Model Purpose	
Starting Inventory	ODF Stand Level Inventory (SLI) Data from the 2017 SLI Year-End Updates. Operations updates are current through December 2017. Stand growth is current through June 2018
Harvest Model Type	Linear Program Model
Model Period	Model Period: 100 years; Model interval: 5 years
Model Goals	Maximize Net Present Value subject to identified constraints (departure goals, target age class outside the HCAs, ending inventory constraint, HCA habitat rules)
Spatial Data	GIS Data August 2019
Harvest Costs	Derived from actual costs
Pond Values	10-year Forest 2 Market 3rd quarter 2019
Conservation Goals	As consistent with DRAFT HCP conservation goals and strategies
Aquatic Goals	As consistent with DRAFT HCP conservation goals and strategies

Harvest Model Data Prep and Information

09/17/2020

Field	Source	Responsibility	Process	Performed on	Export Date	Comments
Unique_ID	Calculated	Division	Calculated at the end for each polygon	Final polygon	20200503	
Acres	Calculated	Division	Calculated at the end for each polygon	Final polygon	20200503	
District	Harvest Units	Division	From Model_HarvestUnits	Original HU	20200429	
Fund	Ownership Managed Lands	Division	HU identity to Ownership ManagedLands dissolved by type. 51 = BOF, 52 = CSL/CSL decert, 0 = not in ownership	HU_SLI_STD	20200429	
County	County Boundaries	Division	HU Identity to Boundaries_County_Limit. Number = TRAScode	HU_SLI_STD	20200429	
Mbcode	Management Basins	Division	HU polygon centroid joined to Boundaries_ManagementBasins. Number = MBcode	Original HU	20200429	
Std_id	SLI_poly	Division	HU identity to SLI_poly	Original HU	20200429	
UPDATEYEAR	SLI_poly	Division	HU identity to SLI_poly	HU_SLI_STD	20200429	
SLIVersion	SLI_poly	Division	HU identity to SLI_poly	HU_SLI_STD	20200429	
HU_ID	Harvest Units	Division	From Model_HarvestUnits	Original HU	20200429	
AEYD	Calculated	Division	From Model_HarvestUnits	Original HU	20200429	
Avg_Slope	Calculated	Division	Calculated for each Harvest Unit or HU identity to SLI_poly	Original HU	20200429	
Spur_Cost	Harvest Units	Division	From Model_HarvestUnits	Original HU	20200429	
Node	Harvest Units	Division	From Model_HarvestUnits	Original HU	20200429	
Thinable	Non Thinnable Areas	Division	Polygon identity with Model_NonThinnableAreas. 0 = non thinnable, 1 = thinnable	HU_SLI_STD	20200429	
Logsys	Harvest Units	Division	From Model_HarvestUnits	Original HU	20200429	
ROW	Statewide Roads	Agency	csv file to Greg - Acres of final polygon by uid in 15ft buffer created from subset of statewide roads (within 15ft of NW managed lands, Status in (NULL , ' ', 'B', 'Blocked', 'O', 'Unknown', Ex-exiting', 'Dormant', 'blocked', 'null')). Created near end point by intersect.	final uid	20200626	
Easement	Previous model data	District	HU polygon centroid joined to HUs designated as requiring easements in previous model runs (WL only). Number = number of model period HU is unavailable	Original HU	20200429	
Rec_thins	Management Harvest Operations	District	HU identity to recent thin layers supplied by districts or extracted from Management_harvest_operations (status = completed, type= partial cut, year completed >= 2006). For each HU of: 1 - 9 = how many years since thinning (2014-2006), 0 = not recently thinned. Then joined to HU polygons.	Original HU	20190819	
H_NoThin	Previous model data	District	HU centroid joined to HUs designated as H_NoThin in previous model runs (TL only). 1 = no thin, 0 = thinning ok	Original HU	20200429	
SNC_zone	Biology SNC Zone	Division	HU centroid joined to Biology_SwissNeedleCastZone. SNCZONE = 1 (Severe Impact), SNCZONE = 2 (Light to Mod Impact), SNCZONE = 0 (Outside zone of impact). BIOLOGY_SwisNeedleCastZone 1 closest to ocean, 2 farther from ocean.	Original HU	20200429	
Site_grp	SLI points/Tod Haren	Division	Average of site_phy values > 0 for sli_points in HU.	Original HU	Tod	
AdminRem	FLMC	Division	Polygon identity to all special use (except riparian/ops limited/wildlife) and HVCA plants (except old growth) in FLMC. 1 = removed, 0 = not removed	HU_SLI_STD	20200503	
OldGrowth	FLMC	District	Polygon identity to all plants identified as old growth in FLMC. 1 = old-growth, 0 = not old growth	HU_SLI_STD	20200503	
Rip_Code	Terrainworks modeled streams/Buffers 20200424, modified 120_50	Division	csv file to Greg - RCA acres by final uid. ROW erased from RCA.	final uid	20200626	

Field	Source	Responsibility	Process	Performed on	Export Date	Comments
AA_Id	Aquatic Anchors	Division	HU centroid in Biology_Aquatic Anchor. Number = aquatic anchor id, 0 = Not in AA	Original HU	20200429	
In_Gorge	Raster Layers/modeled streams	Division	Polygon identity with modeled inner gorge polygons. 1 = inner gorge, 0 = not inner gorge	HU_SLI_STD	20200430	
FPA_Wild	FLMC	Division	Polygon identity with HVCA wildlife habitat areas identified as Eagles/BT pigeons/GB Herons/Ospreys in comments field of FLMC. 1 = designated wildlife habitat, 0 = not wildlife habitat	HU_SLI_STD	20200503	
Ta_mmma	Murrelet Management Areas/MMMA final	Division	Polygon identity with combined layer: STATUS in ('MMMA', 'BUFFER', 'Draft MMMA', 'Draft Buffer') from Biology_MurreletmanagementAreas. 1 = MMMA/habitat, 2 = buffer, 0 = not part of a MMMA/habitat	HU_SLI_STD	20200503	
TAS_Id	Terrestrial Anchors	Division	HU centroid joined to Biology_TerrestrialAnchor. Number = TA id, 0 = not in a TA site	Original HU	20200429	
LSPS_Bid	Raster Layers/modeled streams	District	Polygon identity with district LSPS layer. Number = Object ID, 0 Not in a LSPS basin	HU_SLI_STD	20200503	
LSPSRisk	Raster Layers/modeled streams	District	Polygon identity with district LSPS layer. 2 = intermediate risk, 3 = substantial risk, all others = 0	HU_SLI_STD	20200503	
HLHL_Code	Buren reviewed 2014 HLHL data	Division	csv file to Greg - acres by final uid. ROW and RCA erased from HLHL.	final uid	20200626	
Elev	Harvest Units	Division	Use HU Centroid, raster tool to get elevation of centroid		20200429	
DistOcean	Harvest Units	Division	Create near table calc tool, gives lookup table with feature ID's From/To Distance, join back to the HU Centroids, create field.		20200429	
HCA	ODF Biologist/District	Division	2 csv files to Greg - acres by uid and percent of uid	final uid	20200803	

Keep from original HU's
District
P_Ground
P_Cable
Spur_Cost
LogSYS

General Model Rules

Number	Value Group	Model Rule	Implementation	GIS Check	Reports Check	Who makes decision	Relative Impact on Model outputs	Comparative Analysis Run	Notes
1	Admin rules	N/A	No harvest > 120 acre patch size. Little to no harvest	Visually check patch sizes for large patch sizes; dissolve harvest polygons by period and query for patch size	N/A	OAR 629-630-0000	TBD	Yes	
2	Admin rules	Landslide and public safety	No regen harvest in HLHL polygons within high risk basins; If over 50% of a harvest unit is encumbered by HLHL, exclude entire unit from harvest	Visually inspect moderate and high risk basins. Summarize acres harvested by LSPS basin.	Check classification reports for HLHL breakout.	OAR 629-630-0500	Low	Yes	
3	Economic	Merchantability Specifications	Up to five log grades identified by species group. 40ft log grades merchandise consistent with the official rules for log scaling and grading bureaus	N/A		Kevin	Medium	Yes	
4	Economic	Pond Values	Pond values are applied by species, grade, and region. Ten year average price from F2M market reports, PPI adjusted.	N/A		Kevin	High	Yes	
5	Economic	Stumpage Values	Stumpage is currently estimated as pond value - cost	Check GIS polygon layer for estimated pond/logging costs, and transport layer for estimated road costs	Check harvest reports for net revenue estimates	Kevin	High	Yes	
6	Economic	Breakage and Defect	Size based percent defect is removed from net volume estimates.	N/A	Compare gross volume with net	Kevin	Medium	Yes	
7	Economic	In-Unit Spur Costs	Applied based on LEI HU estimates	N/A	Check spur costs reported in model outputs	Kevin	Low	Yes	
8	Economic	Road Maintenance Costs	Applied based on LEI model road estimates	N/A	Review MSR reports	Kevin	Low	Yes	
9	Economic	Hauling Costs	Calculated by species and size for each harvest unit. Each species and district is assigned to a typical mill site.	N/A	Review MSR reports	Kevin	Low	Yes	
10	Economics	Logging costs	Taken from an OSU survey of local contractors	Check cost estimates in documentation folder	Review average logging cost by harvest type	Kevin	Medium to High	Yes	
11	Economics	Young Stand Silviculture	Average free to grow cost by district	N/A	Review MSR report	Kevin	Low to Medium	Yes	
12	Growth & Yield	SNC growth&yield	Growth adjustments are applied to regeneration stand yield tables based on SNC Zone. Zone 1 = severe (code=1) Zone 2 = light/moderate (code=2)	N/A	N/A	Robbie	Medium	Yes	
13	Growth & Yield	Growth calibration	FVS adjustments include basal area growth modifiers by species and maximum SDI modifers by species	Check stands at 2 different time periods to ensure that FVS growth assumptions reflect actual stand capabilities.	Check inventory reports	Tod	Medium	Yes	
14	Growth & Yield	Imputation	Non-measured stands assigned to similar measured stands	N/A	N/A	Tod	Medium	Yes	

Number	Value Group	Model Rule	Implementation	GIS Check	Reports Check	Who makes decision	Relative Impact on Model outputs	Comparative Analysis Run	Notes
15	Growth & Yield	Silvicultural pathways	Yield tables include multiple silviculture pathways such that the model can choose no harvest, regen, regen+pct, thinnings, and combinations of those options over multiple stand rotations.	Check stands at 2 different time periods to ensure that FVS growth assumptions reflect actual stand capabilities.	Check inventory reports	Tod	High	Yes	
16	Growth & Yield	Initial inventory	Stands are projected from their measured date to 2023.	Ensure that current stand inventory estimates are reasonably close to actual volume.	N/A	Tod	Medium	Yes	
17	Growth & Yield	FVS implementation	Stands are grown using regionally appropiate FVS variants.	Check that growth rates are reasonable for a range of stands.	Growth rates represented by MAI and PAI	Tod	Medium	Yes	
18	Growth & Yield	Planting regimes	Site specific planting reigmes have been developed and have been included by district.	N/A	N/A	Tod	Medium	Yes	
19	Growth & Yield	Green Tree Retention	5 green TPA > 16" DBH (Approx = QMD of stand)	N/A	N/A	Tod	Low	Yes	
20	Operations	Hemlock no-thin zones	Where the attribute “H_NoThin” = 1, the harvest unit receives ‘grow only’ prescriptions until the first clearcut. Tillamook specific	Check H_NoThin=1, and ensure no thinning in initial periods before a regeneration harvest.	No report to directly check no-thin rule.	Colleen/Jodi	Low	Yes	
21	Operations	Harvest Units	Harvest units have been delientated to identifiy likely harvest blocks	N/A	N/A	Colleen/Jodi	Medium	Yes	
22	Economics	In-unit spur cost	The in-unit spur construction costs are in $/acre harvested for the first entry. On subsequent entries, 20% of the original construction cost was applied to account for the cost of reopening the road.	N/A	Spur costs are included in road construction costs in the road cost summary report.	Kevin	Low-Medium(depending on district)	Yes	
23	Economics	Road maintenance	• Maintenance costs are based on the long-term maintenance of a road segment and included the cost for replacing culverts over time. • Maintenance costs are listed in the Road Segment Table in units of $/MBF/Segment. • Maintenance Costs were deducted from the gross value of all harvests that used the road.	N/A	Review model reports	Kevin	Medium	Yes	
24	Economics	Hauling/Loading Costs	Defined in road inputs	N/A	Review model reports	Kevin	Medium	Yes	
25	Operations	Minimum thinning Age	Minimum thinning age set to 35 years	Check a subset of stands that are thin harvested. All stands should be greater than 35 years old.	Review model reports	Brian	Low	Yes	
26	Growth & Yield	Ending Inventory Level	Minimum ending inventory: 20k bdft/ac * operable acres (or 0.5 * avg CMAI)	N/A	Verify Ending inventory exeeds this constraint		Medium	Yes	

Policy Model Rules

Number	Value Group	Model Rule	Implementation	GIS Check	Reports Check	Who makes decision	Relative Impact on Model outputs	Comparative Analysis Run	Notes
1	Economic	Discount Rate and Real Price Appreciation	3% Discount Rate, cost and price appreciation assumed constant	N/A	Compare nominal cashflow with NPV	Brian	Medium	Yes	
2	Harvest Objectives	Volume departure	5% volume departure per time period per subgeographic region & No more than +/-10% departure from 100 year average Volume harvest	N/A	Check volume report per region to ensure departure is within specified limits	Brian	High	Yes	
3	Operations	Minimum regen harvest age	Minium Stand Harvest age is 40 years for all stands	Check a subset of stands that are regen harvested. All stands should be greater than 40 years old.	Harvest volume by age class	Brian	Medium	Yes	
4	Planning unit	Scale of Plannning Unit	Across Subgeographic areas North coast 75% ≤+ 5% TL/AT/FG Valley 15% +/-3% NC/WO South 10% +/- 3% WL/Coos/SW	N/A	District Level Harvest	Brian	Medium	Yes	
5	Harvest Objectives	Age Class Distribution outside HCAs	Target Age Class +/- 2% 0-30: 30% 30-60: 30% All Age Classes above 60, total 40%	N/A	Check Age Class Distribution Outside HCAs	Brian	High	Yes	

Model Scenario Rules

Number	Value Group	Model Rule	Implementation	GIS Check	Reports Check	Who makes decision	Relative Impact on Model outputs	Comparative Analysis Run	Notes
1	Aquatic/Riparian	No harvest in identified riparian buffers	No harvest allowed in riparian buffers.	Query for harvest in riparian buffers	Report harvest by riparian code (should be none)	HCP Aquatic Strategies	Medium - depends on buffer width	Yes	
2	Aquatic/Riparian	No harvest in Temperature Protection Zone	No harvest allowed in Temperature Protection Zones	Query for harvest in Temperature Protection Zone	Report harvest for polygons within temperature protection zone (should be none)	HCP Aquatic Strategies	Low	Yes	
3	Aquatic/Riparian	Potential Debris Flow Tracks (PDFT)	No harvest allow in PDFT	No harvest in any polygon within a potentail debris flow track	Look at Classification reports - there should be no harvest in any polygon with a potentail debris flow track	Brian	N/A	Yes	
4	Aquatic/Riparian	Inner Gorge	No harvest allowed in inner gorge.	No harvest in inner gorges	Classification Summary Reports= no harvest in inner gorge	Brian	Medium	Yes	
5	HCP HCA Strategies	NSO Conservation	*SNC and Alder HSI= 0 for first 30 years *Stands with HSI ≥0.6 are removed from management	Visually check GIS layer to ensure that near-term entries in HCAs are reasonable.	Check Summary reports, and NSO HSI reports	Nick		Yes	
6	HCP HCA Strategies	Marbled Murrelet Conservation	No Harvest in designated occupied stands, suitable nor highly suitable habitat. *No regen harvest in identified buffer nor within 100 meters of unbuffered designated occupied, suitable or highly suitable habitat	Visually check GIS layer to ensure that no harvest occurs in occupied, suitable nor highly suitable habitat and no regen harvest in identified buffer nor within 100 meters of unbuffered designated occupied, suitable or highly suitable habitat	Check Summary reports by HCA	Nick	Medium	Yes	
7	HCP HCA Strategies	Partial Cut Constraints	Maximum of 2 light/moderate thinnings through age 90 removing up to 40% of canopy cover	Review harvest within HCAs	Summarize harvest within HCAs	Nick	Medium	Yes	
8	HCP HCA Strategies	HCA Extent	HCAs identified by harvest unit	Visually confirm HCAs match design	Acres within HCAs by district	Nick	High	Yes	
9	Forest Health Strategies	Swiss Needle Cast Conversion	500 acres (+/-10%) regen harvest per year for Douglas-fir in severe and moderate SNC zones through age 90 for the first 6 periods or until severe and moderate zones are treated, whichever comes first for Tillamook, Astoria (North Fork, Sweethome and Astoria basins)	Review harvest within SNC Conversion Areas	Acres of Douglas-fir stand CC in HCAs	Nick/Robbie	Medium	Yes	
10	Forest Health Strategies	Hardwood Conversion	200 acres (+/- 10%) regen harvest per year in hardwood dominated stands within Tillamook for the first 6 periods	Review Harvest within Hardwood Conversion Areas	Acres of hardwood stands CC in HCAs	Nick/Robbie	Medium	Yes	

Reforestation Prescriptions

District	Regime	Species		TPA
Astoria	WXR1	DF		120
		RA		15
		RC		15
		WH		150
			Total	*300*
	WXR2	DF		150
		RA		6
		RC		15
		WH		129
			Total	*300*
	DXR3	DF		193
		RA		35
		RC		18
		WH		105
			Total	*350*
	1DR4	DF		225
		RA		15
		WH		60
			Total	*300*
	DXR5	DF		210
		RA		17.5
		NF		35
		WH		87.5
			Total	*350*
Forest Grove	1DR3	DF		392
		GF		44
			Total	*436*
	DXR1	DF		174
		NF		87
		RC		87
		WH		87
			Total	*436*
	DXR2	DF		327
		NF		109
			Total	*436*
Tillamook	1WR1	DF		35
		NF		35
		RA		35
		RC		35

* All regimes include 2 dominant species green trees representing the minimum FPA requirement
* All stands include 2 snags representing the minimum FPA requirement

District	Regime	Species		TPA
		WH		210
			Total	*350*
	1WR2	DF		35
		RA		35
		RC		35
		SS		20
		WH		225
			Total	*350*
	WXR3	DF		105
		NF		35
		RA		35
		RC		35
		WH		140
			Total	*350*
	WXR4	DF		105
		RA		35
		RC		35
		SS		35
		WH		140
			Total	*350*
West Oregon	DXR1	DF		200
		RA		20
		RC		40
		WH		100
			Total	*360*
	DXR2	DF		210
		GF		20
		RA		20
		RC		40
		WH		70
			Total	*360*
	DXR3	DF		180
		RA		20
		RC		50
		SS		20
		WH		90
			Total	*360*
	OTR4	DF		110
		RA		70
		RC		50
		SS		40

District	Regime	Species	TPA
		WH	90
		Total	*360*
North Cascade	1DR1	DF	435
		RA	35
		WH	30
		Total	*500*
	DXR2	DF	348
		RA	30
		RC	87
		Total	*465*
	OTR3	DF	60
		NF	240
		WH	30
		Total	*330*
	WXR4	RA	10
		RC	150
		WH	150
		Total	*310*
Western Lane	DXR1	BM	15
		DF	265
		RA	15
		RC	25
		WH	30
		Total	*350*
	DXR2	BM	20
		DF	150
		RA	20
		RC	70
		WH	100
		Total	*360*
	OTR3	BM	35
		DF	70
		RA	50
		RC	70
		WH	125
		Total	*350*
Coos	1DR1	DF	285
		RA	15
		Total	*300*

District	Regime	Species		TPA
	DXR2	DF		200
		RC		200
			Total	*400*
	DXR3	DF		200
		WH		200
			Total	*400*
	DXR4	DF		180
		RA		40
		RC		92
		WH		88
			Total	*400*
Southwest	DXR1	DF		335
		PP		40
		SP		40
		IC		20
			Total	*435*

Yield Table Prescriptions

Moderate Commercial Thins

Thin from below, relative SDI constrained
Conifer Stands Only

Dominant SPP Max SDI	DF	600	* SDI max for thinning is different than
	WH	720	SDIMAX growth modifier
Trigger RD	55,60		
Target RD	35,30		
Max DBH	45		
Min DBH	8		
Min Harv BdFt	Tillamook	6000	
	Others	7000	
Species preference	DF,WH,RA,BM,SS,RC		
Re-entry delay	15		

Precommercial Thins

Thin from below, residual TPA target

Minimum age	10
Maximum age	23
Triger TPA	300
Residual TPA	220

HCA Presciptions

Maximum of 2 thinnings through age 90
Less than 40% of basal area removed (surrogate for cover)

Delivered Log Prices

10 year average from F2M reports, adjusted for inflation using the logging producers price index

Prices as of 9/15/2019

Westside

Species	Prod-1	Prod-2	Prod-3	Prod-4	Prod-5
DF	615	600	429	110	110
WH	505	502	403	110	110
RA	682	510	510	110	110
SS	419	465	465	110	110
RC	1076	1032	1032	110	110
BM	453	453	453	110	110
NF	505	502	403	110	110
SF	505	502	403	110	110
CX	505	502	403	110	110
HX	453	453	453	110	110

Southwest

Species	Prod-1	Prod-2	Prod-3	Prod-4	Prod-5
DF	649	553	500	140	0
PP	400	350	350	100	0
SP	400	350	350	100	0
WF	473	436	402.5	112.5	0
IC	1057	279	0	0	0
CX	473	436	402.5	112.5	0
HX	635	471	372	0	0

Transportation

hu_trans_costs_20200124.csv

Typical mill assigned by species and log size - Provided by Bodi D. on 1/2020

Road network combines HnH era roads, state highway layer, and "stubs" in Coos to complete the network. This is to provide reasonable haul costs, but is inconsistent with the official roads data

ESRI network analysis extension was used to calculate a distance and cost matrix between each HU node and mill node.

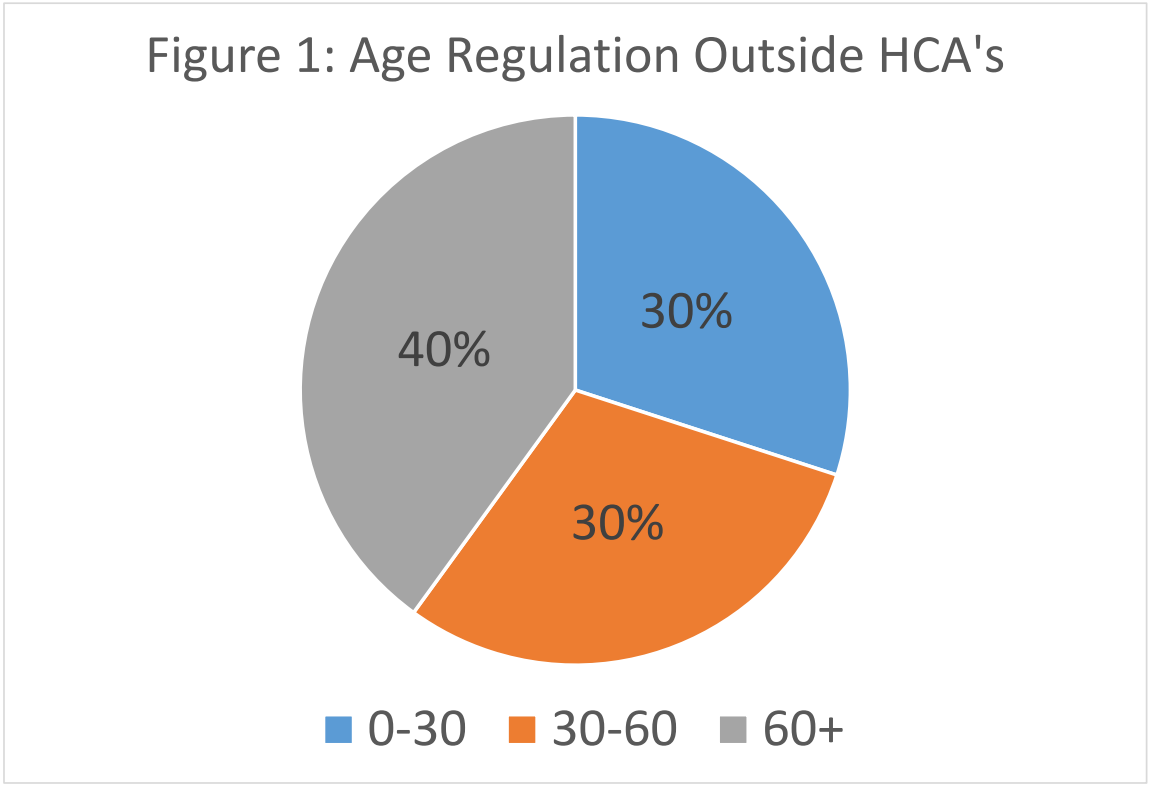
Field	Source	Responsibility	Process	Performed on	Export Date	Comments
hu_id	*Harvest Units*	Division	Update HU polygon layer and	01/24/2020	01/24/2019	
node	*Harvest Units*	Division	Update HU polygon layer and	01/24/2020	01/24/2019	Links each HU to the model roads network Coos HUs stubbed from centroid to end of nearest primary road HUs with missing or incorrect nodes assigned to nearest existing node
df_sw_mill	*Asset Mgt*	GIS/Analyst	Update Mill nodes table, road	01/24/2020	01/24/2019	An "expected" mill destination was identified for each species and log size on each district. Each mill was identified on the model road network.
df_lw_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
wh_sw_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
wh_lw_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
alder_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
pine_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
cedar_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
hwd_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
pulp_mill	*Asset Mgt*	GIS/Analyst	"	01/24/2020	01/24/2019	
df_sw_haul	*GIS Analysis*	GIS/Analyst	Update Hauling Rate and Reru	01/24/2020	01/24/2019	Hauling costs calculated as a funtion of travel time along the shortest path to each mill. Haul cost=2x travel time * $65/hr
df_lw_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
wh_sw_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
wh_lw_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	

alder_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
pine_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
cedar_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
hwd_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
pulp_haul	*GIS Analysis*	GIS/Analyst	"	01/24/2020	01/24/2019	
miles	*GIS Analysis*	GIS/Analyst	Rerun distance matrix	01/24/2020	01/24/2019	Total distance along the shortest path to the DF SW mill
maintenance	*GIS Analysis*	GIS/Analyst	Update road network with mai	01/24/2020	01/24/2019	Total maintenance cost along the shortest path to the DF SW mill
construction		GIS/Analyst		N/A		There is no mechanism to allocate construction costs between harvest units in the LP model

Age Regulation

Description	Figure 1 indicates age regulation as an ending constraint, met by the end of the planning period for stand age classes outside of HCA areas.
Age Regulation Outside HCA's	Age regulation was applied to operable and inoperable harvest units outside of HCAs. Age classes from 0-30 and 30-60 have 30% in each. The remaining 40% in age classes above 60.
Notes	

Age	Age Regulation +/-2%
0-30	30
30-60	30
60+	40



Silvicultural Actions

Regeneration Harvests

The intent of a Regeneration Harvest is to develop a new stand. In general, residual trees left after a Regeneration Harvest are intended to remain on the site through the life of the new stand and subsequent stands. All types of Regeneration Harvests retain less than 80 square feet of basal area per acre (based on trees greater than 11 inches DBH). The Harvest Types (within the Regeneration Harvest Goals) are best defined using residual trees per acre or square feet of basal area per acre; in either case, only trees greater than 11 DBH are counted.

Prescription	Description	Requirements
Clearcut (cc)	A Clearcut removes all (or nearly all) trees in a stand; however, the FMP and the Forest Practices Act (FPA) require that at least a few live trees be retained in each unit. Clearcuts will provide the best conditions for successful plantation establishment on almost all sites on State Forests.	Retain between 2 to 5 green trees or snags per acre Are subject to FPA rules for type 3 harvest (maximum size is 120 acres with green-up requirement)
Retention Cut (RC)	Retention Cuts look more like a partial cut or the first stage of a shelter wood harvest than a clearcut, however the focus of future management will be on the new/young trees in the stand, rather than the residual trees. At its highest density, a Retention Cut leaves nearly as much basal area as a Heavy Thinning, and the management focus may be on the existing cohort, the new cohort, or both. In this harvest type, regeneration is achievable and will help develop complex structure more quickly than after a clearcut. A Retention Cut will result in a stand with two distinct age classes that are well-distributed across the stand.	Retains between 33 and 80 square feet of basal area per acre (on Site Clas I, II, or III) Are subject to the FPA Rules for Type 1 Harvest Are designed to meet and exceed landscape goals for structural components

Parital Cuts

The intent of a Partial Cut Harvest is to manage the growth and density of an existing stand. A prescription for a Partial Cut may be designed to increase the structural complexity of a stand, maximize volume growth, or capture tree mortality. A stand may be Partial Cut several times throughout its life. All Partial Cut harvest types retain at least 80 square feet of basal area per acre of trees greater than 11 inches DBH.

There are several forms and intensities of Partial Cuts, however the most common form of Partial Cut is thinning. Thinning prescriptions are often designed using measures of Stand Density Index or Relative Density and remove a portion of the trees from a stand in a generally uniform pattern. Sometimes thinning prescriptions are developed to increase the horizontal diversity within a stand; a diameter limit prescription often results in a stand with variable density.

The structure of a stand immediately after a partial cut (1 to 3 years) is very dependent on both the harvest prescription and the structure of the stand prior to harvest. Generally, the stand structure will remain the same or become more complex.

Prescription	Description	Requirements
Heavy Thin	A Heavy Thinning approaches the harvest intensity of a Retention Cut, and the management focus will be on developing a new cohort of trees to speed up understory development which leads to a new cohort throughout the thinning area. A heavy thinning results in the fast growth of individual trees, but reduces the total volume growth of the stand	Retains at least 80 square feet of basal area per acre and an SDI% of less than 30.
Moderate Thin	A Moderate Thinning provides for optimal stand growth and allows vigorous growth of the individual trees. Stand structure will continue to develop with a Moderate Thinning, and depending on species composition and site index, a new cohort of trees may be initiated.	Retains an SDI% of greater than or equal to 30 and less than 40.
Light Thin	A Light Thinning focuses on maintaining stand growth and health, however in order to achieve these goals, it must occur more frequently than a Heavy or Moderate Thinning in the same stand. More complex stand structure may not be developed with a Light Thinning and a new cohort of trees will may not be initiated. Early commercial thinning (ECT) falls under a light thinning.	Retains an SDI% of greater than or equal to 40 and less than 50.

Harvest Type Definitions Table

		Regeneration Harvest		**Partial Cut**	
Harvest Types	**Site Class[3]**	**Clearcut**	**Retention Cut (RC)**	**Thinning**	**Group Selection**
Residual Basal Area (sq. ft / acre)	I, II, III		>= 33 & < 80	>= 80	Residual BA/Acre of entire unit must meet PC BA standard[4]
	IV, V		>= 20 & < 50	>= 50	
	VI		>= 10 & < 40	>= 40	
Residual Trees Per Acre[1]		>= 2 & < 5	> 5		
Residual Stand Density Index[2]				Generally, >= 30% & <= 55%	
Unit Size (acres)		>= 5 & < 120	>= 5		> 0.5 & < 5.0 < 50% of total unit in patch cuts.

1. The NW and SW FMPs do not set a minimum size for residual trees, so use the FPA standard of an 11 DBH and 30 feet tall.
2. SDI based on all trees >5.6 DBH and the SDI% is based on a weighted average of the species that comprise a significant component of the stand.
3. The FPA defines harvest types based on the Cubic Foot Site Class
4. When a harvest unit is comprised of a combination of partial cut and patch cuts, then the entire unit must meet the Residual Basal Area standard for a Partial Cut.

Reforestation and Young Stand Management

Planting

Initial Planting

Initial planting occurs after a regeneration harvest. Planted seedlings will be well suited and adapted to the reforestation site, and where appropriate a mixture of species will be planted to increase diversity across the permit area. Density will vary from 250-536 trees per acre (TPA). Stocktype will be site specific and take in factors such as soil type, soil quality, and animal browse potential. Species selection will be on a site by site basis with goal of increasing diversity across the landscape to increase resiliency in the uncertainty of climate change. In areas of disease, such as Swiss needle cast (SNC) or laminated root rot, planted species will be of tolerant stock or from a resistant species with an emphasis on resistant species

Interplanting

Interplanting will occur when stocking levels fall below Forest Practice Act minimums. In certain instances, interplanting will occur to increase stocking on high quality sites to fully capture the site. In other areas, lower stocking will be acceptable as it will provide high quality early seral habitat while still meeting FPA requirements. Density will be site dependent, but range from 200-400 TPA.

Site Preperation

Site preparation is any planned measure to prepare a site for the favorable conditions for newly planted seedlings. Site preparation should not cause detrimental or excessive soil disturbance, and should be carried out in a cost-effective manner. Through site preparation, factors that are limiting for seedling survival and growth may be overcome. Such factors may include limited soil moisture, low light levels, and compacted soil. Logging slash can have positive and negative benefits and should be evaluated on a site by site basis. The three main site preparation techniques are mechanical, chemical, and broadcast burning, which are described below.

Mechanical

Mechanical site preparation is the use of mechanized equipment to rearrange or alter forest slash and/or disturb the forest surface layer and vegetation to create seedbeds or planting spots. Mechanical site preparation reduces competition of other vegetation with crop trees for light, water and nutrients. It can alter wildlife habitat, both positively and negatively, and this should be taken into consideration before use at each site. It can also be used to treat the adverse effects of past activities, such as compaction.

Chemical

Chemical site preparation, which involves the application of herbicides, controls competing vegetation before planting or natural regeneration and during the early stages of seedling establishment. Applications occur by two primary methods, aerially by helicopter or ground based with the use of backpack application equipment. In general, herbicides are effective in suppressing most undesirable vegetation and are well suited for use on many sites. Herbicides, when properly applied, also have little site impact. Proper application implies application according to label instructions. However, in some areas, application of herbicides are of particular concern to other resource users and members of the public.

Broadcast Burning

When properly applied on appropriate sites, prescribed burning can achieve many site preparation objectives. Fire can be used on steep terrain, does not compact the soil, and improves access for planting. Fire impacts can also improve seedling survival and growth by reducing competing vegetation. Prescribed burning is also used to remove slash piles throughout the site and on landings.

However, it also has disadvantages. The biggest disadvantage is the risk of escape, and intense fire can reduce the amount of soil nutrients. Prescribed burning can also reduce the amount of downed wood in a unit, decreasing the amount of suitable habitat for a number of species of concern. Burning can also increase the amount of unwanted vegetation, such as ceanothus and senecio, in certain parts of the permit area.

Release Treatments

Release treatments usually occur in young stands and are designed to reduce competition for desirable tree species. They can also be used to alter species composition under pressure from insect and disease and favor species that are tolerant or resistant to threat. There are two types of release treatments, manual and chemical, and they are described below.

Manual

Manual release treatments are used to reduce competition from unwanted vegetation, usually, but not limited to other tree species. The two main release treatments are precommercial thinning (PCT) and hardwood release.

Precommercial Thinning

A common manual release treatment is PCT. This silviculture activity is used to manipulate the density, structure or species composition of overstocked young forest stands. Generally, the purpose of a PCT operation is to release the biggest and best growing trees so they can maintain their growth. PCT decisions are not made at the planting planning process, as planting density should not require PCT. This tool is used when ingrowth from natural regeneration, both conifer and hardwood, occurs reducing the growth and vigor of planted saplings. PCT is normally conducted in a stand between the ages of 10 and 20 years. Remaining density should be appropriate for the site, and range from 250-350 TPA. In areas of disease, such as SNC, PCT can be used to favor western hemlock and other resistant species over Douglas-fir to help ensure a healthy future stand.

Hardwood Release

Hardwood release is used when ingrowth of hardwoods, mainly red alder in the northwest and madrone and tanoak in the southwest, threaten to change the

stand from conifer dominate to hardwood dominate. While hardwoods are important on the landscape and for local mills, long term conifer production is the goal for many stands across the planning area. In this treatment, hardwoods are removed leaving all conifer. This differs from a PCT in the fact that conifer spacing and species are not manipulated.

Chemical

Chemical release treatments involve the application of herbicides to control undesirable vegetation. Typical application methods are broadcast, directed spray, and hack and squirt, and are described below.

Broadcast

Broadcast application treatments are sprayed over the top of seedlings and undesirable vegetation. These applications usually occur in the first one to two years after planting and are designed to reduce competition from annual forbs and grasses. The two main application methods are aerial and backpack. Aerial is more efficient and cost effective than backpack, however, aerially application methods are a concern to certain resource users, wildlife professionals, and members of the public. Broadcast applications can also occur later in the stand as a release treatment from hardwoods that have overgrown the planted conifer, however, this is rarely used.

Directed Spray

Directed spray (spot spray) applications are made with a backpack and target individual plants. This treatment is often used to remove invasive species, such as Scotch broom, from young stands.

Hack N Squirt

Hack and squirt (basal or stem-injection) is typically applied as way to release conifers from hardwood competition. This method selects certain species, such as red alder, bigleaf maple, madrone, myrtle, tanoak and chinquapin for treatment.

Animal Damage Control

Animal damage on newly planted seedlings reduces their overall size, health, and vigor. Extensive damage can lead to interplanting, extend the time to achieve free to grow, potentially violating the Forest Practice Act. Animal damage occurs in many forms, but the most common is from ungulates (deer and elk) and mountain beaver.

Ungulates

Ungulate browse ranges from minor to severe. Minor browse damage usually has little impact to growth and survival. Repeated severe browse damage to seedlings, sometimes seen with western redcedar, can have major impacts on growth and occasionally lead to mortality. Control measures include Vexar tubing to protect from browse and controled hunts.

Mountain Beaver

Mountain beavers clip the seedling at its base, causing mortality. As the seedling ages, the diameter becomes too large and the animal climbs the stem and clips branches. Mountain beaver browse will occur in most stands in the norther part of the planning area with little damage in the southern part. Trapping is used to reduce damage from mountain beavers.

From HCP Chapter 4

Table 4-3. Minimum Buffer Widths (Horizontal Distance) for All Type F and Large and Medium Type N

Stream Type	Minimum Management Area Width (feet)	
	Type F	Type N
Large	120	120
Medium	120	120
Small	120	See Table 4-4
Seasonal[a]	120	See Table 4-4

[a] Seasonal: A stream that does not have surface flow after July 15.

Table 4-4. Minimum Riparian Conservation Area Widths (Horizontal Distance) for Small Perennial and Seasonal Type N Streams

Stream Type	Minimum Management Area Width (feet)	
	Within 500-foot Temperature Zone	Upstream of 500-foot Temperature Zone
Perennial small Type N	120	35
Potential debris flow track (Seasonal Type N)[a]	50	35
High energy (Seasonal Type N)[b]	50	35
Seasonal other (Type N)[c]	0[d]	0 [d]

Notes:
[a] Potential debris flow tracks: Reaches on seasonal Type N streams that have a high potential of delivering wood to a Type F stream.
[b] High Energy: Reaches on seasonal Type N streams that have a high potential of delivering wood and sediment to a Type F stream during a high-flow event.
[c] Seasonal: A stream that does not have surface flow after July 15.
[d] A 35-foot equipment restriction zone will apply to these streams.