

A photograph of a dense forest with a stream. The stream flows through the center-left of the image, surrounded by lush green vegetation and tall, thin trees. The water is clear and reflects the surrounding greenery. The trees are mostly deciduous with some evergreens. The overall scene is bright and vibrant, suggesting a healthy, well-maintained riparian area.

Designing & Implementing Riparian Thinning

**Dave Christiansen
Olympic Region**

Class Objectives

List the objectives for the riparian thinning scenarios

Identify sideboards in the RFRS

Describe the general process to show how riparian thinning will accelerate meeting the RDFC

Name 3 considerations that separate riparian and upland thinning

Identify 4 situations where riparian thinning incurs risk



Conifer Prescription Category

Type II Thinning with Upland Thinning

Stands in pole exclusion stage, conifer BA >50%.

Generally;

Age <40 years

QMD \cong 10 inches (trees >3.5 DBH)

Adjacent uplands managed similarly

RD >45

Exclusively 2nd or 3rd growth stands with little diversity

Type III Thinning with Upland Thinning

Stands in large tree exclusion stage, conifer BA >50%.

Generally:

Age >40

QMD >10 inches (trees >3.5 DBH)

Adjacent uplands managed with a range of tools;

Thinning, partial cuts, single tree removals

For a variety of objectives;

Provide habitat, lengthen rotation age

Balance age class distribution in a landscape

Protect unstable areas, or meet hydrological maturity goals

Type III Thinning with Regeneration Harvest

Stands in large tree exclusion or later stage, conifer BA >50%.

Generally:

Age >40

QMD >10 inches (trees >3.5 DBH)

Adjacent uplands will be removed,

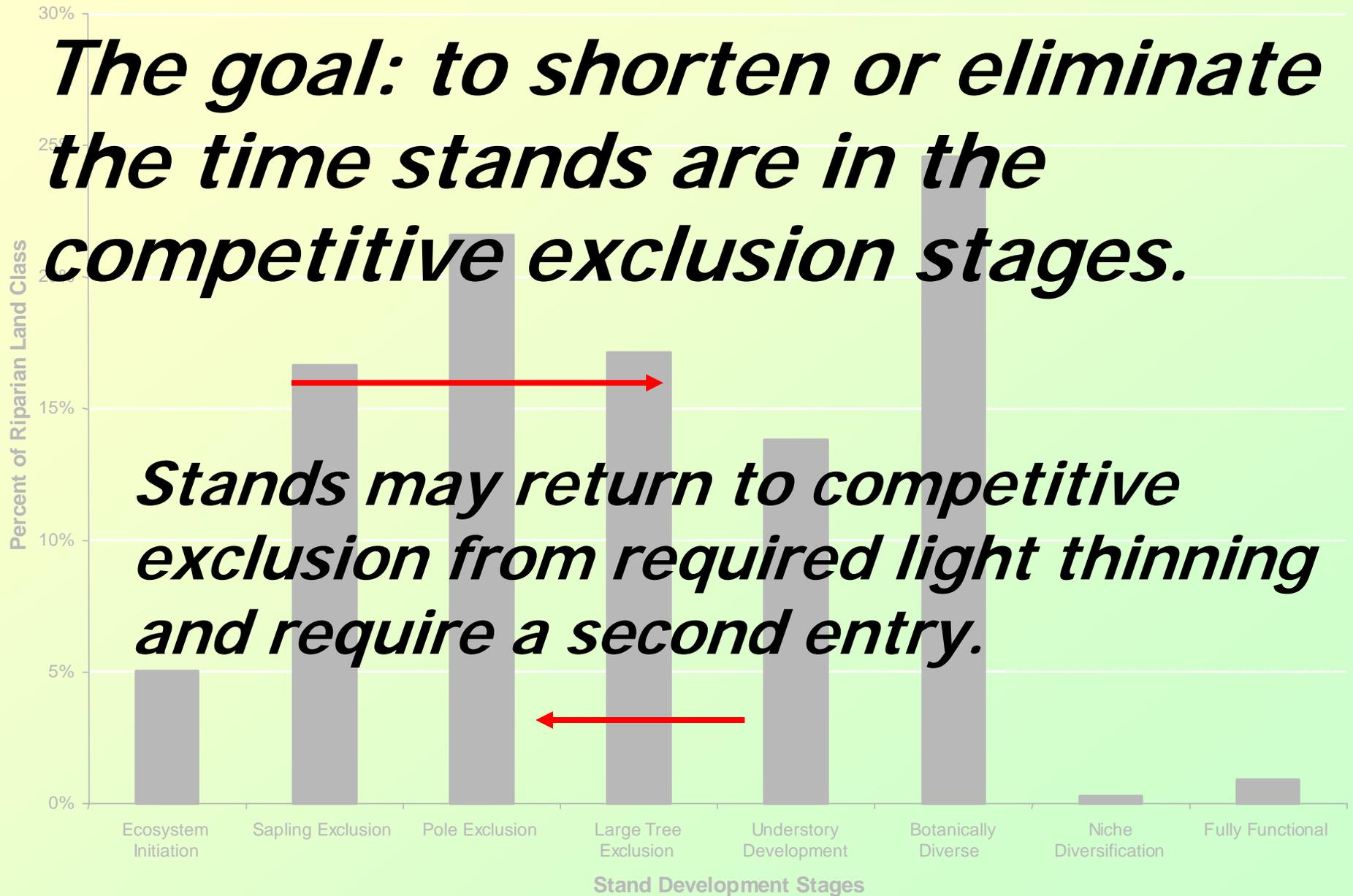
Riparian area exposed to elements, IE: wind

RMZ may be more structurally diverse but lacking;
multiple canopies, large live decadent trees,
large down wood, or snags.



Conservation Objectives

The goal: to shorten or eliminate the time stands are in the competitive exclusion stages.





56% of riparian stands are in a competitive exclusion stage

Type II Thinning with Upland Thinning

High Priority

Accelerate individual tree growth, vigor and stability

Promote species diversity with priority on retaining a component of shade tolerant tree species

Promote future heterogeneity in stand structure.

Create dead down wood to enhance riparian habitat

Type III Thinning with Upland Thinning

Second Highest Priority

Accelerate individual tree growth, maintain vigor, and stability

Promote tree species diversity and protect structural components

Promote heterogeneity in stand structure

Protect snags, down wood, remnant trees and advanced regen

Retain site adapted shade tolerant species for vertical canopy development

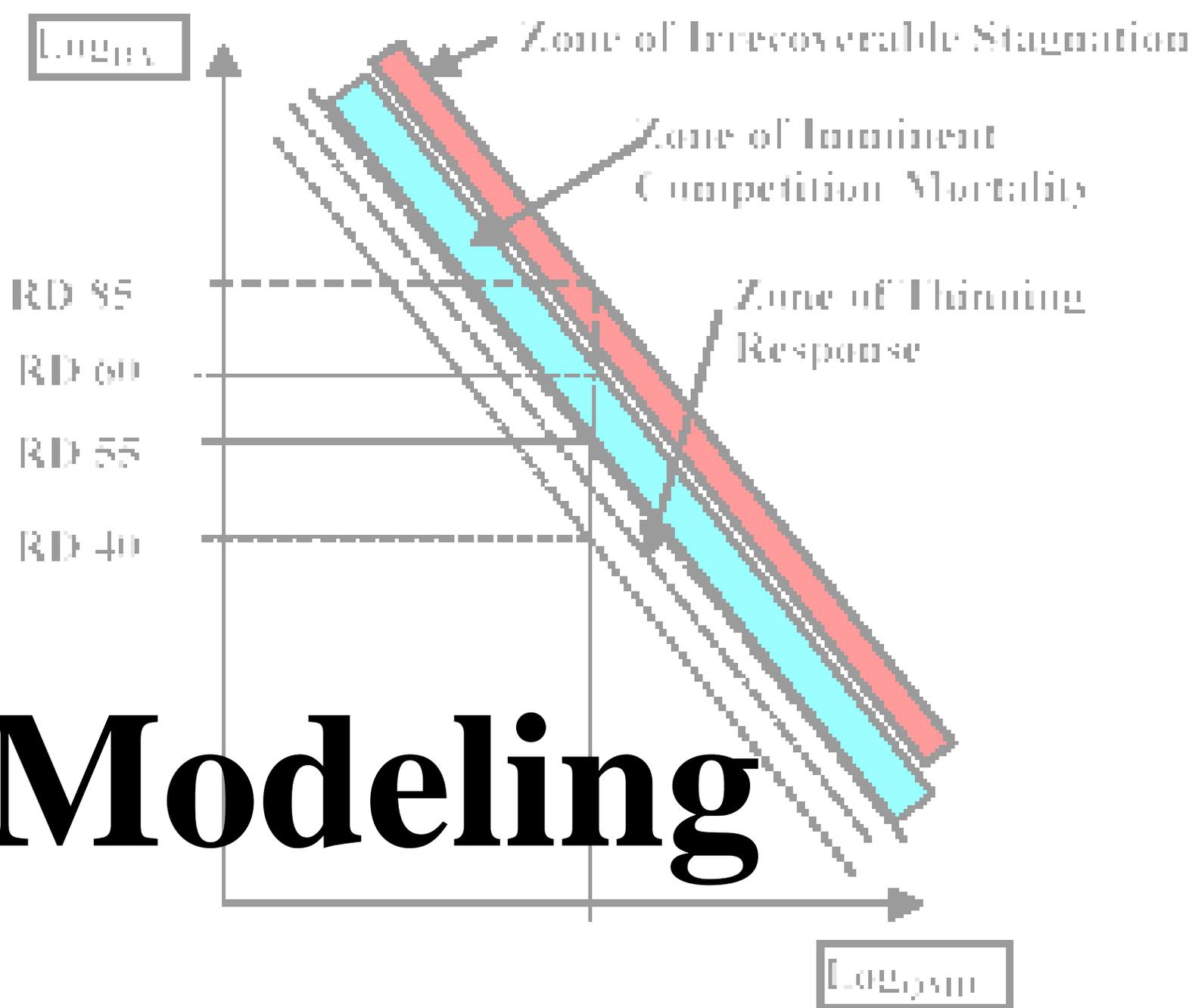
Maintain vigorous trees to minimize windthrow when adjacent uplands are regen harvested in the future

Create dead down wood to enhance riparian habitat

Type III Thinning with Regeneration Harvest Medium Priority

Same as above

Protection of the stand from excessive windthrow
on Type 1&2 water and Type 3's >5 feet wide.



Modeling

Riparian Desired Future Condition

RDFC Characteristics	RDFC Threshold Targets (Discrete Measurables)
Basal area	≥ 300 sq ft per acre
Quadratic mean diameter (Trees >7 inches DBH)	≥ 21 inches
Snags	Retain existing snags ≥ 20” DBH through no-cut zones Maintain at least 3 snags per acre.
Large down wood	Maintain ≥ 2,400 cubic feet/ac Actively create down wood (contribute 5 trees from the largest thinned DBH class) during each conifer management entry
Vertical stand structure	Maintain at least two canopy layers (bimodal or developing reverse J-shaped diameter distribution)
Species diversity	Maintain at least two main canopy tree species suited to the site

Stand Assessments

Visual inspections

Tree height, % Live crown, H/D ratios, RD, Habitat(s), Snags, LWD / CWD and shade

Existing Data

FRIS, watershed analysis

Plots

Forester -vs- cruiser

Blowdown potential

Local wind pattern, Soils

Access

DNRIMPS

Stand table model

Age dependant

Not supported beyond age 60

Inherently under predicts DIA beyond age 60

FVS - <http://www.fs.fed.us/fmfc/fvs/>

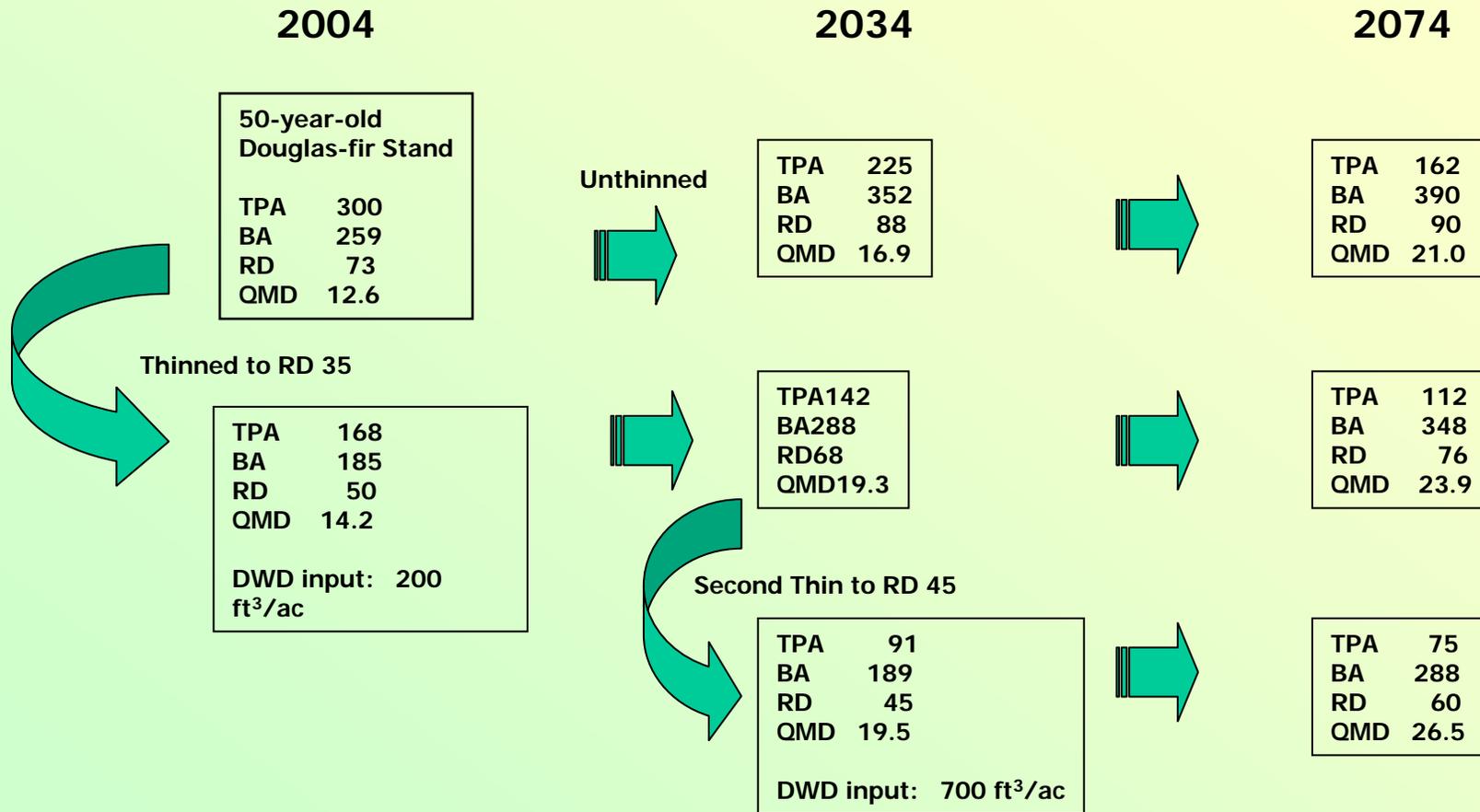
Organon - <http://www.cof.orst.edu/cof/fr/research/organon/>

Are individual tree growth models

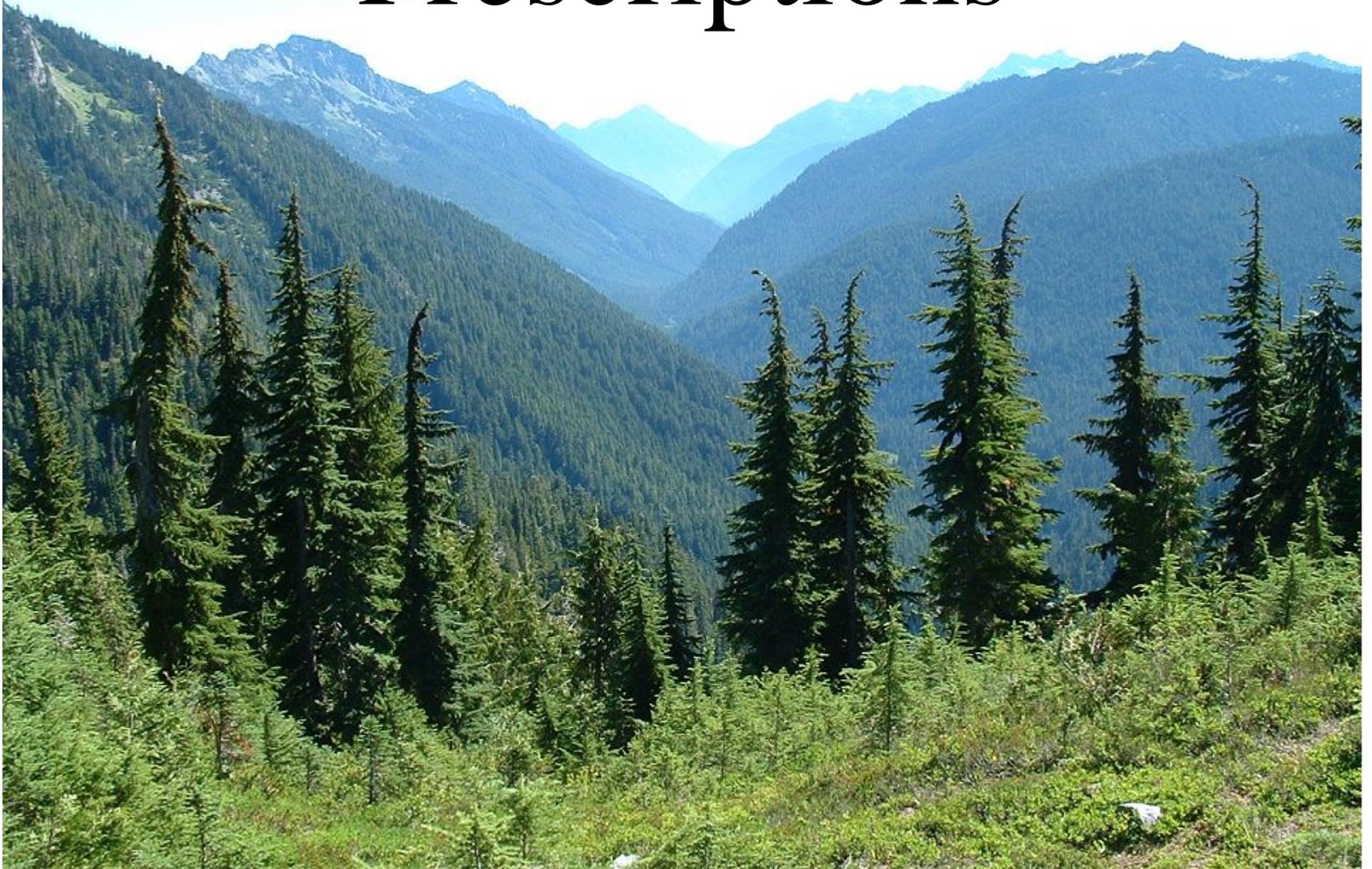
Grow trees based on crown ratios,
diameter, and social position

Need files to limit growth for local conditions

Management Scenario



Prescriptions



DNR's riparian restoration activities will focus on;

Growing large conifer trees

Enhancing stand structural complexity

Attaining a site-adapted species composition dominated by conifers

Providing DWD and LWD

Creating snags

Required Pre-existing Conditions

Commercial product removals only after down wood targets are met.

Residual trees exhibit live crown ratios $>35\%$

Height to diameter ratios are $<90\%$

Minimum Management Parameters Inner Zone

No timber removal.

Restoration limited to wood placement,
under-planting, release of suppressed conifer,
LWD creation and noxious weed control.

Minimum Management Parameters

Middle Zone

RD > 35 (30 with riparian designee approval) or at least 100 (75 in Type III thinnings) dominant and co-dominant tpa, whichever results in the greater number of residual trees

d/D – ratio < 1.0 for first 75 feet for shade retention

d/D – ratio ≤ 1.0

Maintenance of species diversity (including hardwoods)

Designate 5 conifer trees per thinned RMZ acre for DWD from the largest diameter class(s) of the thinned trees for riparian habitat enhancement.

Middle Zone cont.

In Type II thinnings (i.e. ≤ 40 years) fall all 5 trees to be left as DWD and LWD.

In Type III thinnings consider topping 1 to 2 of the 5 designated trees above 20' or girdling for snag creation if the stand is snag deficient.

The trees to be felled as down wood shall be chosen from within 25 feet of the riparian forest management unit (FMU) Boundary adjacent to the inner zone; and shall be felled towards the stream where feasible.

Minimum Management Parameters Outer Zone and Wind Buffer

Outer zone to be managed the same as the middle zone

Wind buffers will be treated the same as the middle and outer zone.

Wind Buffers

Required in areas with moderate to high windthrow risk for Type III thinning adjacent to upland regen

Moderate windthrow risk areas are where adjacent regen harvest can channel winds into the riparian zone

High risk areas are exposed to winter storm winds

Have high water tables with restricted rooting or soil cohesion

Have high height-to-diameter ratios, and/or have low live crown ratios.

Buffer Sideboards

Post RD $>60\%$ of pre RD

RD >40 , or 75 TPA which ever is greater

50 feet wide for Type 3's > 5 feet wide

100 feet wide for Type 1&2

Receive the same treatment as middle and outer zone

Targets

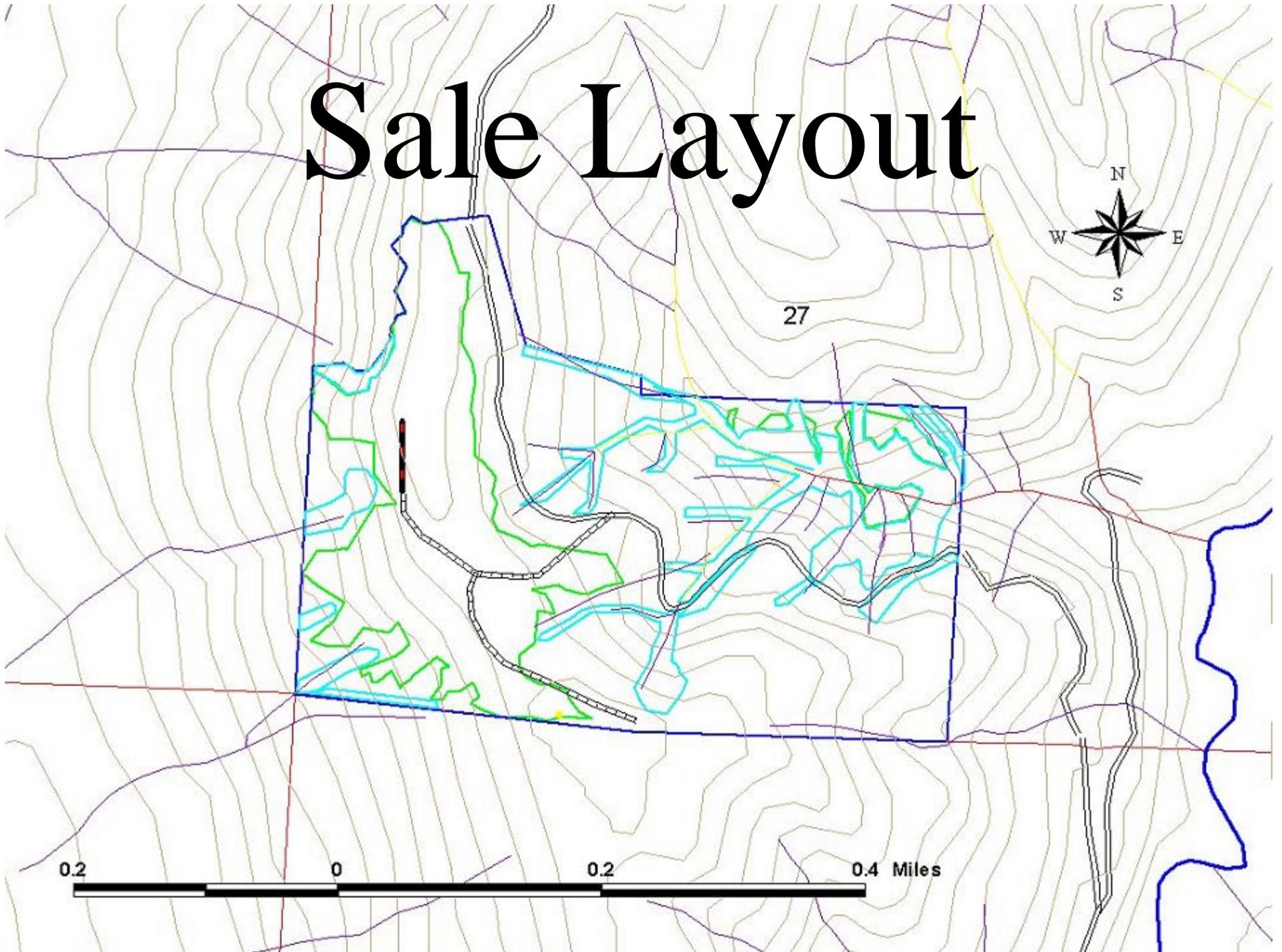
RD, TPA, QMD, BA

Diameter limits

Down wood;

5 trees/riparian acre selected from the
largest trees being cut, pole sales leave 1 down
tree/15 poles removed

Sale Layout



Recon

Identify the operable shape

Model the scenario

- Compare to a no thinning alternative

- Choose alternative best suited to meet the RFDC

Separate upland and riparian FMU's by objective for P&T reporting

Skid trails

Yarding corridors

Temporary crossings and fills

LWD / CWD placement

Full suspension – with and without lift

















Type II Thinning with Upland Thinning

Uplands may be managed similarly

Mark the exterior boundary of the inner zone (25')

Mark down wood contribution / direction (middle zone)

Prescribe other target or operation changes in middle and outer zones

May need to mark stream crossing

Type III Thinning with Upland Thinning

Same as previous slide

Mark mosaic of skips and gaps if stand structure warrants

Skips can protect snags, down wood accumulations, type 5 streams, wetlands, and regen

Gaps to be located >75 feet from the exterior of the inner zone

Type III Thinning with Regeneration Harvest

Same as previous except uplands managed differently

Evaluate windthrow risk

Mark exterior boundary of the outer zone or wind buffer



Operations

COMMUNICATE

RX

Cutters

Rigging Crew

Compliance



BASAL AREA	TREES PER ACRE																								
	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250				
50	13.5	12.4	11.4	10.7	10.1	9.6	9.1	8.7	8.4	8.1	7.8	7.6	7.3	7.1	6.9	6.8	6.6	6.5	6.3	6.2	6.1				
60	14.8	13.5	12.5	11.7	11.1	10.5	10.0	9.6	9.2	8.9	8.6	8.3	8.0	7.8	7.6	7.4	7.2	7.1	6.9	6.8	6.6				
70	16.0	14.6	13.5	12.7	11.9	11.3	10.8	10.3	9.9	9.6	9.2	9.0	8.7	8.4	8.2	8.0	7.8	7.6	7.5	7.3	7.2				
80	17.1	15.6	14.5	13.5	12.8	12.1	11.5	11.1	10.6	10.2	9.9	9.6	9.3	9.0	8.8	8.6	8.4	8.2	8.0	7.8	7.7				
90	18.2	16.6	15.4	14.4	13.5	12.8	12.2	11.7	11.3	10.9	10.5	10.2	9.9	9.6	9.3	9.1	8.9	8.7	8.5	8.3	8.1				
100	19.1	17.5	16.2	15.1	14.3	13.5	12.9	12.4	11.9	11.4	11.1	10.7	10.4	10.1	9.8	9.6	9.3	9.1	8.9	8.7	8.6				
110	20.1	18.3	17.0	15.9	15.0	14.2	13.5	13.0	12.5	12.0	11.6	11.2	10.9	10.6	10.3	10.0	9.8	9.6	9.4	9.2	9.0				
120	21.0	19.1	17.7	16.6	15.6	14.8	14.1	13.5	13.0	12.5	12.1	11.7	11.4	11.1	10.8	10.5	10.2	10.0	9.8	9.6	9.4				
130	21.8	19.9	18.5	17.3	16.3	15.4	14.7	14.1	13.5	13.0	12.6	12.2	11.8	11.5	11.2	10.9	10.7	10.4	10.2	10.0	9.8				
140	22.7	20.7	19.1	17.9	16.9	16.0	15.3	14.6	14.1	13.5	13.1	12.7	12.3	11.9	11.6	11.3	11.1	10.8	10.6	10.3	10.1				
150	23.5	21.4	19.8	18.5	17.5	16.6	15.8	15.1	14.5	14.0	13.5	13.1	12.7	12.4	12.0	11.7	11.4	11.2	10.9	10.7	10.5				
160	24.2	22.1	20.5	19.1	18.1	17.1	16.3	15.6	15.0	14.5	14.0	13.5	13.1	12.8	12.4	12.1	11.8	11.5	11.3	11.1	10.8				
170	25.0	22.8	21.1	19.7	18.6	17.7	16.8	16.1	15.5	14.9	14.4	14.0	13.5	13.2	12.8	12.5	12.2	11.9	11.6	11.4	11.2				
180	25.7	23.5	21.7	20.3	19.1	18.2	17.3	16.6	15.9	15.4	14.8	14.4	13.9	13.5	13.2	12.8	12.5	12.2	12.0	11.7	11.5				
190	26.4	24.1	22.3	20.9	19.7	18.7	17.8	17.0	16.4	15.8	15.2	14.8	14.3	13.9	13.5	13.2	12.9	12.6	12.3	12.0	11.8				
200	27.1	24.7	22.9	21.4	20.2	19.1	18.3	17.5	16.8	16.2	15.6	15.1	14.7	14.3	13.9	13.5	13.2	12.9	12.6	12.4	12.1				
210	27.7	25.3	23.5	21.9	20.7	19.6	18.7	17.9	17.2	16.6	16.0	15.5	15.0	14.6	14.2	13.9	13.5	13.2	12.9	12.7	12.4				
220	28.4	25.9	24.0	22.5	21.2	20.1	19.1	18.3	17.6	17.0	16.4	15.9	15.4	15.0	14.6	14.2	13.9	13.5	13.2	13.0	12.7				
230	29.0	26.5	24.5	23.0	21.6	20.5	19.6	18.7	18.0	17.4	16.8	16.2	15.7	15.3	14.9	14.5	14.2	13.8	13.5	13.3	13.0				
240	29.7	27.1	25.1	23.5	22.1	21.0	20.0	19.1	18.4	17.7	17.1	16.6	16.1	15.6	15.2	14.8	14.5	14.1	13.8	13.5	13.3				
250	30.3	27.6	25.6	23.9	22.6	21.4	20.4	19.5	18.8	18.1	17.5	16.9	16.4	16.0	15.5	15.1	14.8	14.4	14.1	13.8	13.5				

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50	14	14	15	15	16	16	17	17	17	18	18	18	19	19	19	19	19	20	20	20	20				
60	16	16	17	18	18	19	19	19	20	20	21	21	21	21	22	22	22	23	23	23	23				
70	18	18	19	20	20	21	21	22	22	23	23	23	24	24	24	25	25	25	26	26	26				
80	19	20	21	22	22	23	24	24	25	25	26	26	27	27	27	28	28	28	29	29	29				
90	21	22	23	24	24	25	26	26	27	27	28	28	29	29	30	30	31	31	31	31	32				
100	23	24	25	26	26	27	28	28	29	30	30	31	31	31	32	32	33	33	34	34	34				
110	25	26	27	28	28	29	30	31	31	32	32	33	33	34	34	35	35	36	36	36	37				
120	26	27	29	29	30	31	32	33	33	34	34	35	36	36	37	37	38	38	38	39	39				
130	28	29	30	31	32	33	34	35	35	36	37	37	38	38	39	39	40	40	41	41	42				
140	29	31	32	33	34	35	36	37	37	38	39	39	40	41	41	42	42	43	43	44	44				
150	31	32	34	35	36	37	38	39	39	40	41	41	42	43	43	44	44	45	45	46	46				
160	33	34	35	37	38	39	40	41	41	42	43	44	44	45	45	46	47	47	48	48	49				
170	34	36	37	38	39	40	41	42	43	44	45	45	46	47	48	48	49	49	50	50	51				
180	36	37	39	40	41	42	43	44	45	46	47	47	48	49	50	50	51	52	52	53	53				
190	37	39	40	42	43	44	45	46	47	48	49	49	50	51	52	52	53	54	54	55	55				
200	38	40	42	43	44	46	47	48	49	50	51	51	52	53	54	54	55	56	56	57	57				
210	40	42	43	45	46	47	49	50	51	52	53	53	54	55	56	56	57	58	58	59	60				
220	41	43	45	46	48	49	50	51	52	53	54	55	56	57	58	58	59	60	61	61	62				
230	43	45	46	48	49	51	52	53	54	55	56	57	58	59	60	60	61	62	63	63	64				
240	44	46	48	50	51	52	54	55	56	57	58	59	60	61	62	62	63	64	65	65	66				
250	45	48	49	51	53	54	55	57	58	59	60	61	62	63	64	64	65	66	67	67	68				



Risk

Younger stand RMZ thinning with upland thinning

Low level of risk, stands are dynamic and respond to thinning quickly

Older RMZ thinning with upland thinning

Low to moderate level of risk, older stands respond to thinning; windthrow potential is low due to upland forests protecting the RMZ

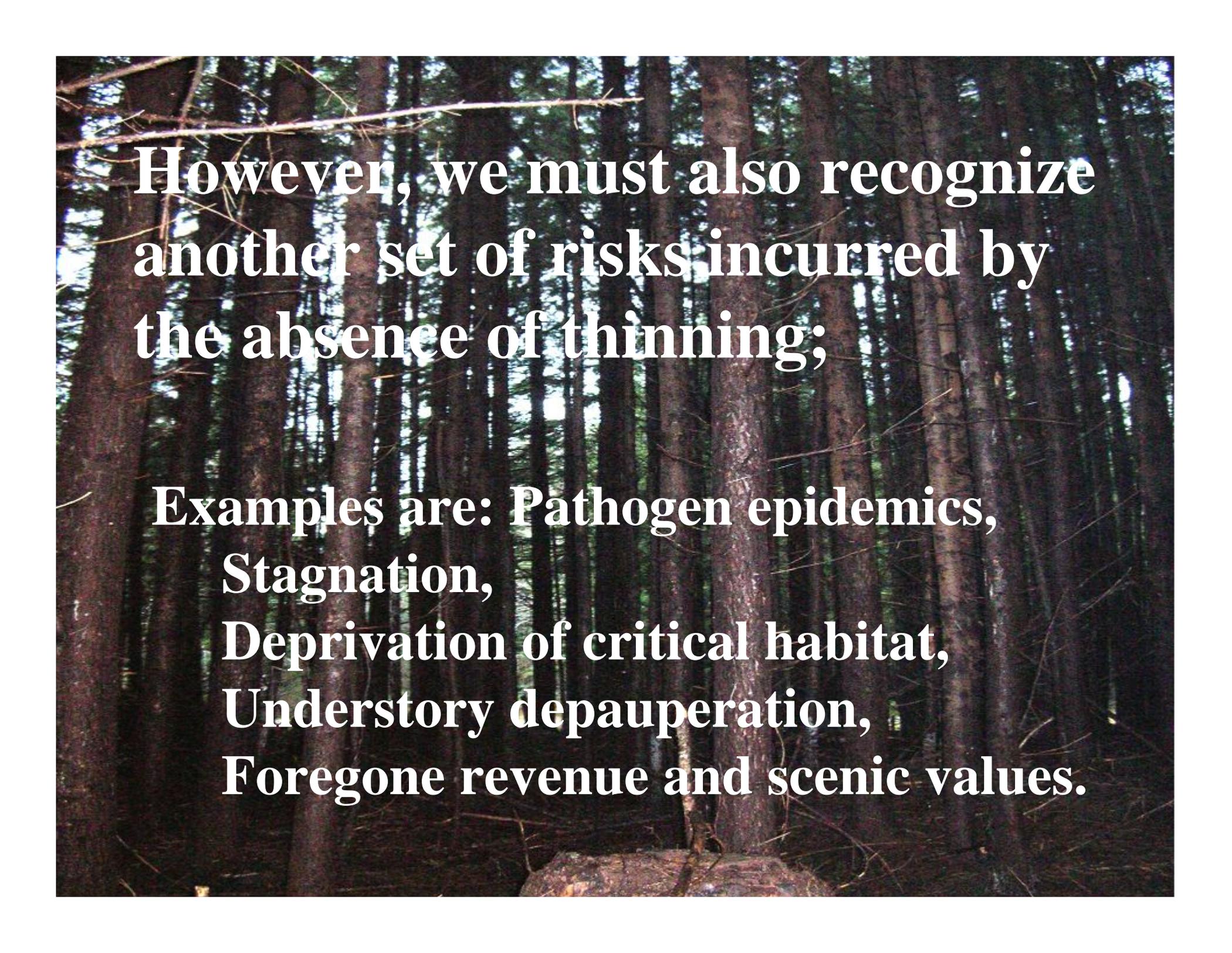
Older RMZ thinning with regeneration harvest

Higher than previous two, uncertainty from variability in windthrow

Most westside thinnings that remove >40% of the pre-thinning RD induce additional risk of blow-down, snow-breakage, and/or wind shear.

Elevated risk of annosum root rot (*Heterobasidion annosum*) is induced when western hemlock and/or Pacific silver fir stumps are cut shorter than 12 inches.

Thinnings that alter stand composition from mixed to single species induce elevated risk of epidemic insects and disease outbreaks. (Conversely, thinnings that promote mixed stands reduce the risk of epidemics.)



However, we must also recognize another set of risks incurred by the absence of thinning;

**Examples are: Pathogen epidemics,
Stagnation,
Deprivation of critical habitat,
Understory depauperation,
Foregone revenue and scenic values.**

Operators can also induce risk by poor performance;

risk is considered low due to the sensitivity of the operation and need for compliance.

Review Objectives

List the objectives for the riparian thinning scenarios

Identify sideboards in the RFRS

Describe the general process to show how riparian thinning will accelerate meeting the RDFC

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