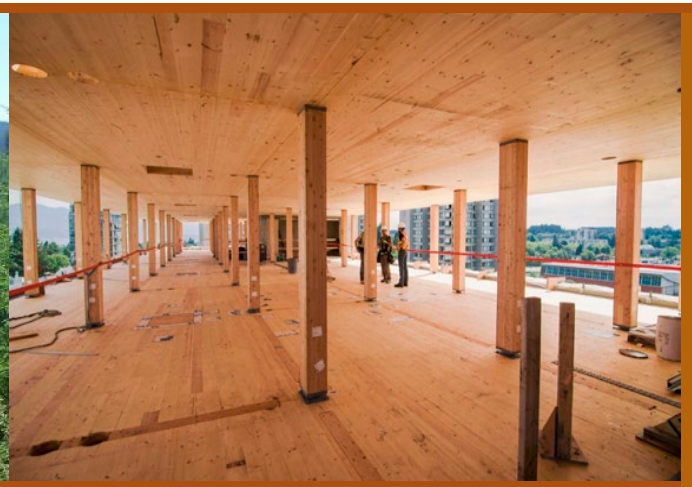
Carbon and Forest Management Work Group

Scenario Voting





Meeting 5
March 13, 2024, 9 a.m. – 3 p.m.

At Today's Meeting

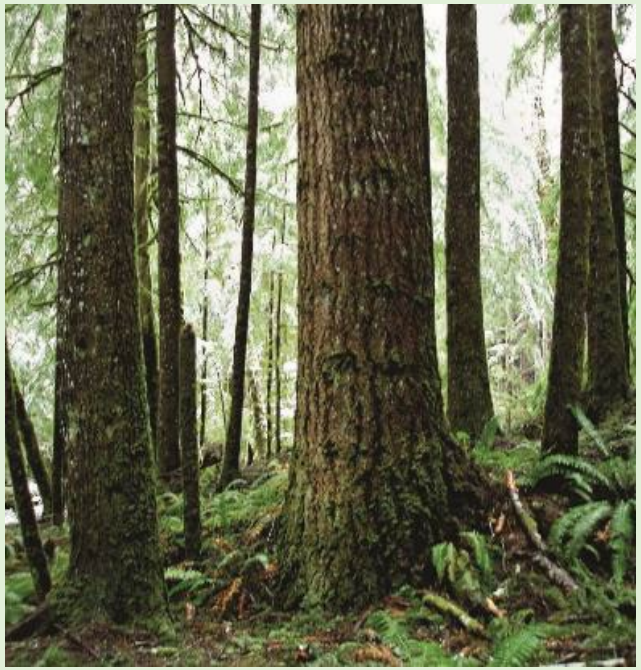
- Work group will vote on a **subset** of the scenarios discussed in the February 14 meeting. These scenarios are developed enough for a vote. This is a **FORMAL VOTE**
- **Additional scenarios (those discussed in previous meetings) will be discussed and voted on** during the April 13 work group meeting
- **Today's goal:** Provide a preliminary set of scenarios to ESSA to begin the model configurations.

Background Information



Timber Volume Vs. Rotation Age

Trees grow differently based on the productivity of the soil, the climate, and other factors.

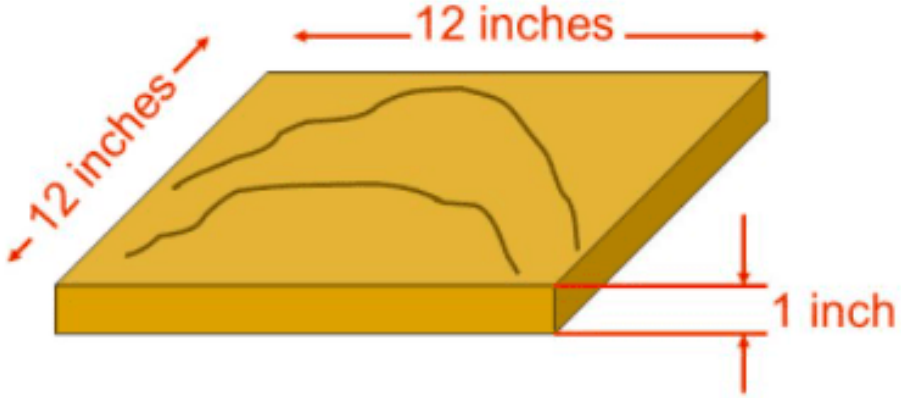


Productive site
80 years old

Poor site
400 years old

Timber Volume Vs. Rotation Age

For that reason, DNR harvest forests when they achieve a certain **timber volume per acre**, not when they reach a certain **age**.



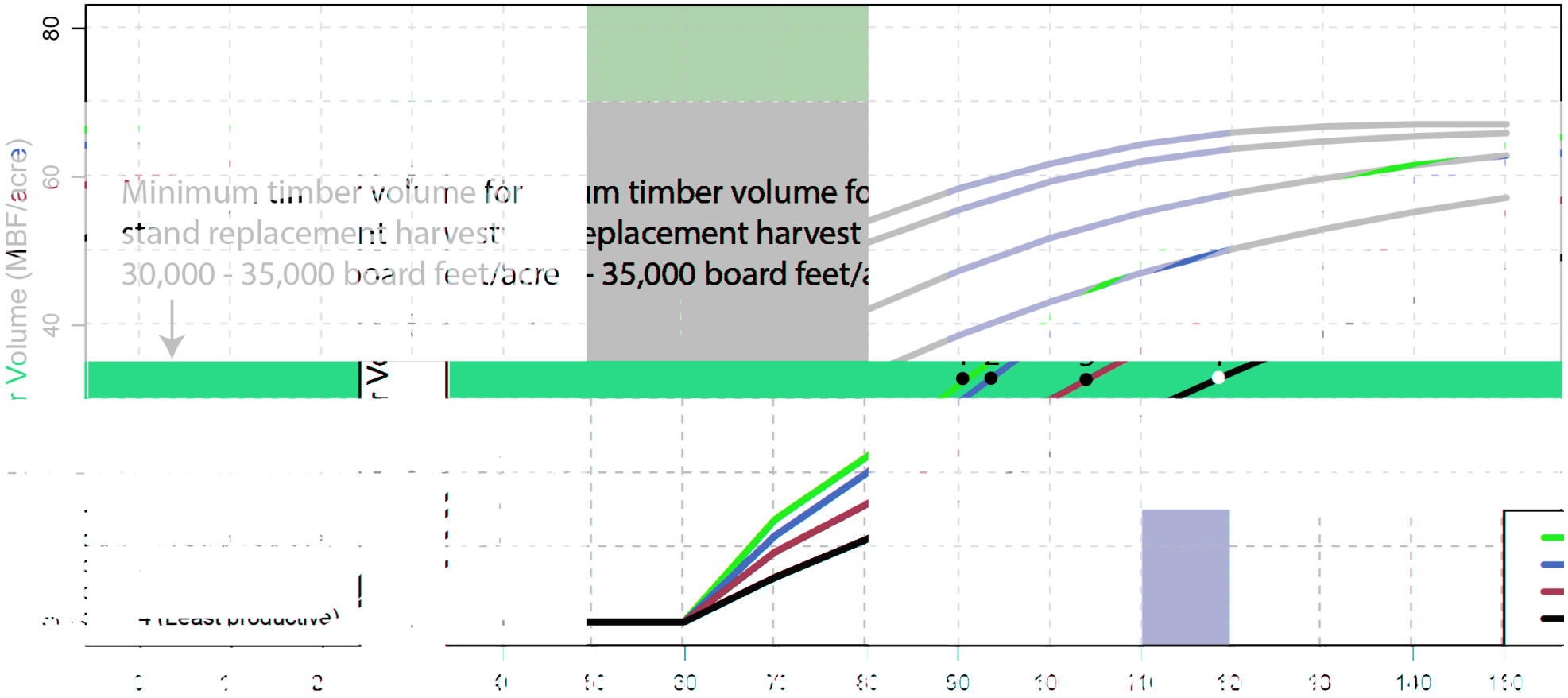
Board foot

Timber Volume Vs. Rotation Age

- All scenarios will use timber volume/acre instead of age to indicate rotation length
  - **Lengthen rotation**: *Increase* minimum timber volume per acre at which a stand can be harvested (takes longer for a stand to reach this volume).
  - **Shorten rotation**: *Reduce* minimum timber volume per acre at which a stand can be harvested (takes less time for a stand to reach this volume).
- Rotation length will vary according to site class.



Douglas Fir Sample Yield Curve (DNR Current Operations)



Rotation Length

- Site class 1: ~50 yrs.
- Site class 2: ~55 yrs.
- Site class 3: ~65 yrs.
- Site class 4: ~78 yrs.

Harvest Considerations

- Minimum timber volume indicate when a stand is *available* for harvest, not when it *will be* harvested.
- Every site is different. Must consider numerous other factors, such as harvest methods and costs, access, projected revenue, acres in the stand, and environmental concerns that affect total available timber volume.

Stand Replacement Harvest

- Done primarily in general ecological management (GEM) areas.
- Harvested stands are replanted.
- Primary harvest type is variable retention harvest:
  - Minimum 8 leave trees per acre, and
  - Irregular harvest opening due to retention of trees near wetlands, riparian areas, cultural resources, and other features.
- Within timber sale boundaries, average net removals are 90%, but actual removals can vary widely because 8 leave trees per acre is a minimum, not a maximum amount.

Variable Retention Harvest Examples

Commercial Thinning

- Removals average 30 percent but **can vary widely** from one stand to another. Thinned areas are NOT replanted.
- In uplands, most common thinning type is variable density:
  - Some areas thinned more heavily than others, and
  - May create gaps in canopy to enhance stand structure.

Commercial Thinning

- Done when trees are merchantable (suitable in size and quality for production of forest products).
- Minimum timber volume for thinning in all scenarios ~18,000-20,000 board feet/acre.



Let's Get Started

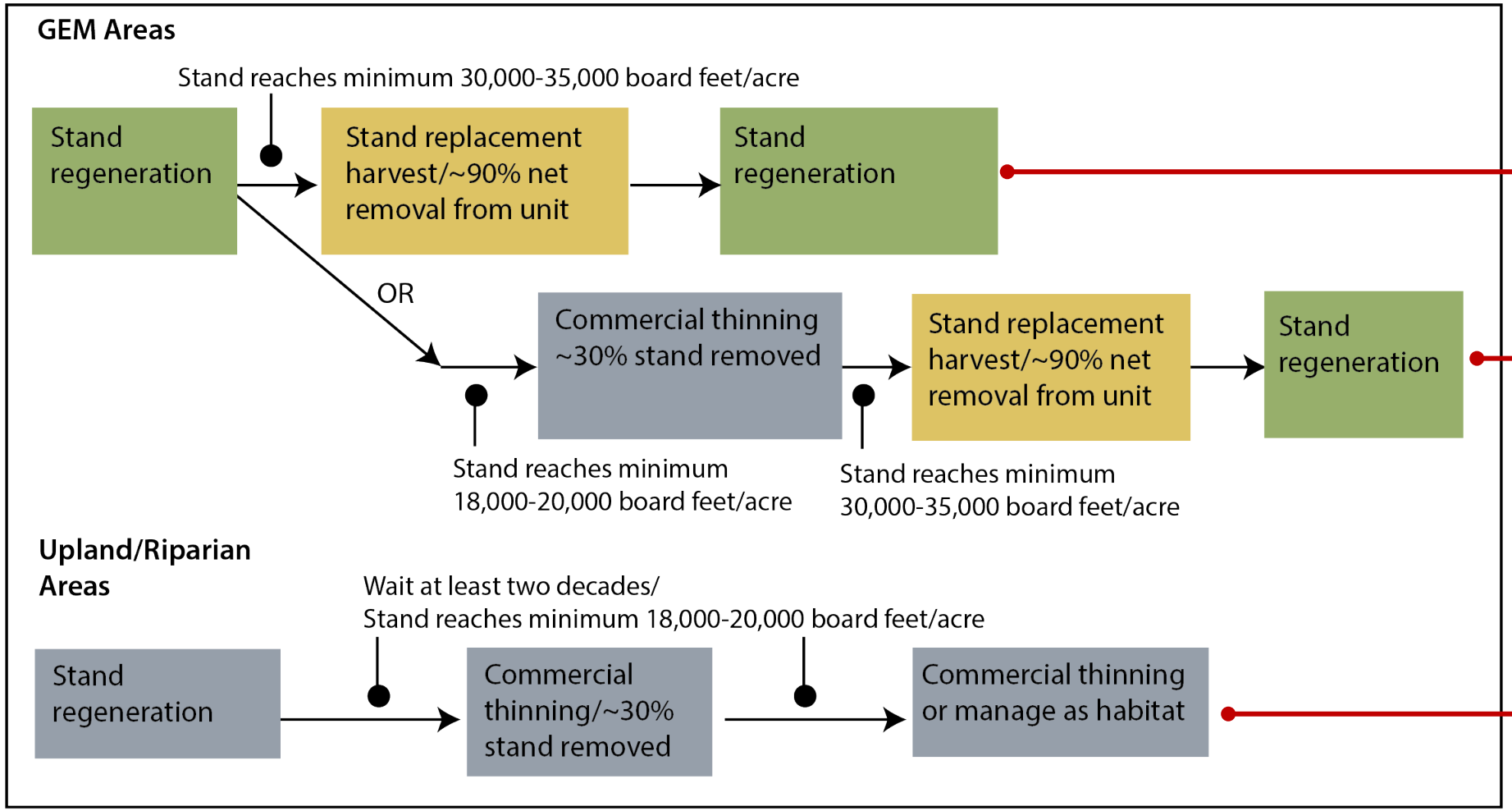
Number of Scenarios

- Total number of scenarios available for ESSA, **including** climate variations: **16.**
- Climate vote to be held after vote on DNR Current Operations Scenario (Scenario 1).

Scenario 1: DNR Current Operations

- Stand replacement harvest (GEM areas): Minimum timber volume approximately **30,000-35,000 board feet/acre**; rotation length **50-80 years** depending on site class.
- Thinning in GEM areas happens rarely as part of a harvest rotation; thinning in upland or riparian areas typically done for ecological objectives.
- Current sustainable harvest level 465 million board feet per year in Western Washington (2015-2024 planning decade).

Scenario 1: DNR Current Operations



Mistake on drawing corrected since 3/13 meeting

Scenario 1: DNR Current Operations

- **How much thinning**? In fiscal years 2014 through 2023 in **western Washington**, DNR completed:
  - Roughly 73,700 acres of pre-commercial thinning, and
  - Roughly 18,700 acres of commercial thinning.
- **Additional young stand management**: Chemical site preparation, chemical or manual conifer release (using hand cutting or herbicide to remove competing plants or treat noxious weeds).



Scenario 1: DNR Current Operations

- Planting density: Roughly 300-400 seedlings per acre (conifer).
- Species diversity 2022 snapshot:
  - 78% Douglas fir, 11% hemlock,5% western redcedar, and
  - 28% one species, 72% two or more species.
- Natural infill further diversifies stand.

Formal Vote on Scenario 1: DNR Current Operations

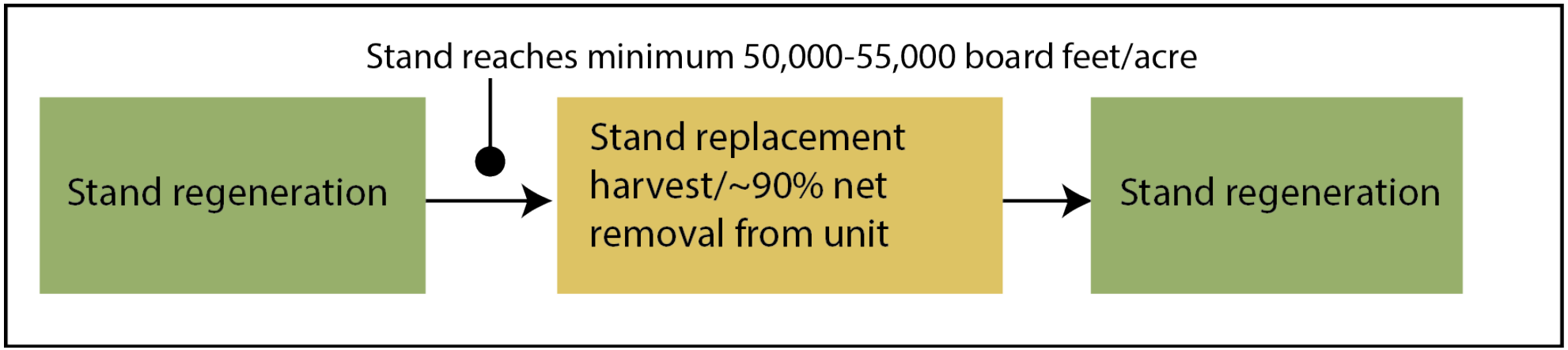


Representative Concentration Pathways (RCPs): ESSA *and* Climate Vote

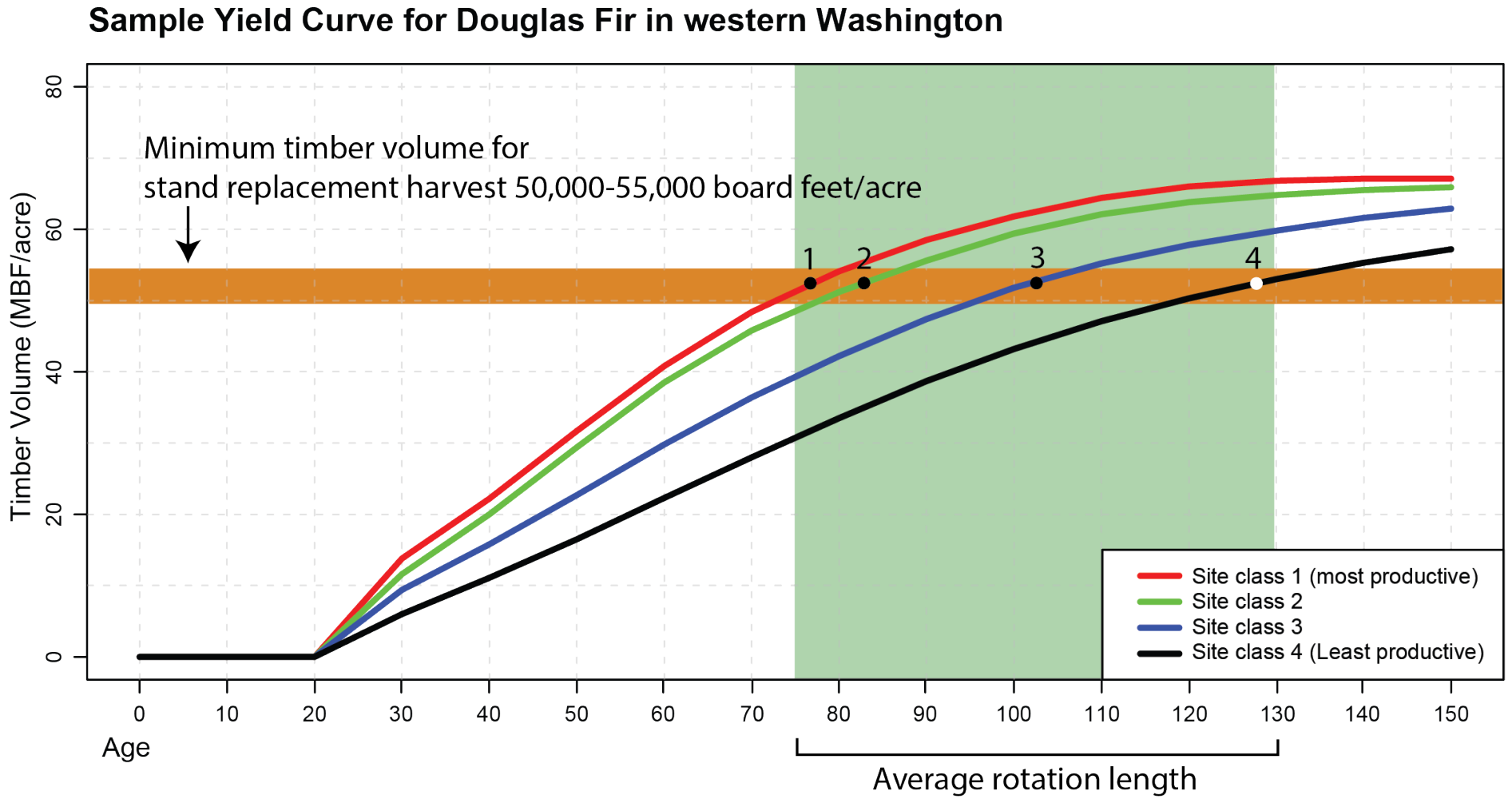


Scenario 2: Lengthen Harvest Rotation

- **Dial turned:** Harvest rotation length.
- Scenario specific to stand replacement harvest in **GEM areas only.**
- Minimum timber volume: 50,000-55,000 board feet/acre; translates to rotation length of ~**75-130 years** depending on site class.



Scenario 2: Lengthen Harvest Rotation

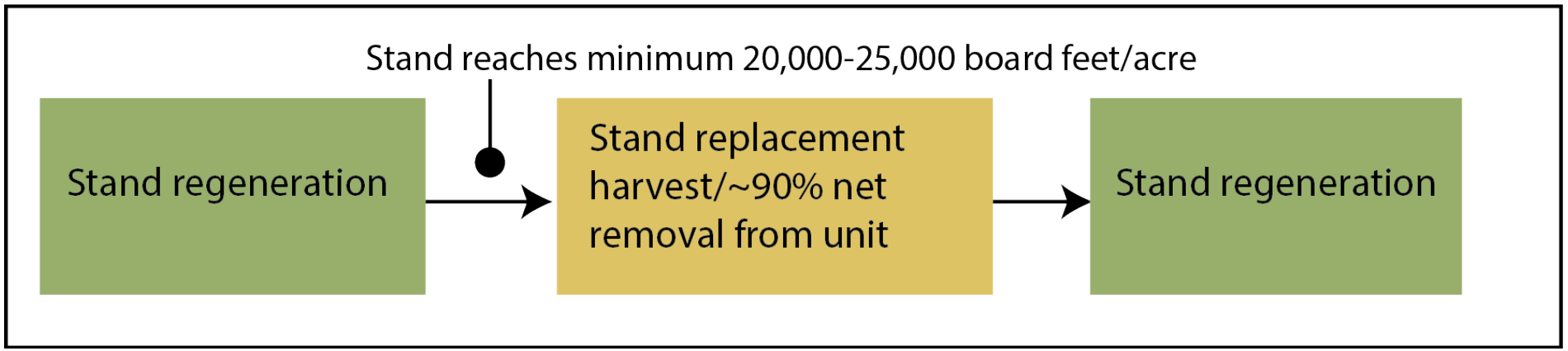


Rotation length
~75-130 years

Current operations rotation length 50-80 years

Scenario 3: Shorten Harvest Rotation

- **Dial turned:** Harvest rotation length.
- Scenario specific to stand replacement harvest in **GEM areas only.**
- Minimum timber volume: 20,000-25,000 board feet/acre; translates to rotation length of ~**40-60 years** depending on site class.



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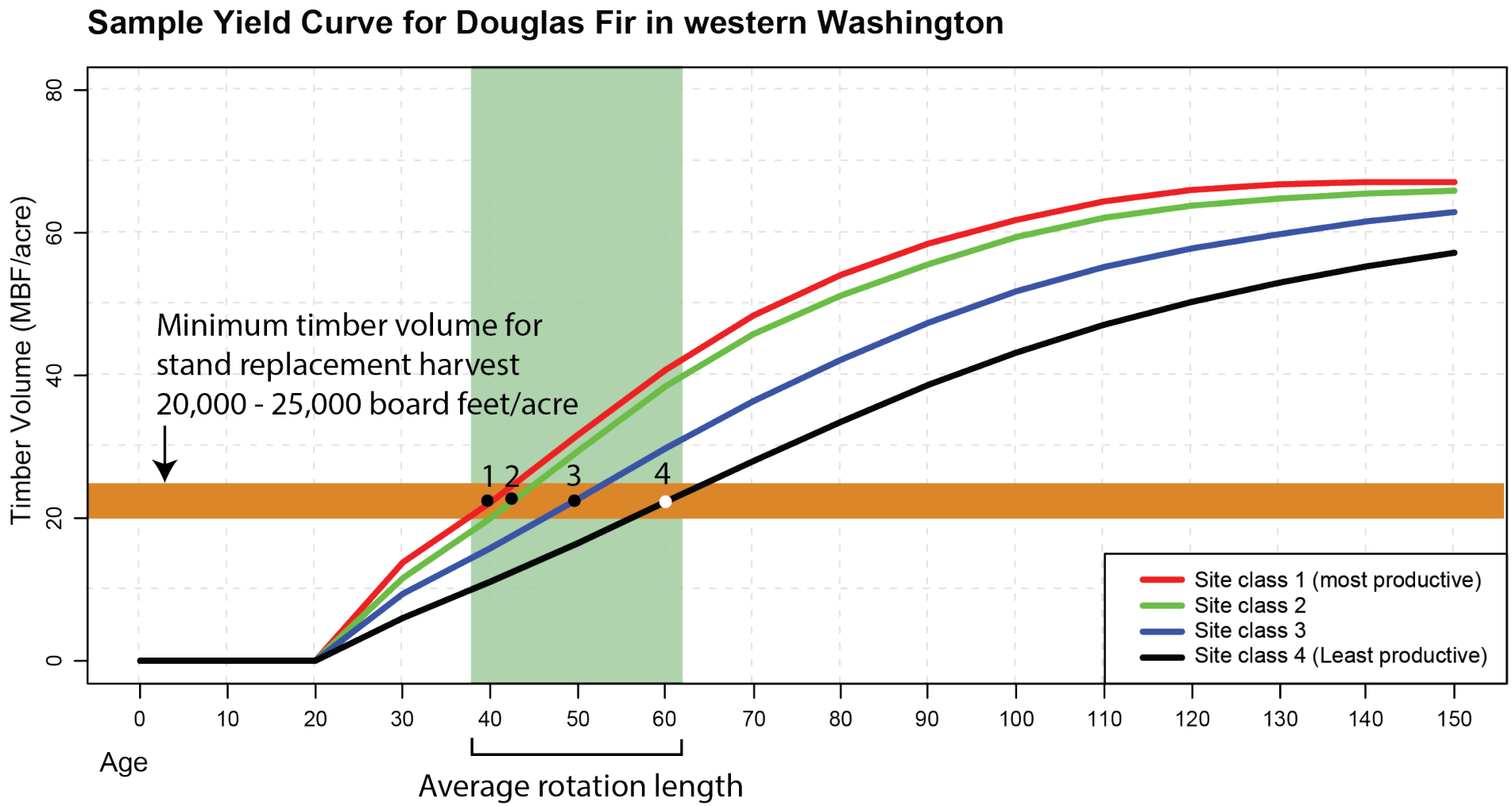


Rotation length
~40-60 years

Current operations rotation length
~50-80 years

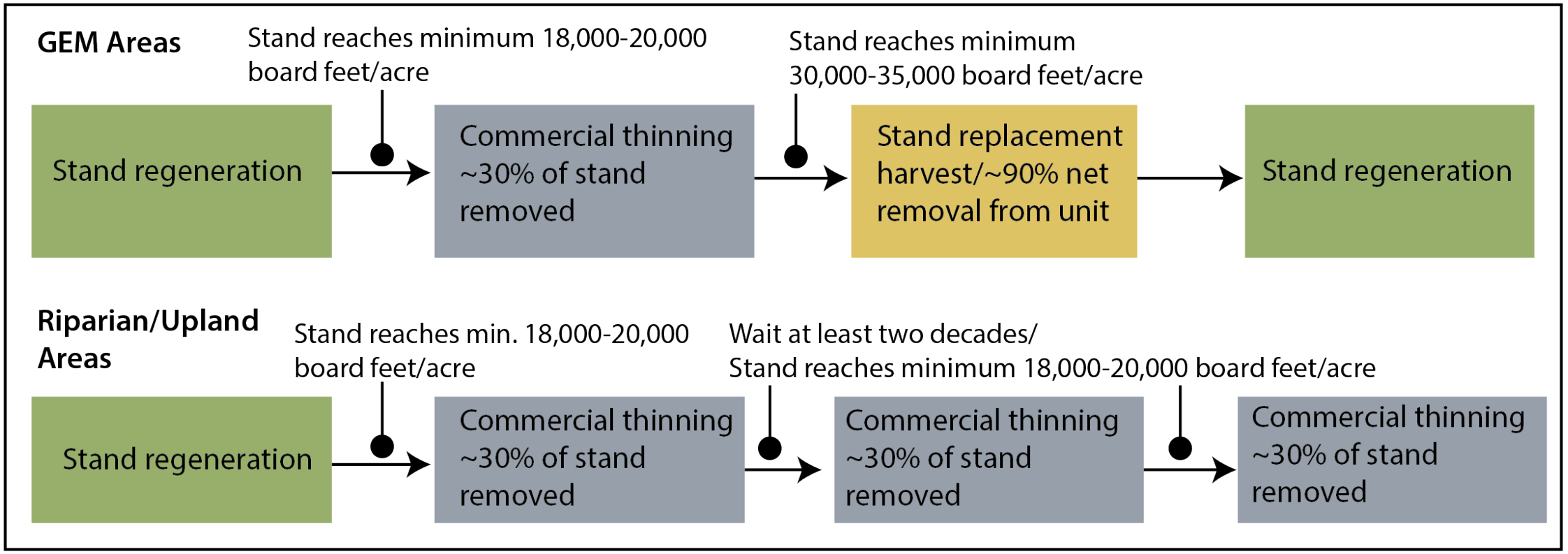
Formal Vote on Scenarios 2 and 3: Harvest Rotation



Scenario 3: Significantly Increase Thinning

- **Dial turned**: thinning.
- GEM areas: One thinning entry per harvest rotation.
- Uplands: In areas allowed under the *State Trust Lands Habitat Conservation Plan* (HCP). May be thinned more than once per stand objectives. Must wait two decades to thin again.

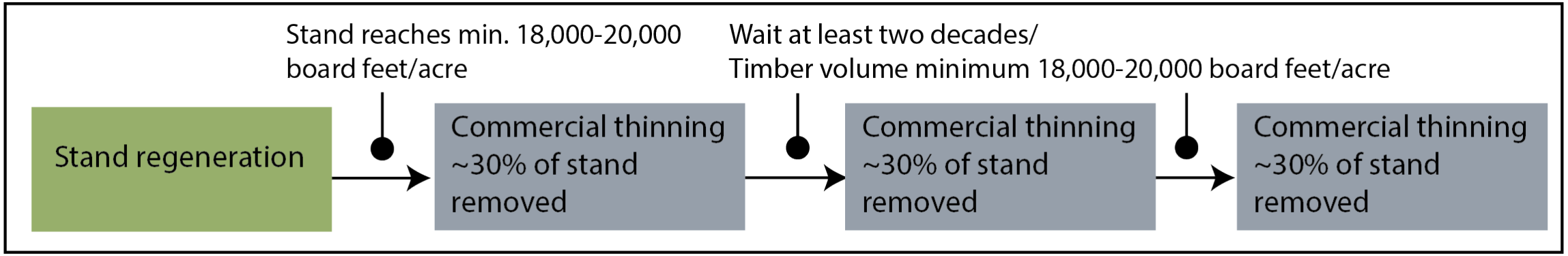
Scenario 4: Significantly Increase Thinning



Mistake on drawing corrected since 3/13 meeting

Scenario 5: Thinning Only

- **Dial turned**: thinning.
- Forests in all land classes (GEM, upland, riparian) will undergo commercial thinning repeatedly with no stand replacement harvest.



Formal Vote on Scenarios 4 and 5: Thinning



Scenarios 6 and 7: What is Carbon-dense, Older, Structurally Complex Forest?

For scenario development, using the definition of structurally complex stand in the 2006 *Policy for Sustainable Forests (PSF)*:

> A forest in the 'botanically diverse' 'niche diversification' or 'fully functional' stage of stand development. Forests in these phases have varying sizes of trees, understory vegetation and lichen, downed wood and snags, etc.

Stand Characteristics

Botanically diverse → Niche diversification → Fully functional

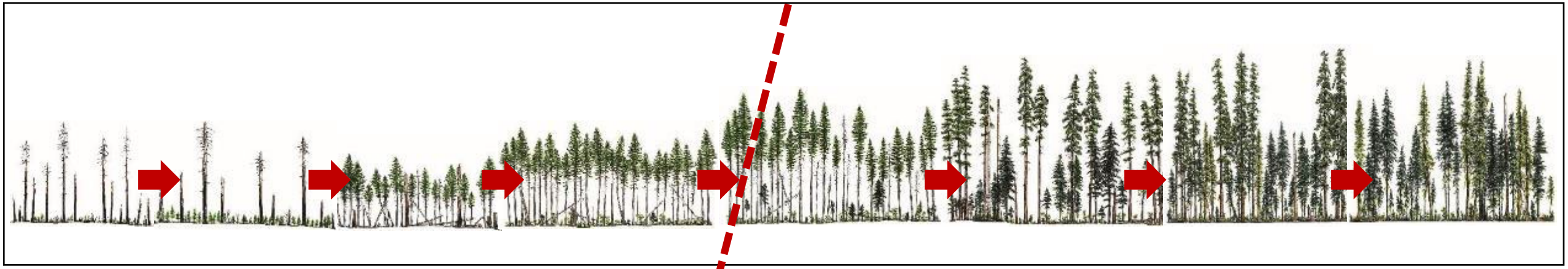
(Maturation II → Vertical diversification → Horizontal diversification)

Over time:

- Snags, large pieces of down woody material, and gaps in upper tree canopy form as original trees die out.
- Understory develops and diversifies in species and tree diameter.
- Shade-tolerant trees eventually reach upper tree canopy.

Stand Characteristics

Structurally complex forest



Stand Initiation	Canopy Closure	Competitive Exclusion & Biomass Accumulation	Maturation I	Maturation II	Vertical Diversification	Horizontal Diversification	Pioneer Cohort Loss
(Ecosystem Initiation)	(Competitive Exclusion)	(Competitive Exclusion)	(Understory Development and Botanically Diverse)	(Botanically Diverse)	(Niche Diversification)	(Fully Functional)	

Green: Based on Franklin et al 2002
Orange: Carey and Curtis 1996

Scenario 6: Increase Deferrals Carbon-dense, Older, Structurally Complex Forest

- Defer approximately 50% of forest stands in GEM areas currently identified (through modeling) as carbon-dense, older, structurally complex forest that are NOT already deferred.
- Indefinitely deferred from stand replacement harvest.
- Maybe thinned to maintain forest health or meet other ecological objectives.



Scenario 7: Defer all Acres of Carbon-dense, Older, Structurally Complex Forest

- Defer **all** forest stands in GEM areas currently identified (through modeling) as carbon-dense, older, structurally complex forest that are NOT already deferred.
- Indefinitely deferred from stand replacement harvest.
- Maybe thinned to maintain forest health or meet other ecological objectives.

Formal Vote on Scenarios 6 and 7: Deferrals



Additional Scenarios/April 2024 Meeting

- Longer rotation and more thinning
- Defer forests that may develop into structurally complex forest
- Small adjustments to improve carbon sequestration (such as seedling improvements, planting densities, silviculture, etc.)
- Turn multiple dials (such as rotation age based on site class, additional thinning, additional deferrals, managing to 10-15% older forest per HCP planning unit)
- Harvest rotation length based on site class
- Polyculture with long rotations
- Manage by state minimum requirements (instead of the HCP)
- No harvest