

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

3 Prepared for the March 2019 Board of Forestry Management Committee Meeting
4 Presented by Rachelle Hedges, Policy Analyst for Berkeley Forests at the University of California, Berkeley

5

6 Introduction

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

27

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

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

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

49

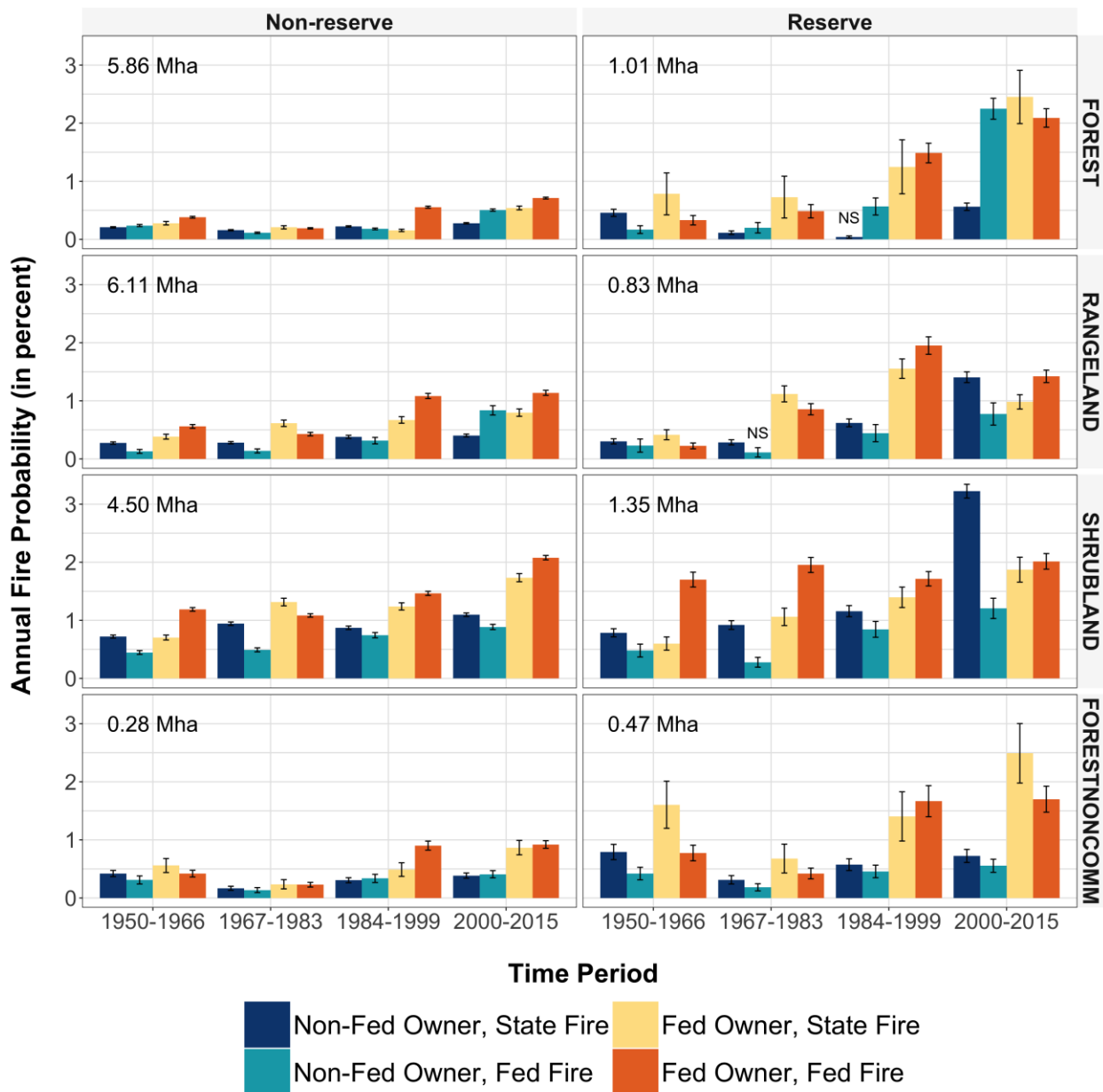
50 1. Post fire reforestation practices in California

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

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

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

63



64

65 Figure 1: Annual fire probabilities for California landscapes. (Source Starrs et al. 2018)

66 <http://iopscience.iop.org/10.1088/1748-9326/aaaad1> - open access web link

67

68 After separating wildfire rates by major vegetation types, and ensuring that ecologically similar
69 plots on private and federal land are compared, the trends are very clear – wildfire probabilities
70 have doubled on private timberlands and quadrupled on National Forest timberlands since the
71 1970s. Planting high numbers of seedlings that essentially grow into more ladder fuels, and are
72 expensive to remove in pre-commercial activities, is an increasingly irrational strategy.

73
74 It is also well documented that both the cash-constrained National Forests and family forest
75 owners with smaller properties are not always conducting money losing pre-commercial
76 thinning operations, although such actions would have the significant long-term benefit in
77 reducing fuel loading and improving growth. Larger timberland owners are investing funds in
78 high quality seedlings and planting and then investing more funds to remove up to half of those
79 seedlings within a decade. Revising the point count stocking standards for California’s
80 timberlands would be one step to more accurately reflect present and anticipate future
81 conditions.

82
83 One of the best empirical tests of what are more appropriate stocking standards is what private
84 landowners do when they reforest after a large wildfire. Most private landowners engaged in
85 post wildfire reforestation are responding by planting far fewer seedlings per acre than would
86 be required under the FPRs after a planned harvest. Ordering fewer seedlings per acre reduces
87 the wastage of seeds from the seed zones where the fires are occurring, reduces the seedling
88 costs per acre, and can reduce follow-up costs of vegetation management within the newly
89 growing stands. Different foresters apply different stocking levels based on their professional
90 assessments of what is appropriate given available resources and future potential. In areas
91 where private timber lands abut National Forest lands, which have much higher fire
92 probabilities, some strategic units are replanted to levels designed to maximize potential
93 survival of at least some sawlog sized trees in the event of a highly probable future fire, rather
94 than to maximize fire risk-free growth. The recent experiences of RPFs responsible for major
95 post fire reforestation efforts was a major source of empirical evidence on what modified
96 minimum stocking standards should be in different situations around the state.

97 2. FIA remeasurement data analysis for even aged stands in California owned by corporate
98 owners, non-corporate owners, and the National Forests

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

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

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

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

124

125

126 3. Registered Professional Forester feedback

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

146

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

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

155 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

156

157 More xeric conditions in California (vs the other western states) support a lower number of TPA
 158 proposed as the new stocking standards for California. Soil moisture is the limiting factor for
 159 seedling establishment in these conditions, and managing inter-tree competition through
 160 spacing is critical to forest health in our Mediterranean Climate. The proposed standards would
 161 move away from the 12' spacing needed to meet the 300 TPA minimum, to spacing closer to
 162 15' to 20' before pre-commercial thinning. The table below outlines the spacing (in feet) at
 163 different stocking levels.

164

165 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'

166

167 Consulting foresters have pointed out that many owners with smaller properties will not
168 perform the costly PCTs at the correct time and will end up carrying far too many trees that will
169 compete with each other for limited resources. Larger landowners may also struggle to perform
170 timely PCTs, as the 2018 California Forest Carbon Plan has already tasked them with a
171 staggering amount of work – setting forth a goal of increasing the rate of forest restoration and
172 fuels treatments on nonfederal forest lands from the recent average of 17,500 acres per year to
173 35,000 acres per year by 2020, and from 250,000 acres per year to 500,000 acres per year by
174 2020 on Federal forest lands.

175

176 Conclusion

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

188

189 Proposed language changes

190 The attached document includes proposed language changes throughout the relevant sections
191 of the Forest Practices Rules. Different foresters had discussed different TPA for different site
192 indexes and districts. We can change anything before Rachelle makes copies on Monday, March
193 4th, before the BOF Forest Management Committee meeting on Tuesday, March 5th, when this
194 is the 2nd of 3 items on the agenda.

195

196 Main Points

- 197 1. Separate sets of minimum TPA stocking standards for the higher fire risk soil water
198 limitations in the Northern and Southern Districts, compared to the Coast District.
199 2. Southern Subdistrict TPA stocking standards are revised to reflect what appears to
200 simply be a higher ratio from the baseline Coast standards.
201 3. No proposed changes in how stocking sampling is measured and evaluated
202 4. No proposed changes in the basal area-based stocking standards
203

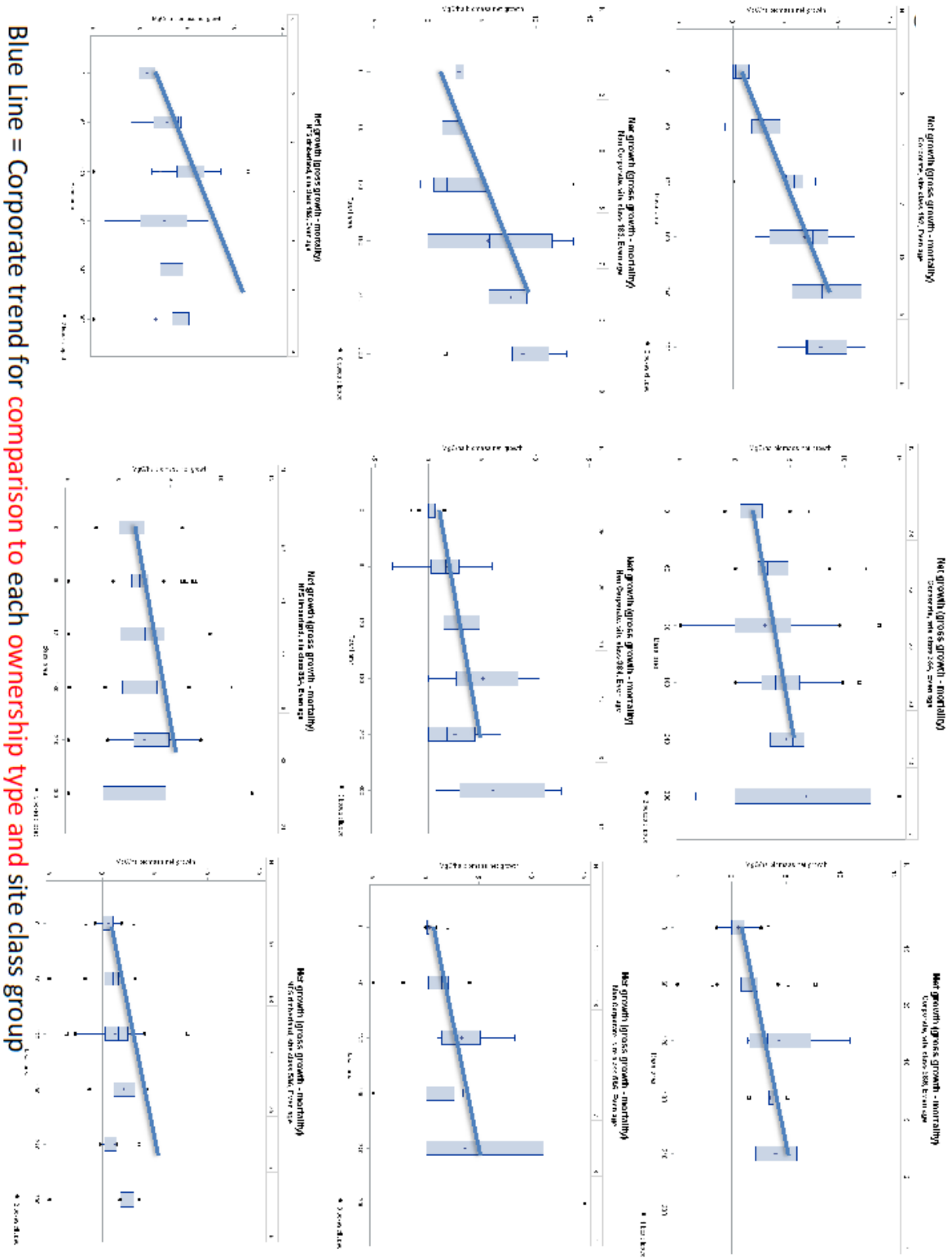
204 Table 3: Summary of Proposed Point Count Stocking Standard changes

			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

205

206

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



Blue Line = Corporate trend for comparison to each ownership type and site class group

209 2
 210