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Friends of the Gualala River, Sierra Club, Coast Action Group and the Albion River Watershed Protection Association have asked me to comment on the Coastal Ridges Option A for THP 1-04-260-MEN (and other current THP's for which you may be accepting comments, and which also reference this option A including: 1-05-003 MEN, 1-05-004-MEN, 1-05-031-MEN, 1-05-170-MEN, 1-05-222-MEN, 1-05-223-MEN, 1-06-005 MEN 1-06-224-MEN, 1-07-009-MEN, 1-07-011-MEN, 1-07-064-MEN,1-07-078-MEN,1-07-088-MEN). The fundamental question is whether or not the harvest and growth goals together, as detailed in the Option A document, can be sustained in such a way as to assure that the requirements for resource protection, as specified by the California Forest Practice Rules can be met. My clients are further concerned that the intensity of proposed harvest activities in just the first decade would have an adverse impact upon wildlife habitat, water quality and other public trust resources in these watersheds.

I have been a licensed forester in California since 1978. I have degrees in forestry from University of California and Yale University. I have worked in forest inventory for over 30 years. My experience includes designing, implementing and interpreting forest inventories and growth models for public and private clients. As part of my experience I completed the inventory of 2602 plots on Jackson Demonstration State Forest. I also do have experience with the Forest Practice Act: a decade ago I prepared and submitted 3 NTMP's in the Coast District, all of which were subsequently approved. Please see http://www.forestdata.com/ for more detail and background information on our company.

I have reviewed the 2007 California Forest Practice Rules, the Option A document, its figures and maps, and much of the review commentary. I have seen some of the above referenced Timber Harvest Plans that reference the Option A document. Although familiar with forests in the vicinity of both tracts, I have not visited the Willits Woods and Longview properties. My comments here are restricted to the Option A document as it relates to THP's referenced above. I wish to comment on the determination of site indices, the inventory, and the growth projection methodologies. I offer this report for the record.

Site Index.

a. Methods: I obtained the soils maps for the Eastern and Western Parts of Mendocino County. Using the GIS I overlayed the approximate property boundaries upon the soils data (see Figure 1). From that information I calculated the area of land within each USDA Natural Resource Conservation Service (NRCS) mapped soil type. The Mendocino County assessment area is 33435 acres, of which 27282 are productive of redwood/Douglas-fir; 1755 additional acres will support Douglas-fir, hardwoods and pine; and 3898 acres are described in the soils surveys as low site or oak/pine sites. For each soil type I referred to the soil survey and obtained forest productivity site index (100 year curves). I converted the 100 year site index values to 50 year values using the classic Linquist and Palley (1962) for redwood, and Schumacher (1930) Douglas-fir site tables. I then calculated an overall area weighted site indices for the productive areas of the property as summarized in Table 1 below. Most of the soil types mapped are complex, meaning that in this unstable country of the Franciscan formation there is a mosaic of recognized soil types within each mapped polygon. Assuming the entire site within each polygon to be composed entirely of the most productive soil within the named complex, I calculated the maximum possible site for the polygon, given the values provided by the soil survey (see Table 2 maximum values). Similarly, I averaged the published values and calculated the average site index values for each soil type (see table 3 average values), and again for the minimum so as to establish the range provided in Table 1 summary. The details of area of soils by published soil survey type (MuSym) are presented in Table 2 (Maximum possible site index) and Table 3 (Average site index).

Table 1: Area-Weighted NRCS Soils Survey Forestland Productivity Site Summary (High-Low (Average))

Acres of Redwood & DF Sites	**27782**
DF high-low (av.) site index (50 yr) weighted by area for 27282 ac.	*103-86 (98)*
RW high-low (av.) site index (50 yr) weighted by area for 27282 ac.	*91-74 (83)*
Acres of DF/hardwood Sites	**1755**
DF high-low (av.) site index (50 yr) weighted by area for 1755 ac.	*86-80 (85)*
Acres of Ponderosa/hardwood and non productive sites	**3898**
Grand Total Acres in Mendocino County Assessment area	**33435**

b. Discussion: Site determination for this property has been a matter of concern for more than a decade. Except for the Douglas-fir on the Longview Tract (which is site index 106 in Option A vs. 103 from overall analysis of the soil maps) the highest possible NRCS soil productivity values calculated here are very significantly below the lowest of the many site values presented in the Option A. I converted these site indices into

site classes[1] (see Figure 2). Comparing the site map to those of Jackson State, and based on my recollection of the eastern hardwood portion of Jackson State, the NRCS site determinations for the Willits property seem reasonable. After checking my numbers I determined that the overall site determinations presented in the Option A are a full site class higher than those calculated from the soil survey. I therefore tried to understand how the Option A site study could have so overestimated the site productivity when compared to the NRCS maps. I have concluded the following:

i. The site tree plots were comprised mostly of young trees. When looking over the site tree data I note that, fewer than a tenth of the site trees presented are over 40 years old. For this entire site study there were only 19 trees cored that were over 50 years of age. Only 6 trees over 60 years old were cored for site on the entire 34000 acres. As there are 20 soil types on the property, these cores are very unlikely to have represented the variety of sites. A somewhat arbitrary "agreement" was imposed by CDF to use trees 25 years and older for site. As evidenced by the Option A itself, the younger trees do tend to yield higher site numbers. The US Forest Service FIA Handbook discussed the classic "McArdle selection method"[2] and notes that "Trees 60-120 years old are most desirable, but younger trees may be used if needed". Only 6 "desirable" trees were used.
ii. The site tree plots or the site trees themselves may not have been selected or located using random methods.
iii. It is possible that there are significant undocumented errors in the NRCS soils mapping, but I find this hard to believe.

Site index is a major driver of growth models. While modeling, a single site class was applied to the entire holding irrespective of forest type, soil type, biological variables, management history and conditions on the ground. Even if it were representative of the overall average site, in decades when forest growth is projected for lands to be harvested that are on lower site than the average for the entire block, then CRYPTOS modeling will overstate the projected future inventory for those lands. These issues are fundamental to the projections of growth under Option A.

It is not a valid methodology to project 100 years of sustainable production based almost entirely on young site trees in a narrow age group that are then broadly generalized to fit a great variety of sites. The calculated results are so substantially higher than the published standard—the NRCS soil surveys. Because of this overestimation of site capability, I expect that the growth realized on these lands in the long-term will be much lower than the projections contained in the Option A document.

[1] Mendocino Redwoods Company Option A, Appendix B, Table 2 at www.mrc.com
[2] See Field Instructions for the Annual Inventory of Washington, Oregon and California. USFS. 2005. Section 9-6. Available at http://www.fs.fed.us/r5/rsl/publications/

Figure 1

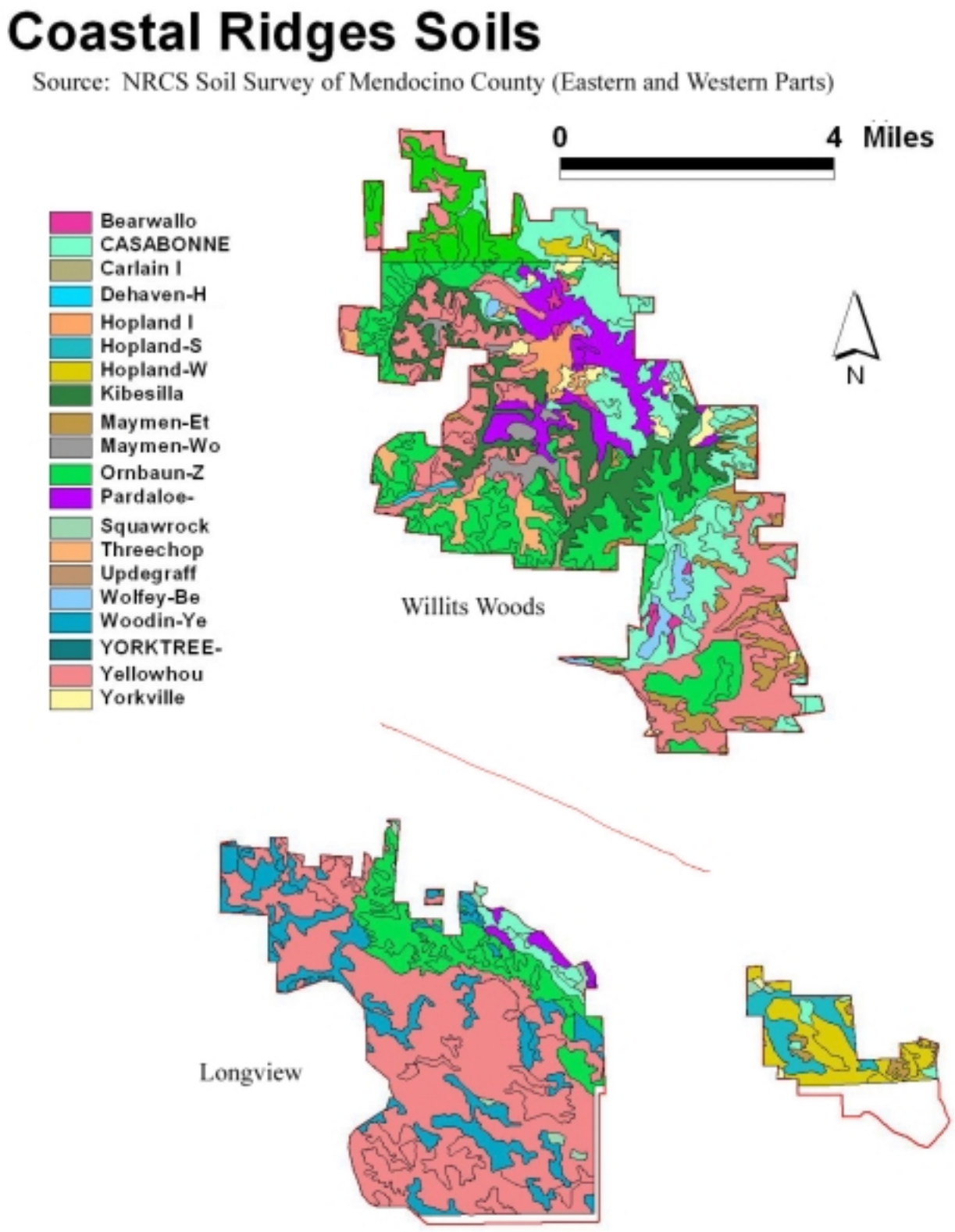
Coastal Ridges Soils
Source: NRCS Soil Survey of Mendocino County (Eastern and Western Parts)
0
4 Miles
N
Bearwallo
CASABONNE
Carlain I
Dehaven-H
Hopland I
Hopland-S
Hopland-W
Kibesilla
Maymen-Et
Maymen-Wo
Ornbaun-Z
Pardaloe-
Squawrock
Threechop
Updegraff
Wolfey-Be
Woodin-Ye
YORKTREE-
Yellowhou
Yorkville
Willits Woods
Longview

Figure 2

Coastal Ridges Lands: Highest Possible Site per NRCS Soil Survey

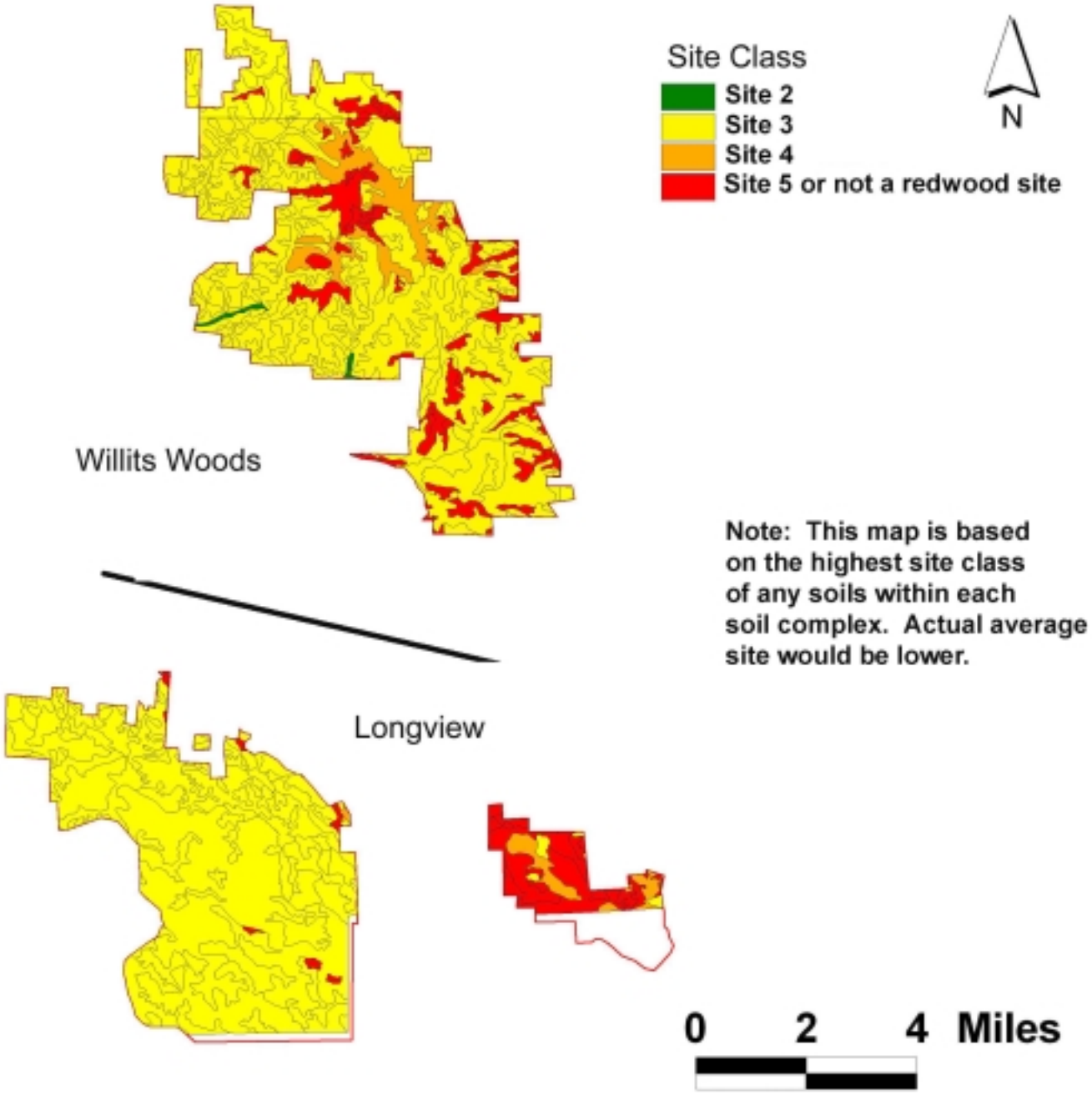

Table 2: Coastal Ridges Highest Site Index for Mapped Soil Complex

as derived from NRCS Soils Maps for Mendocino County

SOIL NAME	MUSYM (NCRS soil ref #	Coastal Ridges ACRES	NRCS 100 year Site Index of most productive soils in complex DF	RW	*** 50 year site **** Schumacher (1930) DF	Linquist & Palley (1962) RW
CA687 Eastern Mendocino Soil Survey						
CASABONNE-W	CASABONNE	109	9	153	140	106	90
CASABONNE-WOHLY LOAMS		110	349	153	140	106	90
CASABONNE-WOHLY-PARDALOE C		111	121	144	130	100	81
HOPLAND-WITHERELL-SQUAWROC		149	140	n/a			
MAYMEN-WOOI	MAYMEN-ET	160	30	n/a			
ORNBAUM-ZENI	ORNBAUN-Z	169	25	155	148	107	96
ORNBAUM-ZENI LOAMS		170	341	155	148	107	96
ORNBAUM-ZENI LOAMS		171	739	155	148	107	96
SQUAWROCK-V	SQUAWROCK	201	5	n/a			
YELLOWHOUNI	YELLOWHOU	220	268	143	135	99	88
YORKTREE-YOI	YORKTREE-	228	12	n/a			
YORKVILLE-SQUAWROCK-WITHERI		233	18	na			
YORKVILLE-YORKTREE-SQUAWRO		235	14	na			
CA694 Western Mendocino County Soil Survey							
BEARWALLOW-WOLFEY COMPLEX		103	21	n/a			
BEARWALLOW-WOLFEY COMPLEX		104	139	n/a			
CARLAIN LOAM		118	36	185	155	119	103
CASABONNE-WOHLY COMPLEX		119	323	153	140	106	90
CASABONNE-WOHLY COMPLEX		120	2350	144	130	100	81
CASABONNE-WOHLY-PARDALOE C		121	606	144	130	100	81
DEHAVEN-HOTEL COMPLEX		135	45	183	155	118	103
HOPLAND LOAM		166	329	n/a			
HOPLAND-SQUAWROCK ASSOCIAT		168	28	n/a			
HOPLAND-WITHERELL-SQUAWROC		169	1109	n/a			
HOPLAND-WOHLY COMPLEX		171	383	118		*82*	--
KIBESILLAH-YELLOWHOUND COMP		178	1995	143	135	*100*	*88*
MAYMEN-ETSEL-SNOOK COMPLEX		185	944	n/a			
MAYMEN-WOODIN-ETSEL COMPLE		186	319	n/a			
ORNBAUM-ZENI COMPLEX		187	414	155	148	107	96
ORNBAUM-ZENI COMPLEX		188	3740	155	148	107	96
ORNBAUM-ZENI COMPLEX		189	1449	155	148	107	96
PARDALOE-WOODIN COMPLEX		190	1323	123	--	86	--
PARDALOE-WOODIN-CASABONNE (		191	217	144	130	99	81
SQUAWROCK-GARCIA-WITHERELL		205	37	n/a			
SQUAWROCK-GARCIA-WITHERELL		206	81	n/a			
SQUAWROCK-WITHERELL COMPLE		207	59	n/a			

(Table 2: continued)	soil ref #)	**ACRES**	DF	RW	DF	RW
THREECHOP-ORNBAUM COMPLEX	211	413	155	148	107	96
UPDEGRAFF LOAM	217	3	94	--	65	--
UPDEGRAFF-HOPLAND-WOODIN C(	218	46	106	--	73	--
WOLFEY-BEARWALLOW COMPLEX	229	280	n/a			
WOODIN-YELLOWHOUND COMPLE)	231	1168	143	135	99	88
WOODIN-YELLOWHOUND COMPLE)	232	1409	143	135	99	88
YELLOWHOUND-KIBESILLAH COMP	235	4108	143	135	99	88
YELLOWHOUND-KIBESILLAH-ORNB	236	484	155	148	107	96
YELLOWHOUND-KIBESILLAH-ORNB	237	5583	155	148	107	96
YELLOWHOUND-WOODIN COMPLE)	238	1505	143	135	99	88
YELLOWHOUND-WOODIN-ORNBAU	240	300	155	148	107	96
YORKVILLE-SQUAWROCK-WITHERI	242	44	n/a			
YORKVILLE-SQUAWROCK-WITHERI	243	162	n/a			
YORKVILLE-YORKTREE-SQUAWRO(	244	2	n/a			
YORKVILLE-YORKTREE-SQUAWRO(	245	125	n/a			

Notes:

1. Assessment area is Mendocino County Lands of Coastal Ridges only
2. Sources
a. Mendocino County, Eastern Part and Southwestern Part of Trinity County, California
Forestland Productivity
b. Mendocino County, Western Part, California
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c. James Linquist and Marshall Palley. 1962. Emphirical Yield Tables for Young Growth Redwood, UC Ag. Ex. Bulletin 796
(Compares with McArdle, R. E., Meyer, W. H. and Bruce, D . 1961. The yield of Douglas-fir in the Pacific. Northwest. USDA Tech. Bull. 201.)
d. Francis Schumacher. 1930. Yield, Stand and Volume Tables for Douglas Fir in California, UC Printing Office Bull 491
e. Boundaries digitized from topographic maps Coastal Ridges LLC Harvest Planning Map
3. This chart indicates the highest published site index for any of the soils within the named soil complex

Table 3: Coastal Ridges Average Site Index for Mapped Soil Complex

as derived from NRCS Soils Maps for Mendocino County

SOIL NAME	MUSYM (NCRS soil ref #)	Coastal Ridges ACRES	NRCS 100 year Average Site Index productive soils DF average	NRCS 100 year Average Site Index productive soils RW average	50 year site Schumacher (1930) DF average	50 year si Linquist & (1962) RW average
CA687 Eastern Mendocino Soil Survey						
CASABONNE-WOHLY LOAMS	109	9	135	140	98	90
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(Table 3: continued)	soil ref #)	**ACRES**	DF 100 yr	RW 100 yr	DF 50 yr	RW 50 yr
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YORKVILLE-SQUAWROCK-WITHERELL	243	162	n/a			
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a. Mendocino County, Eastern Part and Southwestern Part of Trinity County, California
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c. James Linquist and Marshall Palley. 1962. Emphirical Yield Tables for Young Growth Redwood, UC Ag. Ex. Bulletin 796
(Compares with McArdle, R. E., Meyer, W. H. and Bruce, D . 1961. The yield of Douglas-fir in the Pacific. Northwest. USDA Tech. Bull. 201.)

d. Francis Schumacher. 1930. Yield, Stand and Volume Tables for Douglas Fir in California, UC Printing Office Bull 491

e. Boundaries digitized from topographic maps Coastal Ridges LLC Harvest Planning Map

3. This chart indicates the average of the published site indices for rated soils within the named soil complex

I. The Inventory.

Methods. A 1995 Inventory exists. That inventory includes grid plots on a 10-chain (660 ft.) spacing with a subsample of permanently monumented plots, which still exist today. Some have been revisited.

The 1999-2000 "Pioneer Resources" inventory summary is presented in the Option A document. This inventory is based on 2763 unmarked temporary plots. Each year the methods varied slightly with respect to hardwoods, but essentially the design included: a 20 BAF variable plot for conifer trees > 4.5" in diameter, a 1/250th acre fixed area plot for smaller trees, and a 1/100th acre fixed area plot for hardwood trees > 4.5" in diameter. None of the plot data are provided in the Option A or on the 4 CD's.

The Option A document uses CRYPTOS modeling to "grow" the 1999-2000 inventory plots forward to January 1, 2006 for the purposes of presenting base inventory data. From that point the base inventory was used to further predict a century of growth and yield. The inventory output is presented in terms of timber volume for the major conifer species and also for hardwoods by "stratum". "Revised Tab 3" summarizes each stratum for volume, basal area and number of trees per acre by species and 2-inch diameter classes.

Since I do not have the inventory data I assume the stratum summaries are correct. They seem to cross reference well with other information presented in the Option A document. A summary is provided for the major strata in Table 4 below:

Table 4: Coastal Ridge Option A: Interpretation of 2006 Inventory as projected by CRYPTOS and presented for Selected Significant Strata (21081 ac.)

			WHR	WHR		Conifer					BA wtd.
Name	WHR equivalent		size	Dens	Acres	BF	RW	DF/OTH	RW Trees	DF/oth	Av.DBH in.
	TYPE	SIZE		cnifer		Vol/ac.	BA	BA	/ac.	t/ac	(Cnfr.)[3]
L2C4	DF/MHW	Poles	3	D	1449	7900	19.5	80	135	608	5.0
L4E2	Redwood/other con	Young Growth	2	P	1396	3076	1.6	35	72	270	4.4
L8C3	Tanoak/conifer	Poles	3	M	6779	5828	30.5	60.3	213	562	4.6
W2C4	DF/MHW	Poles	3	D	1052	6733	33.5	48.9	244	515	4.5
W4C2	Redwood/other con	Poles	3	P	1262	6522	33.3	34.1	196	239	5.3
W5A5	MHW	Mixed	6	blank	1763	2914	4	34.9	56.4	256	4.8
W8C2	Tanoak/conifer	Poles	3	P	1402	3223	13.7	43.5	129	395	4.5
W8C3	Tanoak/conifer	Poles	3	M	4774	6973	44.8	45	364	371	4.7
W8D3	Tanoak/conifer	Seed/ Sapling	1	M	1204	5462	42.3	38.4	294	273	5.1

Discussion. The Pioneer inventory looks to me to have been an appraisal cruise. Apparently there was no attempt to core any trees at all during the inventory. Therefore there is no site or

[3] inches diameter of tree of average basal area for all conifer 2" and larger

growth information available. These oversights are unfortunate as such data that are normally used for systematic stratified site determination, and for estimates of growth (useful for CRYPTOS calibration) are not available from the inventory. Therefore Coastal Ridges found it necessary to generalize a model for the entire property at the expense of site-specific accuracy.

I compared the stratification of the inventory with the 1-meter county mosaic imagery for Mendocino County[4]. The stratification appears to be useful for management although biologically heterogeneous. Essentially there is not a forest type map for the property.

I calculated the diameter for the conifer tree of average basal area for each of the 8 strata selected in Table 4 above. Though slightly higher than the Quadratic Mean Diameter (because this measure has bias in favor of larger trees) it indicates that the conifer component of each these strata is dominated by stands of sapling size trees, with a few larger trees that I would guess are located mostly in the WLPZ areas. I note that the Option A documents include a discussion of quadratic mean diameters. Unfortunately those calculations do not include submerchantable trees smaller than 7″ diameter at breast height, therefore overlooking all smaller trees, which actually dominate the property.

II. Growth projections

Methods: Coastal Ridges used CRYPTOS to model decadal growth and harvest of its individual plots, for 100 years. In order to more fully describe the process a windows front end was created for CRYPTOS so that multiple iterations could easily be run as in running with batch files. Using this method the computer consultant ran CRYPTOS thousands of times. I could not venture to reproduce this effort but at length I did receive the resultant database, which occupied 4 CD's.

Discussion: There are now tools other than CRYPTOS for growth modeling including FRIEGHTS and FVS, but CRYPTOS remains an accepted and excellent stand modeling tool, although it has its limits. CRYPTOS is based on data from redwood and Douglas-fir stands in California that were typically stocked with 50-450 stems per acres and always with less than 25% hardwoods[5]. Canopy cover of conifers on the Coastal Ridges tracts was estimated in 1997 at 48.9% and that conifer cover density is applied to the growth model. The CRYPTOS base model data were from stands >75% stocked with conifers. As such CRYPTOS may not be an accurate predictor of growth on lands heavily stocked with hardwoods, as are the Coastal Ridges tracts.

When CRYPTOS is used for stands with varying stocking characteristics, for increased accuracy it can be calibrated for local conditions. Calibration is based on increment cores from trees on growth plots.

[4] see http://archive.casil.ucdavis.edu/casil/remote_sensing/naip_2005/
[5] see http://www.cnr.berkeley.edu/~wensel/cryptos/intro.htm

One hundred six permanent plots were remeasured in 2001. An October 1, 2001 memo from North Coast Resource Management indicates that smaller trees were calibrated in a negative direction (0.75) while larger trees were to be calibrated in a positive direction (up to 1.99)[6]. Again, the plot data are not provided, but this great variation in calibration can very likely be explained by the study having been based upon growth of a group of trees in a narrow range of size classes, which were then allocated across a broad range of diameters. Output from these calibration figures, if used, should be very closely scrutinized.

I note that ultimately it was decided that CRYPTOS was to be run for this project in the uncalibrated mode.

Ingrowth. Artificial and/or natural regeneration of north coast forests following harvest is a normal occurrence. Demonstration of a level of post harvest stocking is required per the Forest Practice Rules. Likewise an estimate of future "ingrowth" is necessary for most long-term CRYPTOS modeling. Ingrowth includes trees that exist and will grow into the inventory, and trees that do not yet even exist. Therefore an estimate of future regeneration that is based on actual field measurements is very important for credible growth and yield modeling. For example, a large industrial landowner on the north coast hired our company years ago to conduct inventories that can produce localized estimates of ingrowth solely for the purposes of modeling their strata to demonstrate sustained yield. The result of our work was a set of CRYPTOS "ingrowth" files which varied among stand age, site class, species distribution, management history and silvicultural methods, and which provided ingrowth files that were demonstrably based on actual observation of their forest lands.

In contrast Coastal Ridges used a standard set of "assumptions" to create CRYPTOS ingrowth files for modeling its entire holding, irrespective of site. Anticipated ingrowth (of 15-300 conifer seedlings, plus some hardwood, per acres) was added to each plot during each decade (just prior to the modeled harvest) determined by the harvest method (selection, transition, etc.) and the pre-harvest species composition weighted by basal area. This property is large. It occupies 2 distinct geographic types, has 20 mapped soil types. It is heavily stocked with hardwoods (which seem to tend to dominate low sites in the area and also to inhibit conifer regeneration), and has received a great number of treatments over the years. Therefore I would expect that a collection of localized ingrowth files could yield very different long-term results when modeling growth and yield. These files could be obtained using a systematic inventory procedure that addresses all of the variables discussed above.

IV. Other Issues.

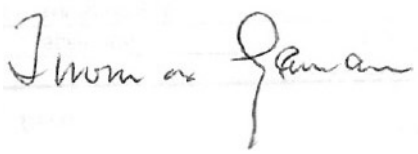
Remeasurement inventory: The Option A document is a long-term document designed to assure sustainability. Part of this process

[6] see section IV, tab 12.

is periodic remeasurement. The Option A document suggests that the permanent “plots will be remeasured on a regular interval”. However, the “plan of action” is not due to be submitted to CDF until 90 days after approval of the first THP under the Option A. I would suggest that the remeasurement process should occur at least one time each decade. To avoid silvicultural bias associated with permanent marked monitoring sites, this process should include installing new temporary plots as well as revisiting the existing permanent plots. Site tree information should be systematically collected on all plots. Plot data should be made available to CDF for review.

Summary. The Option A presents site indices that overestimate the long-term productive capacity. Site indices were set unrealistically high, then averaged to model growth for 20 mapped soil types. Much of the area is not significantly productive of redwood and Douglas-fir. Future ingrowth is based on assumptions. Biological types and strata on the property have not been mapped or substantially identified. As a result the Option A document provides a long-term model of growth based on unsupportable site information, old cruise data, and growth and stocking assumptions. The harvest and restoration goals for these already heavily cutover and depleted lands, as set forth in the long-term growth modeling, are unlikely to be accomplished. There is no timeline for future inventories or checks that the production benchmarks will be met.

Respectfully submitted,



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