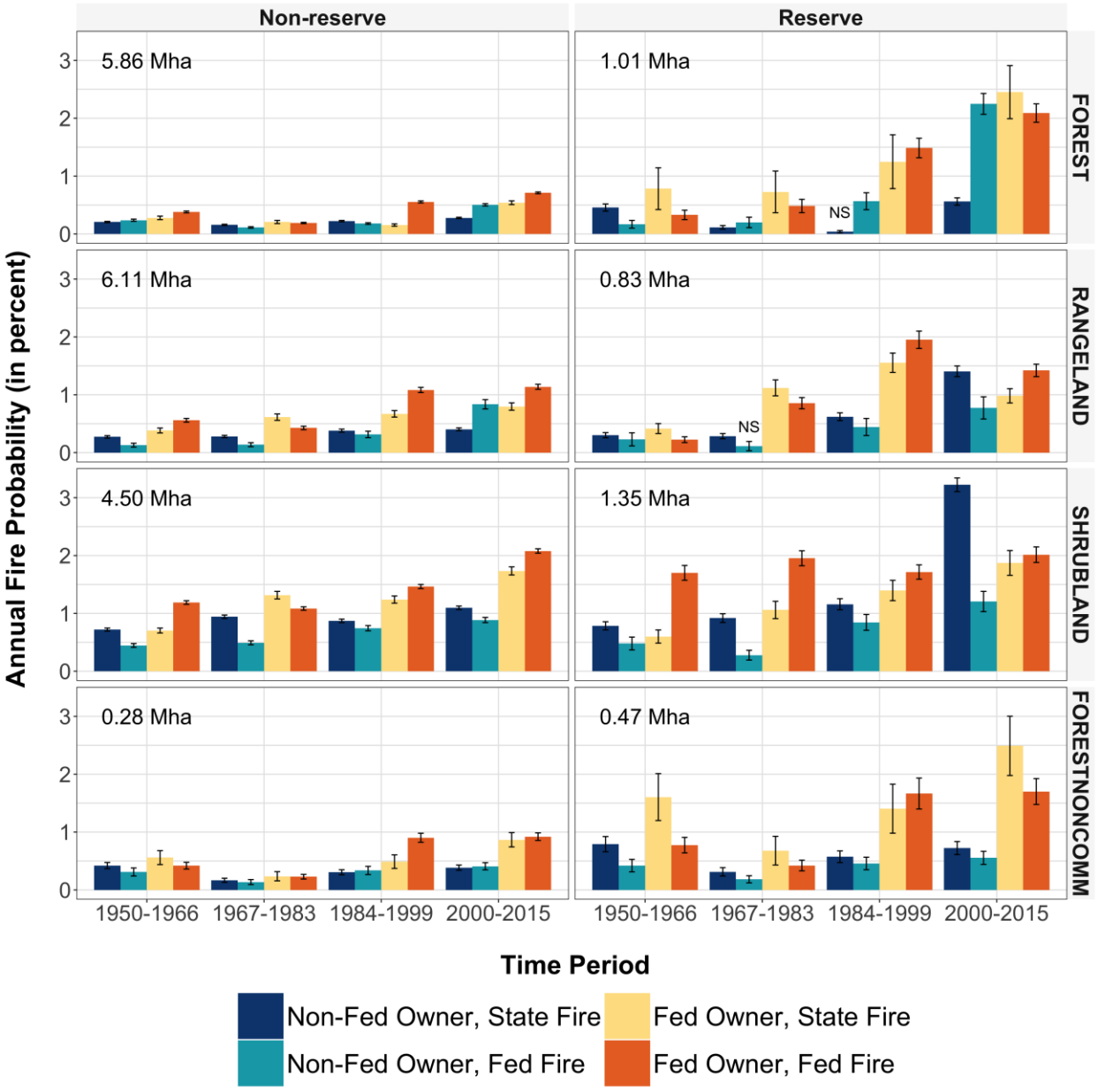


Figure 1: Annual fire probabilities for California landscapes. (Source Starrs et al. 2018) http://iopscience.iop.org/10.1088/1748-9326/aaaad1 - open access web link

After separating wildfire rates by major vegetation types, and ensuring that ecologically similar plots on private and federal land are compared, the trends are very clear – wildfire probabilities have doubled on private timberlands and quadrupled on National Forest timberlands since the 1970s. Planting high numbers of seedlings that essentially grow into more ladder fuels, and are expensive to remove in pre-commercial activities, is an increasingly irrational strategy.

It is also well documented that both the cash-constrained National Forests and family forest owners with smaller properties are not always conducting money losing pre-commercial thinning operations, although such actions would have the significant long-term benefit in reducing fuel loading and improving growth. Larger timberland owners are investing funds in high quality seedlings and planting and then investing more funds to remove up to half of those seedlings within a decade. Revising the point count stocking standards for California's timberlands would be one step to more accurately reflect present and anticipate future conditions.

One of the best empirical tests of what are more appropriate stocking standards is what private landowners do when they reforest after a large wildfire. Most private landowners engaged in post wildfire reforestation are responding by planting far fewer seedlings per acre than would be required under the FPRs after a planned harvest. Ordering fewer seedlings per acre reduces the wastage of seeds from the seed zones where the fires are occurring, reduces the seedling costs per acre, and can reduce follow-up costs of vegetation management within the newly growing stands. Different foresters apply different stocking levels based on their professional assessments of what is appropriate given available resources and future potential. In areas where private timber lands abut National Forest lands, which have much higher fire probabilities, some strategic units are replanted to levels designed to maximize potential survival of at least some sawlog sized trees in the event of a highly probable future fire, rather than to maximize fire risk-free growth. The recent experiences of RPFs responsible for major post fire reforestation efforts was a major source of empirical evidence on what modified minimum stocking standards should be in different situations around the state.

2. <u>FIA remeasurement data analysis for even aged stands in California owned by corporate owners, non-corporate owners, and the National Forests</u>

Since all private forests (except those that have been reforested after severe wildfires) were replanted to the 300/150 TPA standard, the remeasured FIA plots cannot provide us with data that compare different stocking standards in California. However, further analysis of the data presented in the AB1504 reports delivered to the BOF compiled by Olaf Kuegler at the Pacific Northwest Research Station provides some insights into what determined historic growth rates. The net (growth & yield) growth rates for remeasured FIA plots are compared against the initial basal area per acre levels in Figure 2 (at the end of this proposal). The figures show net growth rates on the Y axis by increasing basal area per acre on the X axis by owner and grouped FIA site class. (Please note, the 6 FIA site classes do not exactly match or align with the site class designations in the California FPR but are similar.) Initial growth rates for basal area levels below the 60 (average of the 30-90 BA/acre subgroup) are roughly similar across ownerships, but larger differences show up at higher basal area levels where corporate lands always outperform the other ownerships. The basic pattern is that stands with higher basal area (and more leaf area) have higher net growth rates – but there are very large deviations from the median/mean trendline. Three key takeaway messages are:

1) that proscribed 'best practices' based on textbook patterns or mean empirical values WILL NOT be representative of all situations, as many sites are far below the mean and there are clearly some best practices shared by less than a quarter of sites;

2) on-going forest management actions designed and implemented by licensed professionals are going to be more important determinants of stand level growth rates than complex regulations concerning initial stocking standards or commercial thinning standards.

3) TPA or basal area per acre are not great predictors of net growth rates, as the upper quartile of stands after controlling for site class, initial basal area per acre, and ownership can be 3x as high as the lowest quartile. This suggests that the single line 'Langsaeter curve' referred to in the FPR definition of 'Adequate Site Occupancy' may not be very accurate for California.

3. Registered Professional Forester feedback

Through a series of meetings and field trips with Registered Professional Foresters (RPFs), the group received considerable feedback from foresters from around the state. Many foresters have experienced first-hand the significant improvement in seedling quality and initial stand management practices, and noted that they have to spend additional funds to thin the regulatory required overstocked stands to ensure future growth. Foresters across the state commented that they need to consider what site-specific stocking is appropriate for location, available resources (seeds, labor, contractors, etc.), landscape level risks (who are their neighbors and what are the probabilities of future fire sweeping onto newly planted site), and what future threats need to be considered over many decades as they make decisions in the first decade of stand initiation. Missing the optimal PCT window reduces initial investment but can significantly reduce net growth over next 40 years and the overall return on investment. Family forest owners with limited capital often miss the optimal PCT window. PCT is labor intensive, and labor costs are increasing much faster than commodity prices for small diameter wood that must often be shipped to far off energy plants if the wood can even be sold (often at a loss). In addition, if the PCT trimmings are simply left on site, they add considerable dry fuel to stands (albeit for a short time period). Leaving trimmings is not uncommon if the low value wood cannot be economically removed. A number of foresters commented that overstocking, rather than understocking, appears to be a bigger drag on forest productivity once conifer dominance is achieved.

4. Comparison of West Coast Stocking Standards and recommendation for new stocking standards

Ensuring that sufficient stocking is implemented is a consistent component of state forest practice regulations across western states. Washington, Oregon, and Idaho all use a simpler breakdown of sites based on geographic location, dividing each state into two initial regional stocking standards. The following table compares the four western states, with a proposed revised stocking standard for California, with a basic comparison between coastal and interior sites.

Table 1: Comparison of TPA Stocking Standards for Western States

State	Coastal			Interior		
WA	190 avg, 150 min			150 avg, 120 min		
OR	Site Productivity = 120+ cu ft/ac/yr			Site Productivity = 50-119 cu ft/ac/yr		Site Prod = 20-49 cu ft/ac/yr
OR	200			125		100
ID	NA	NA		North	South	South
ID	NA	NA		170	125	125
CA	Site I, II	Site III	Site IV, V	Site I, II, III	Site IV	Site V
CA	300	300	150	300	150	150
William Main Research Group Stocking Standards March 2019 Proposal						
CA	200	125	100	125	100	100

More xeric conditions in California (vs the other western states) support a lower number of TPA proposed as the new stocking standards for California. Soil moisture is the limiting factor for seedling establishment in these conditions, and managing inter-tree competition through spacing is critical to forest health in our Mediterranean Climate. The proposed standards would move away from the 12' spacing needed to meet the 300 TPA minimum, to spacing closer to 15' to 20' before pre-commercial thinning. The table below outlines the spacing (in feet) at different stocking levels.

Table 2: Comparison of TPA and average tree spacing

	Spacing (in feet) at Different Stocking Levels								
TPA	303	258	222	194	170	151	134	120	109
Avg. Spacing	12'*12'	13'*13'	14'*14'	15'*15'	16'*16'	17'*17'	18'*18'	19'*19'	20'*20'

Consulting foresters have pointed out that many owners with smaller properties will not perform the costly PCTs at the correct time and will end up carrying far too many trees that will compete with each other for limited resources. Larger landowners may also struggle to preform timely PCTs, as the 2018 California Forest Carbon Plan has already tasked them with a staggering amount of work – setting forth a goal of increasing the rate of forest restoration and fuels treatments on nonfederal forest lands from the recent average of 17,500 acres per year to 35,000 acres per year by 2020, and from 250,000 acres per year to 500,000 acres per year by 2020 on Federal forest lands.

Conclusion

The proposed standards provide only a revised minimum density, which foresters must not go under. Many foresters will still prefer to initially plant at higher densities higher than the proposed new stocking standards to ensure that they have the desired number of seedlings by the desired species mix and/or young trees that exhibit better than average growth characteristics. RPFs have the local expertise and experience necessary to best determine proper stocking within any one site. The process of becoming a RPF in California is challenging – one of the most difficult licensing processes in the United States. A burden of responsibility is placed upon RPFs, not only by the Office of Professional Foresters Registration, but by the Z'berg-Nejedly Forest Practices Act (which contains nearly 40 instances in which it specifies that a RPF may make an alternative determination than what is recommended in the Act), to do what is best for the forest at the local level.

Proposed language changes

The attached document includes proposed language changes throughout the relevant sections of the Forest Practices Rules. Different foresters had discussed different TPA for different site indexes and districts. We can change anything before Rachelle makes copies on Monday, March 4th, before the BOF Forest Management Committee meeting on Tuesday, March 5th, when this is the 2nd of 3 items on the agenda.

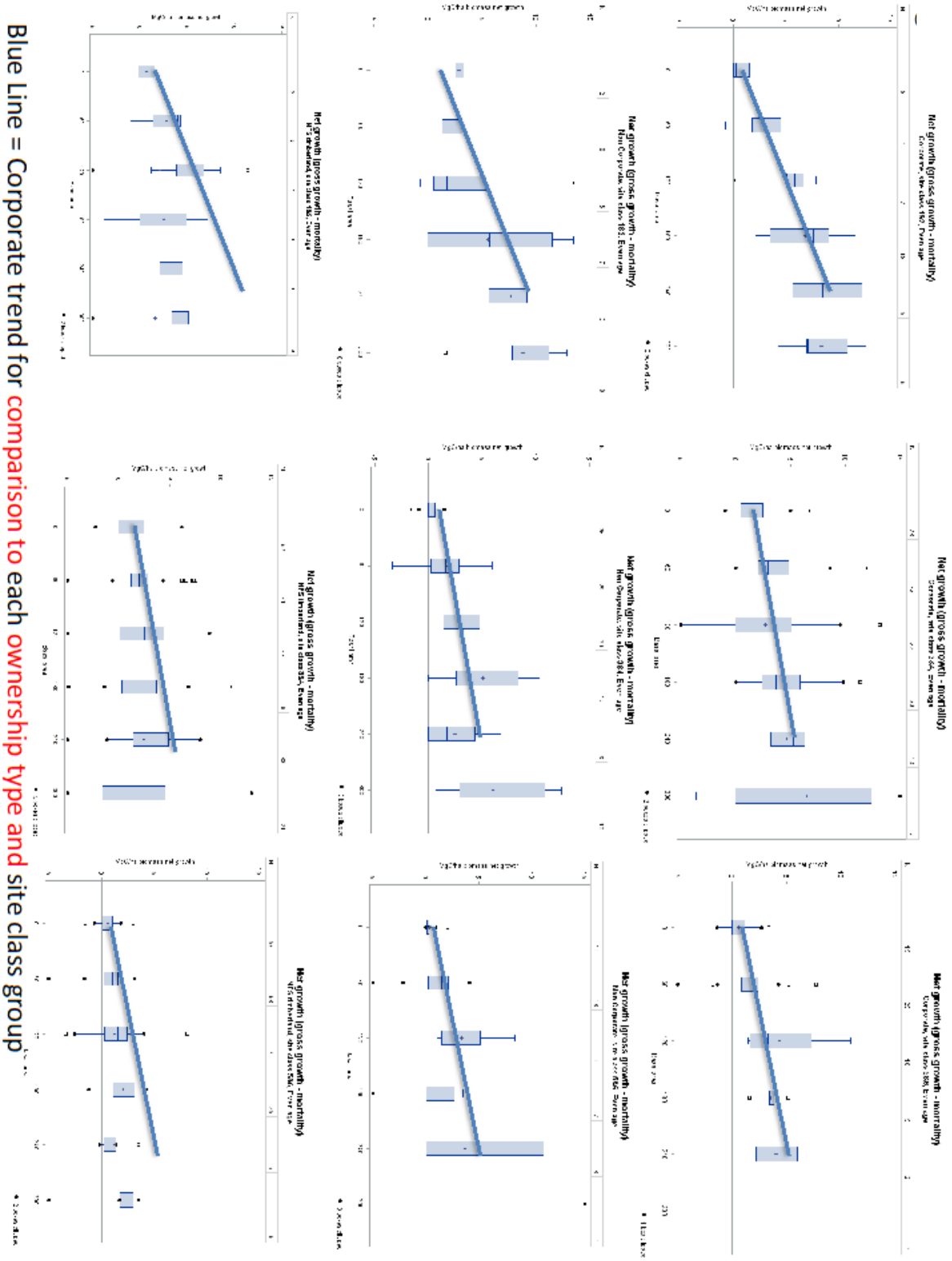
Main Points

1. Separate sets of minimum TPA stocking standards for the higher fire risk soil water limitations in the Northern and Southern Districts, compared to the Coast District.
2. Southern Subdistrict TPA stocking standards are revised to reflect what appears to simply be a higher ratio from the baseline Coast standards.
3. No proposed changes in how stocking sampling is measured and evaluated
4. No proposed changes in the basal area-based stocking standards

Table 3: Summary of Proposed Point Count Stocking Standard changes

			FPR Site		
Districts	I	II	III	IV	V
Northern, Southern	125	125	125	100	100
Coast	200	200	125	100	100
Coast, Southern Subdistrict	300	300	200	200	200

Figure 2: The net (growth & yield) growth rates for remeasured FIA plots are compared against the initial basal area per acre levels



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