Analyzing the sustainability of timber harvest targets using alternative forest management scenarios for a national forest in the western United States.

SyncroSim 2023

Ft Collins, CO

September 19-21, 2023

Ayn Shlisky Hunt

Emphases

- **The scale of model applications**
- **Techniques to simulate silvicultural prescriptions constrained by public policies and social acceptability**
- **Confidence in model outcomes**

Integrated Vegetation Management Strategy

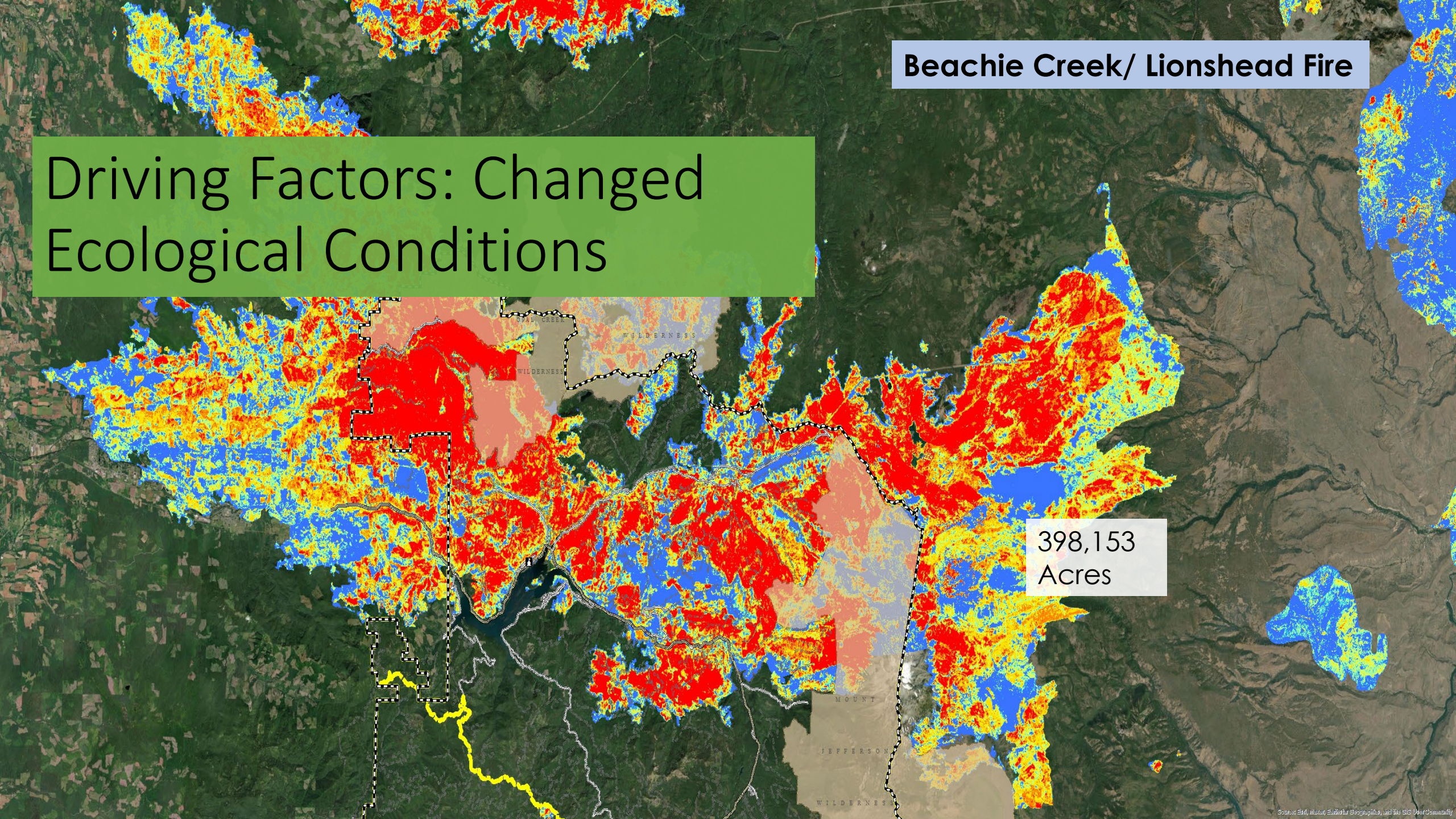
Vegetation Analysis and Scenario Modeling Team

Forest Service

- **Cheryl Friesen, Team Lead**
- **James Rudisill, Silviculture**
- **Lindsay Anderson, Silviculture**
- **Bobette Jones, Ecology**
- **Pek Wijayratne, Ecology**
- **Rosana Costello, Data Resources Management**

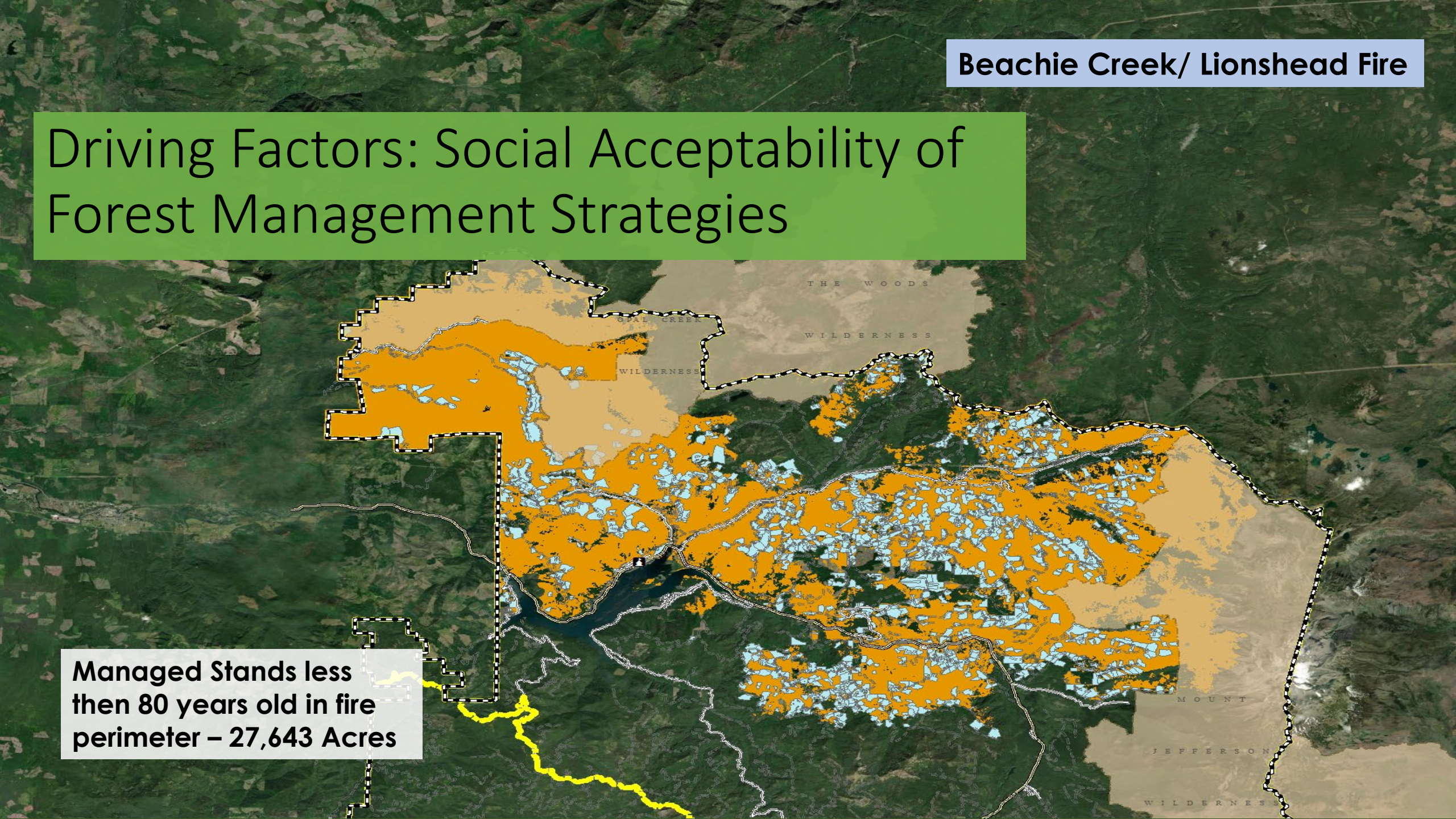
ACES

- **Ayn Shlisky Hunt, Analyst**
- **Stuart Johnston, Silviculture**


Beachie Creek/ Lionshead Fire
Driving Factors: Changed Ecological Conditions
398,153 Acres

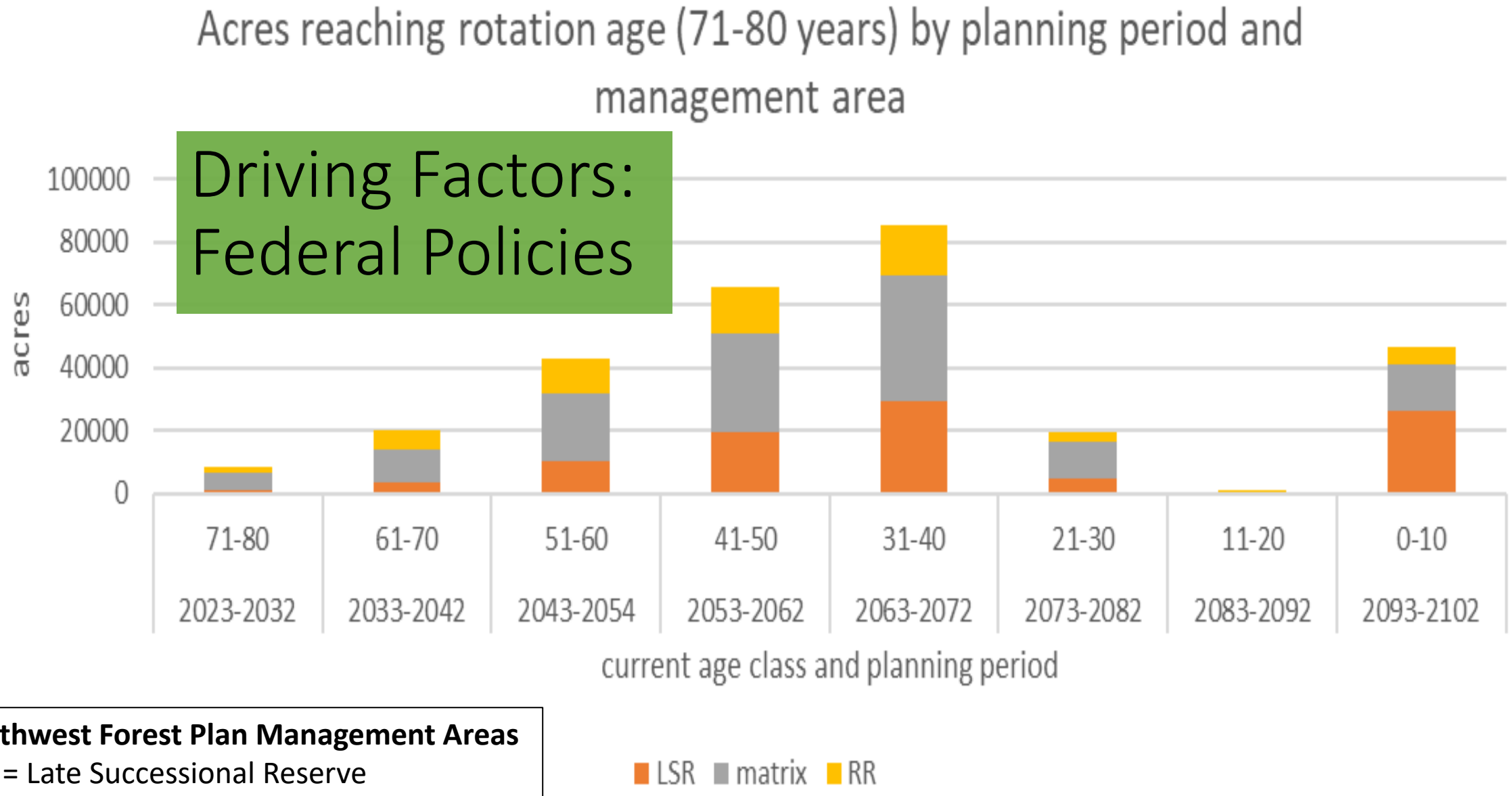
Beachie Creek/ Lionshead Fire

Driving Factors: Social Acceptability of Forest Management Strategies



Managed Stands less then 80 years old in fire perimeter – 27,643 Acres

Driving Factors: Federal Policies

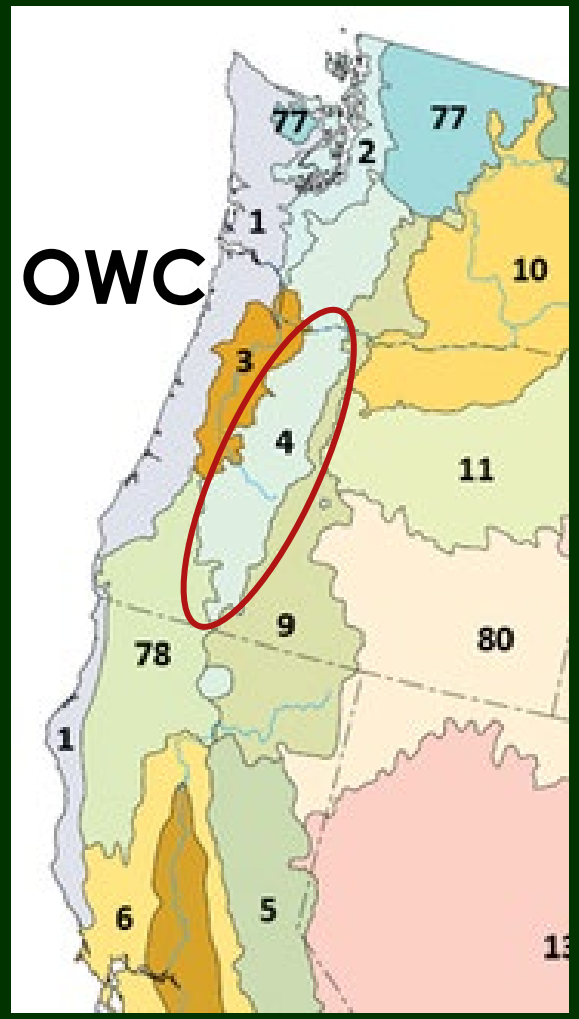


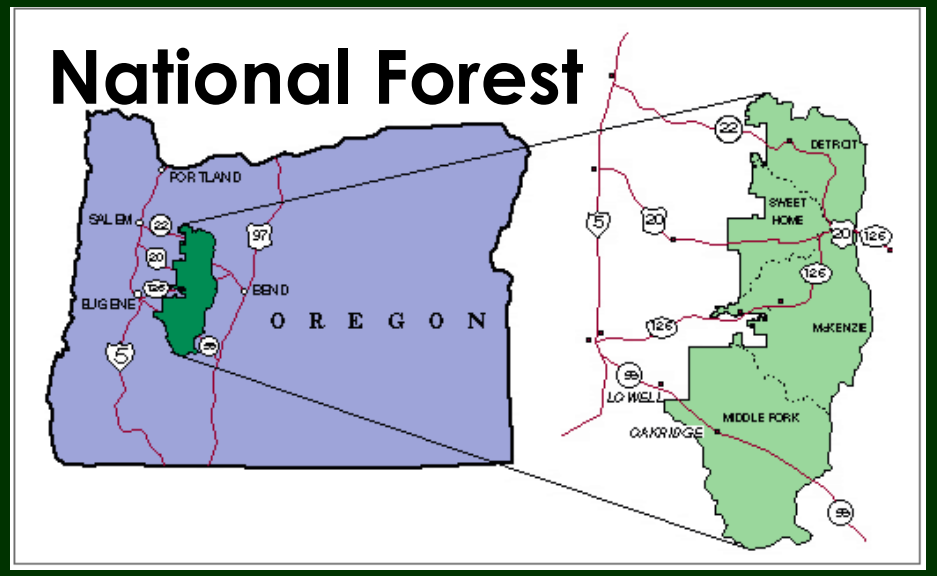
Northwest Forest Plan Management Areas
LSR = Late Successional Reserve
RR = Riparian Reserve

The Questions

1. **Is 75 MMBF of timber harvest sustainable?**
2. **What are the relative impacts of alternative management scenarios on harvest volume and treatment acreage?**
3. **Are there temporal or geographical patterns that can inform strategic planning across administrative or watershed units?**
4. **Can you produce answers while working half-time for 4 months?**

Model Basis - Oregon West Cascades Model





Timber Emphasis & other primary sources of timber volume

Landscape Project Assessments

Inventory plot-level models

S-T model evaluation

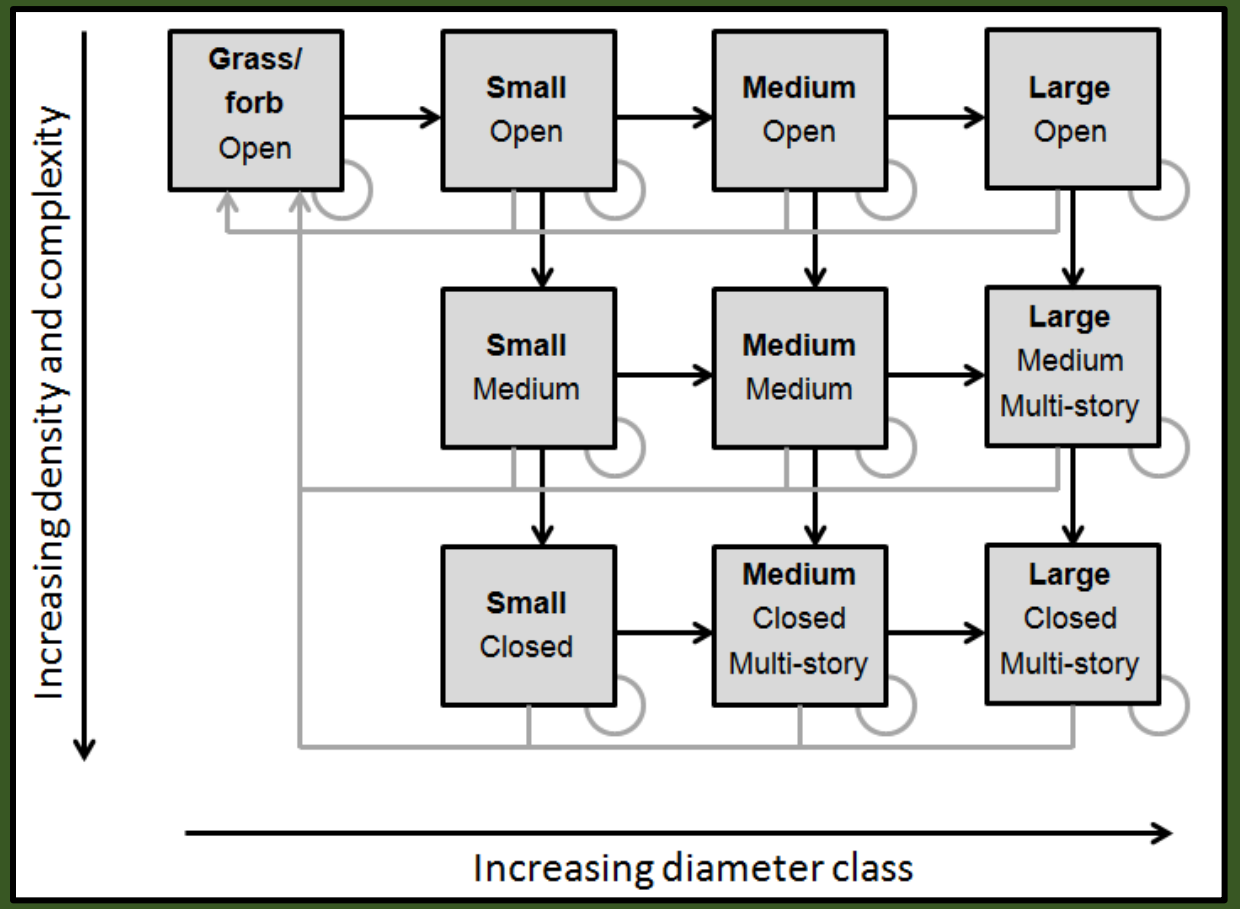
Timber Emphasis Model (non-spatial)

48 Strata
- 8 Potential Vegetation Types
- 3 Management Areas
- Managed vs unmanaged

> 800 State Classes
- Dominant tree size class (QMD)
- Canopy cover class
- Layering (single, multi)
- Stand age class (year of origin)

Transitions
- Natural disturbances
- Alternative successional pathways
- Forest treatments

Other Strata
- 4 Ranger Districts
- 18 5th field watersheds



Current acres classified into state classes

Forest inventory and LiDAR data sources

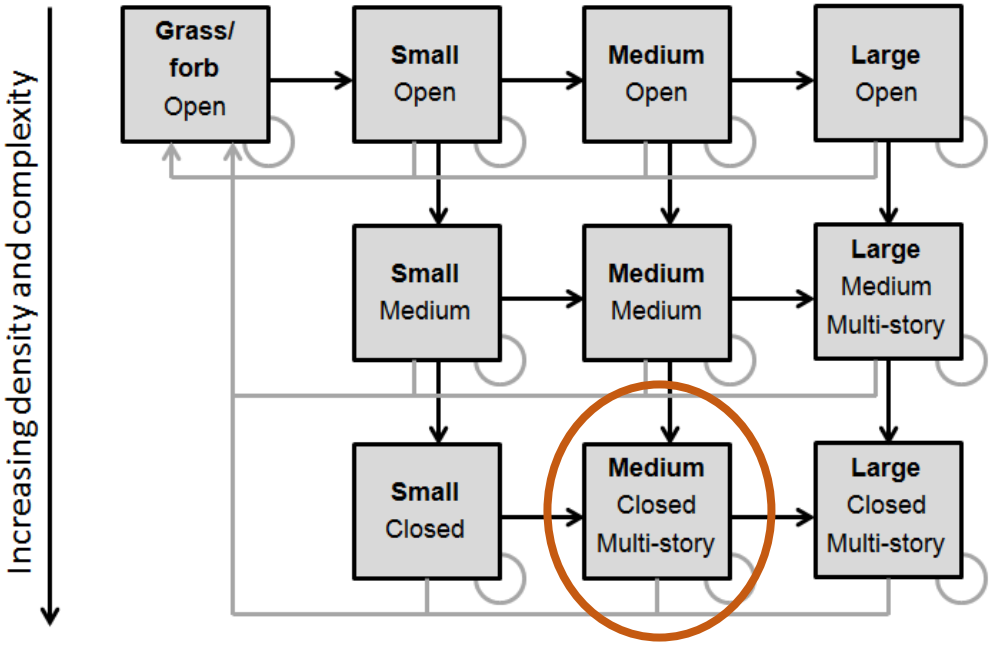
Cover Types	
Code	**Description**
DF	Douglas-fir
GF	Grass/forb
LP	Lodgepole pine
MH	Mountain hemlock
SFDF	Silver fir/Doug-fir

Canopy cover classes	
Code	**Description**
P	Post-disturbance
O	Open (10-40% cover)
M	Medium (40-60% cover)
C	Closed (>60% cover)

Canopy Layers	
1	Single layer stand
2	Multi-layer stand

Structural age classes		
Code	**Description**	
GF	Grass/Forb/Seedlings	< 10% cover of trees
Y	Young trees	< 5” DBH
P	Pole sized trees	5 – 9.9” DBH
S	Small trees	10 – 14.9” DBH
M	Medium sized trees	15 -19.9” DBH
L	Large sized trees	20 – 29.9” DBH
G	Giant trees	30” + DBH

Age class
Varies by PVT and state



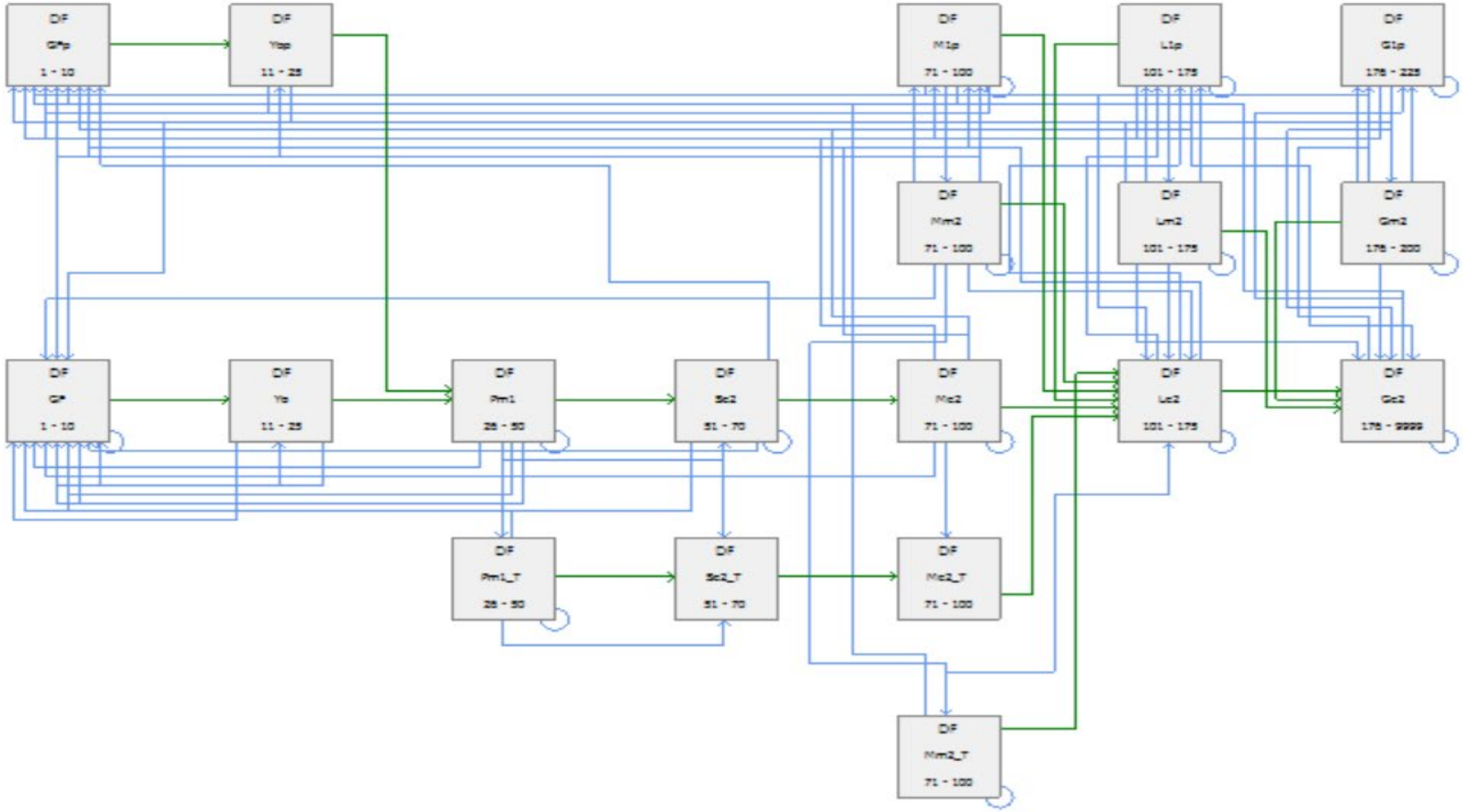
- Had to lump data for states not in model.
- Post moderate and high severity fire (2015-2022) acreages classified as grass/forb.

SyncroSim - [Scenario : [127] IVMS Scenario 4]

File Edit Scenario Window Help

Multiprocessing 7 Results

General | Run Control | Transition Pathways | Initial Conditions | Transition Targets | Output Options | Advanced



nat | wc_rip_man | wi_LSR_man | wi_LSR_MF_Restore | **wi_matrix_man** | wi_matrix_nat | wi_mtx_MF_Restore | wi_rip_man

	Primary Drivers of Model Components					
Model Component	PVT	Managed/ Natural	Manage-ment Area	State class	Social values	Ecolog. values
Timber Volume	X	X		X		
Management Prescriptions	X	X	X	X		X
Scenarios					X	X

Harvest Volume

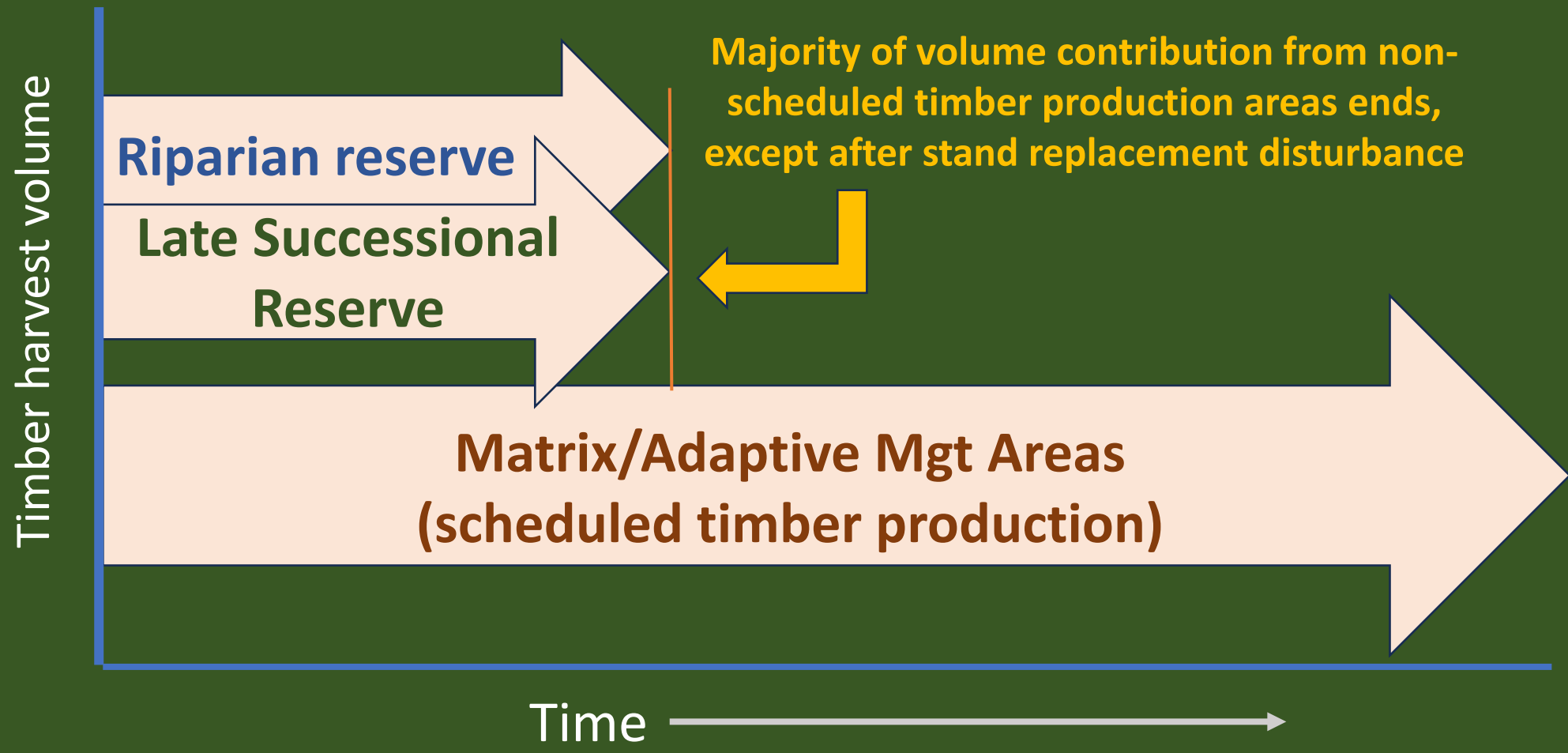
- MBF/acre by
  - PVT
  - state class
  - silvicultural treatment

Model Age Range	Harvest volume (MBF)/acre by PAG model							
	Douglas-fir interm	Western hemlock moist	Western hemlock interm	Western hemlock cool	Pacific silver fir warm	Pacific silver fir interm	Mountain hemlock interm	Mountain hemlock cold
0 to 10								
11 to 20								grass/ forb
21 to 30	Thin 12-15	Thin 10						
31 to 40			Thin 10-15	Thin 9-12				
41 to 50		Thin 12-18			Thin 9-15	Thin 9-15		<5" dbh
51 to 60	Thin 15-20 Regen 30		Thin 12-20	Thin 10-20				
61 to 70		Thin 15-25 Regen 25						
71 to 75								
76 to 80			Regen 35	Thin 15-18 Regen 20-25	Thin 15-20 Regen 20	Thin 12-18 Regen 20-22		5-10" dbh
81 to 90	Thin 20-25 Regen 35	Regen 30					Thin 10-15 Regen 22-25	
91 to 100					Regen 25-30	Regen 25-30		
101 to 110			Regen 35	Thin 20 Regen 30				10-15" dbh
111 to 120								
121 to 130								
131 to 140								
141 to 150								15-20" dbh
151 to 160								
161 to 170								
171 to 200								20-30" dbh
201 to 230								
231 to 240								
241 to 280								
281 to 300								
300 to 350							>30"	
351 to 500								

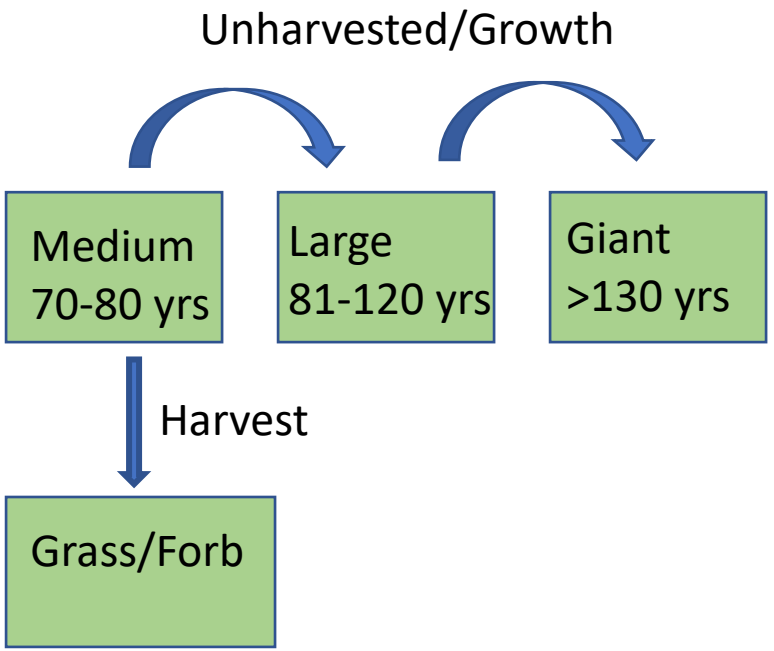
Transition Volume/acre attribute

“One-and-done” Silvicultural Prescription

Scheduled versus non-scheduled timber production



Scenario 1
Matrix/AMA
75 MMBF Target



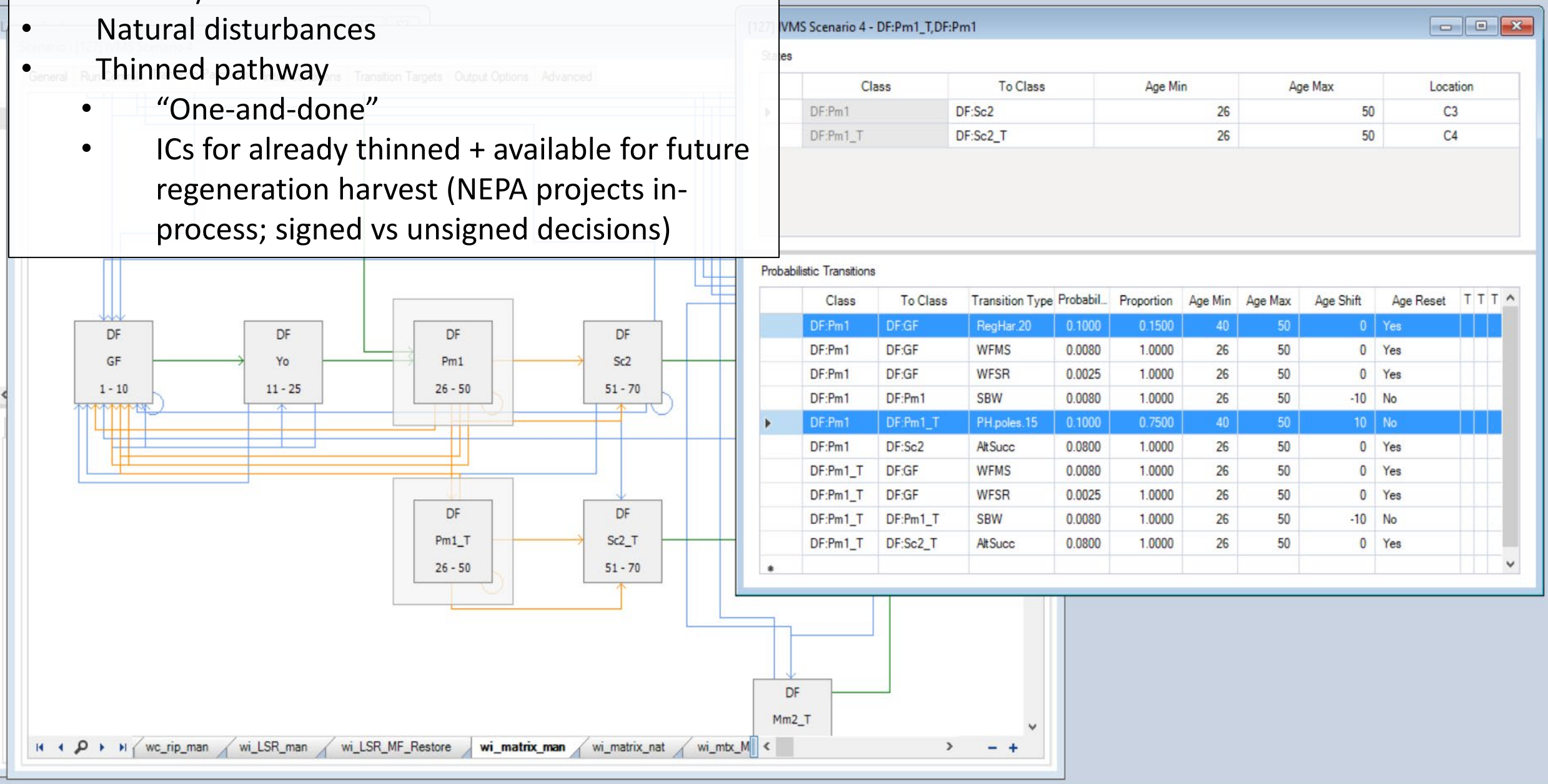
"Aging Out"
Growth of Un-harvested areas beyond 80 years of age

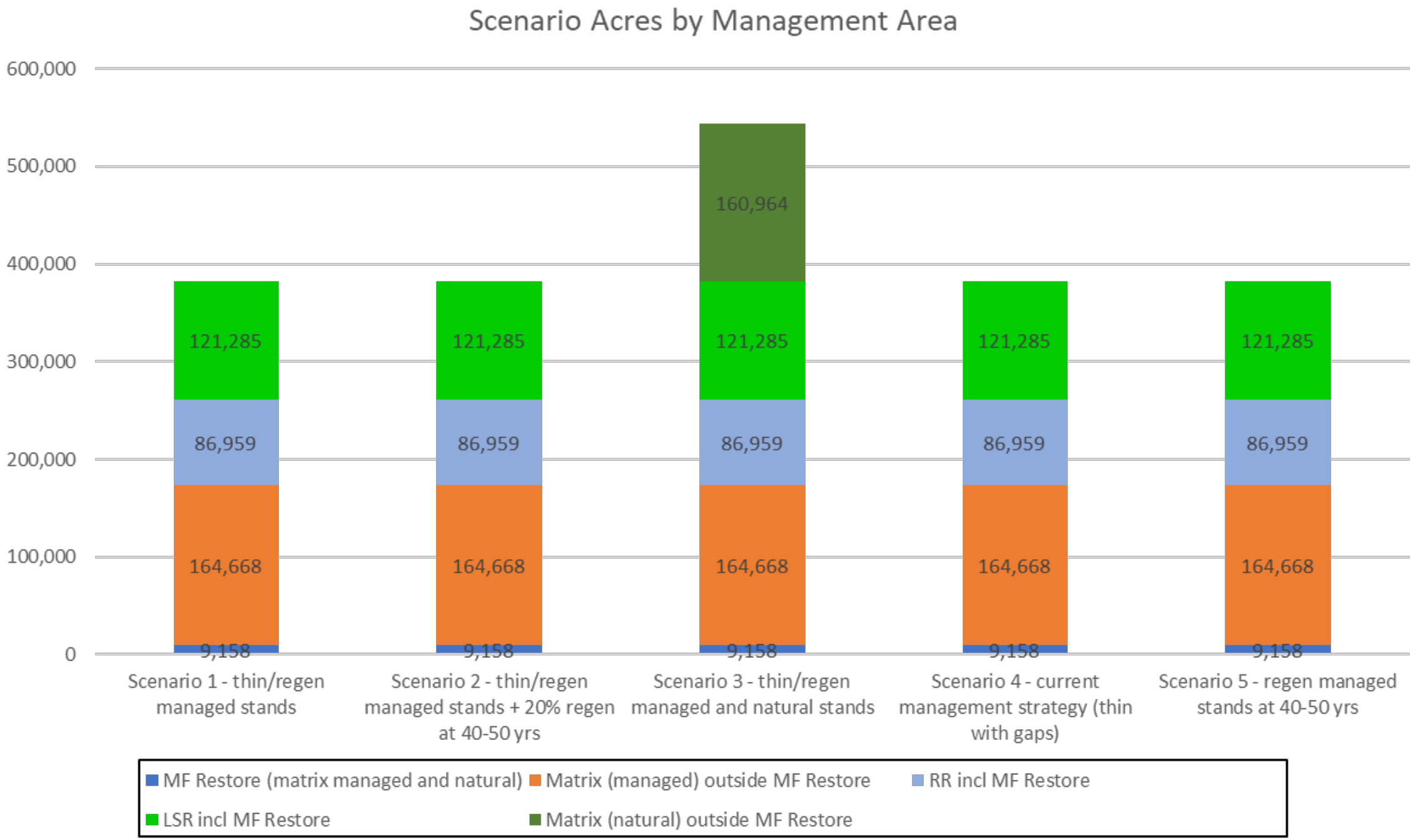
PVT	Matrix Acres "aging out" of regeneration harvest eligibility	Total Matrix Acres	% of Total Matrix Acres in Scenario
WH intermediate	26881	96568	28
WH moist	713	1981	36
WH cool	745	2719	27
DF intermediate	99	4127	2
PSF warm	4826	12138	40
PSF intermediate	2133	49300	4
MH intermediate	0	1303	0
MH cold	0	5691	0
	35397	173827	20

IVMS Scenarios.xlxs

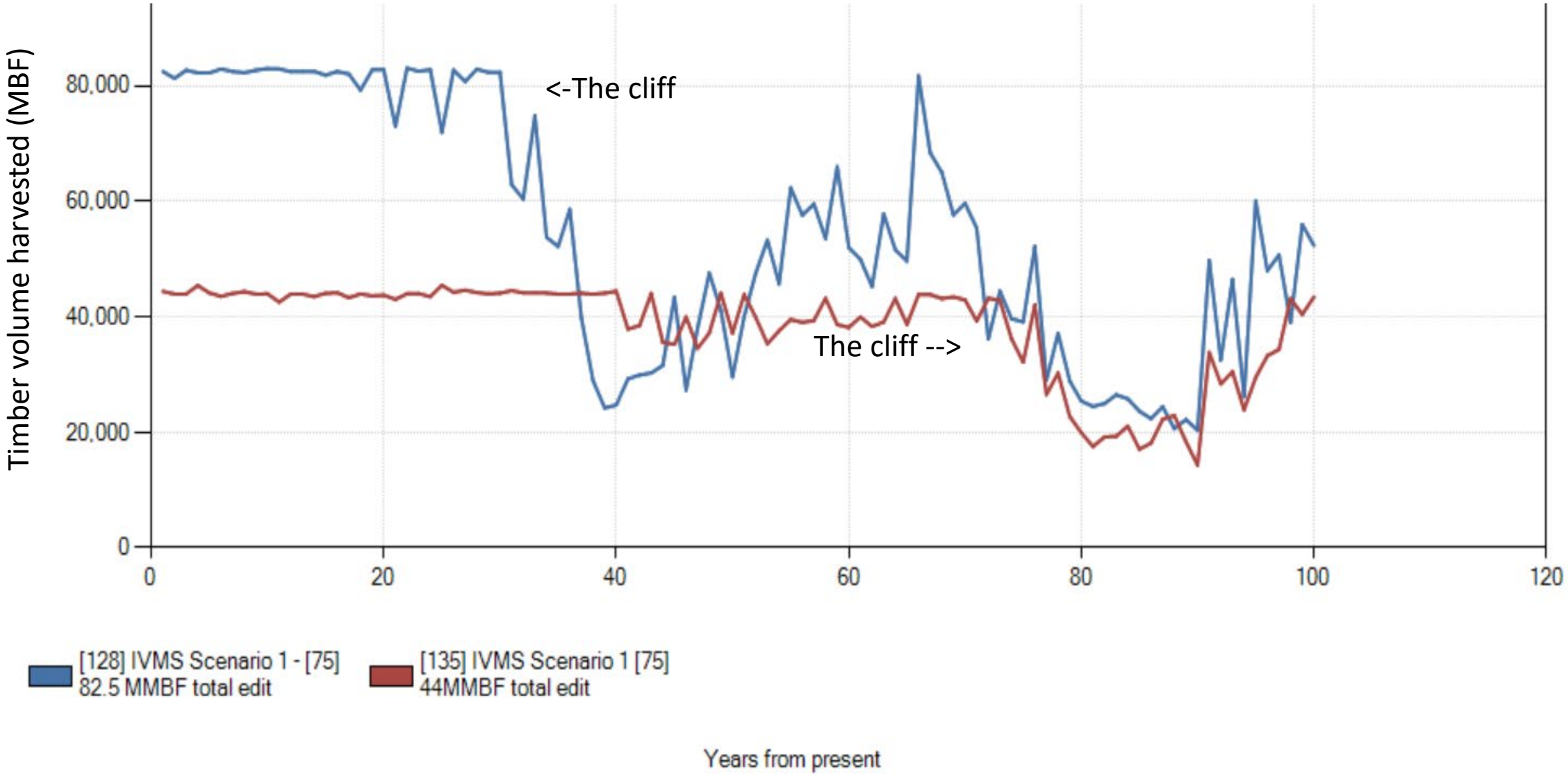
Pathways

- Silvicultural treatments defined by harvest volume/acre
- Natural disturbances
- Thinned pathway
  - "One-and-done"
  - ICs for already thinned + available for future regeneration harvest (NEPA projects in-process; signed vs unsigned decisions)

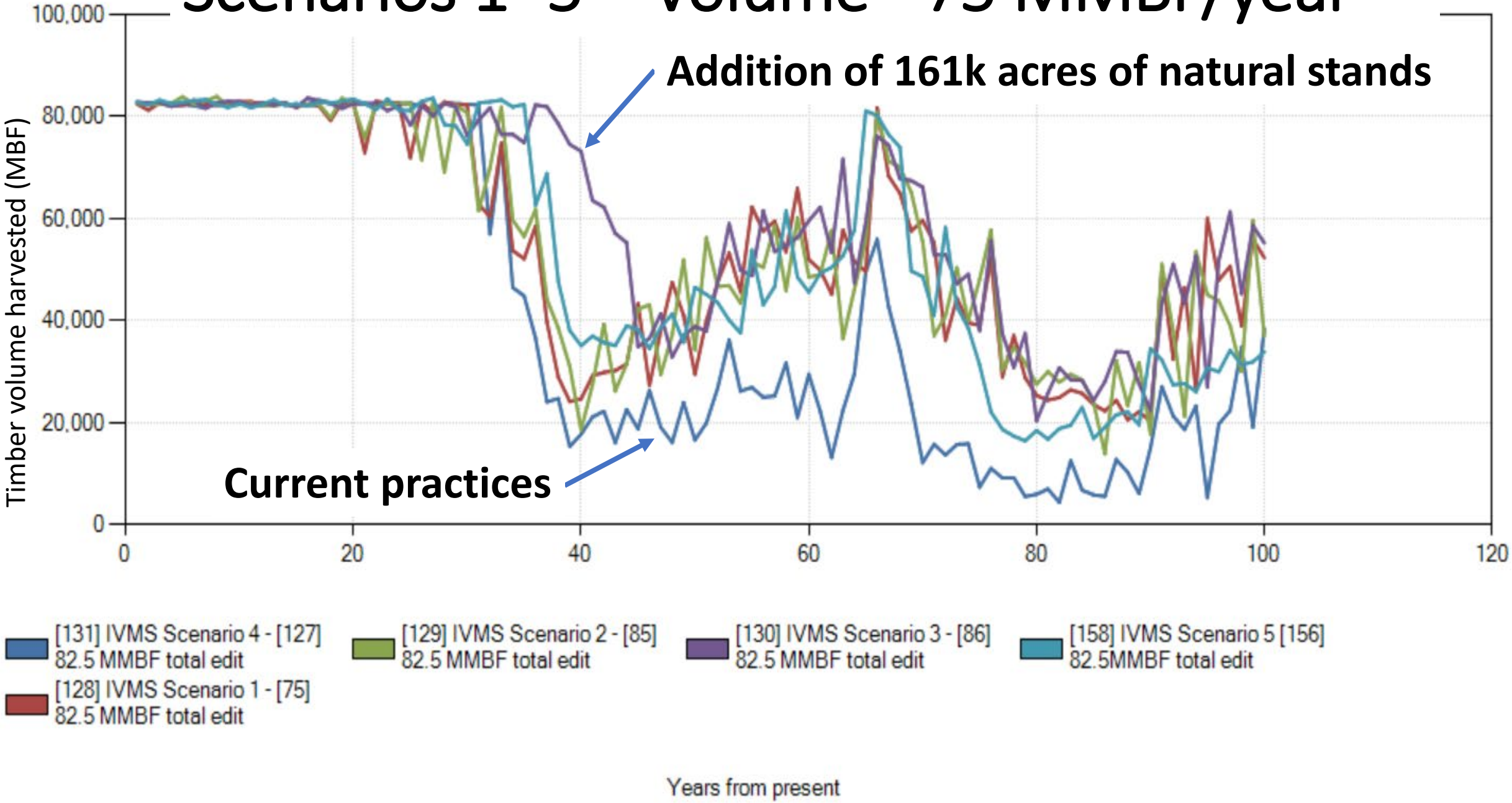



Scenario Acres by Management Area
600,000
500,000
400,000
300,000
200,000
100,000
0
121,285
86,959
164,668
9,158
160,964
Scenario 1 - thin/regen managed stands
Scenario 2 - thin/regen managed stands + 20% regen at 40-50 yrs
Scenario 3 - thin/regen managed and natural stands
Scenario 4 - current management strategy (thin with gaps)
Scenario 5 - regen managed stands at 40-50 yrs
MF Restore (matrix managed and natural)
Matrix (managed) outside MF Restore
RR incl MF Restore
LSR incl MF Restore
Matrix (natural) outside MF Restore

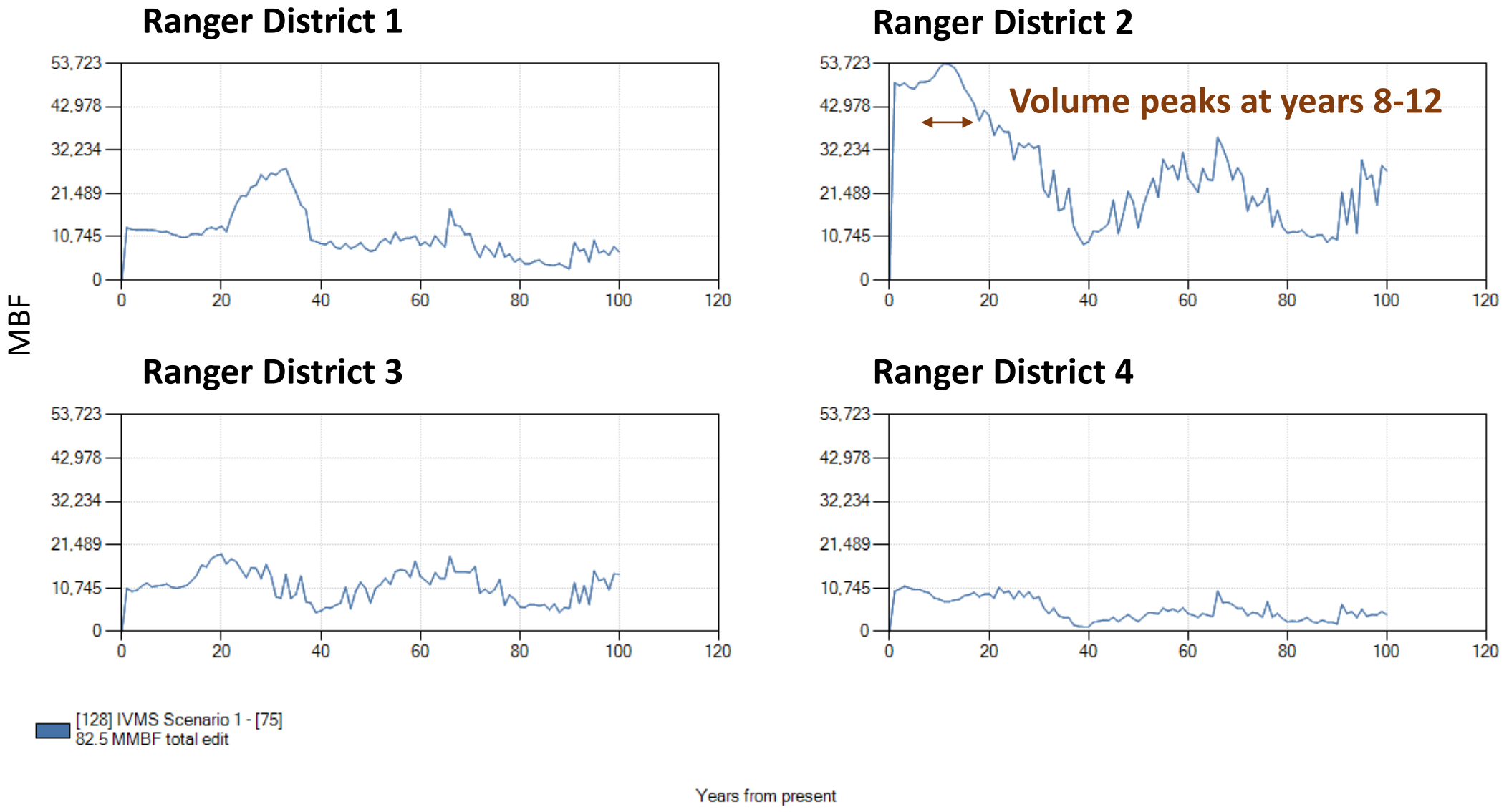
Scenario 1 - Thin 40-50 yr; regen 70-80 yr - Volume targets: 75 vs 40 MMBF

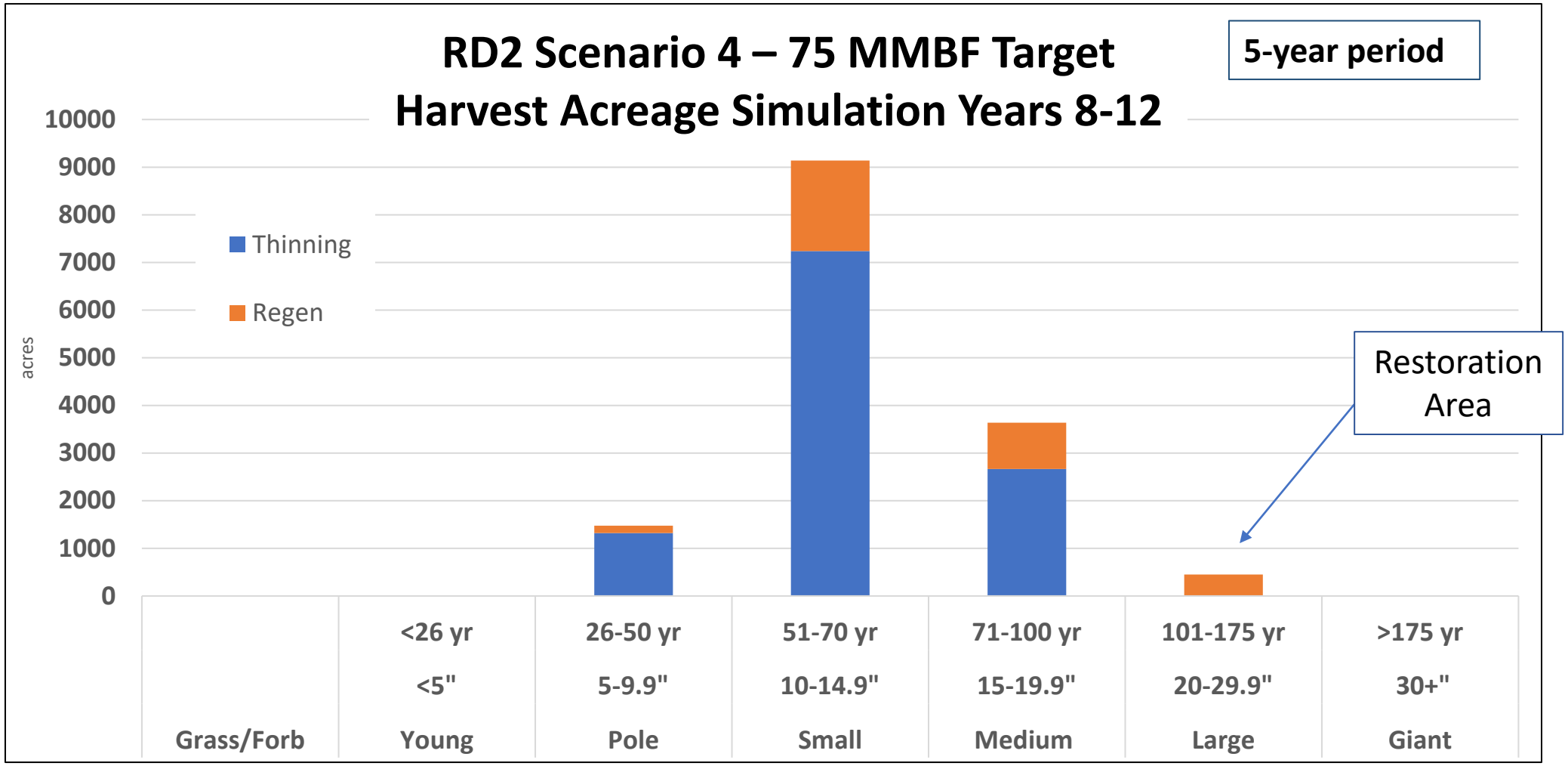


Scenarios 1 -5 – Volume - 75 MMBF/year



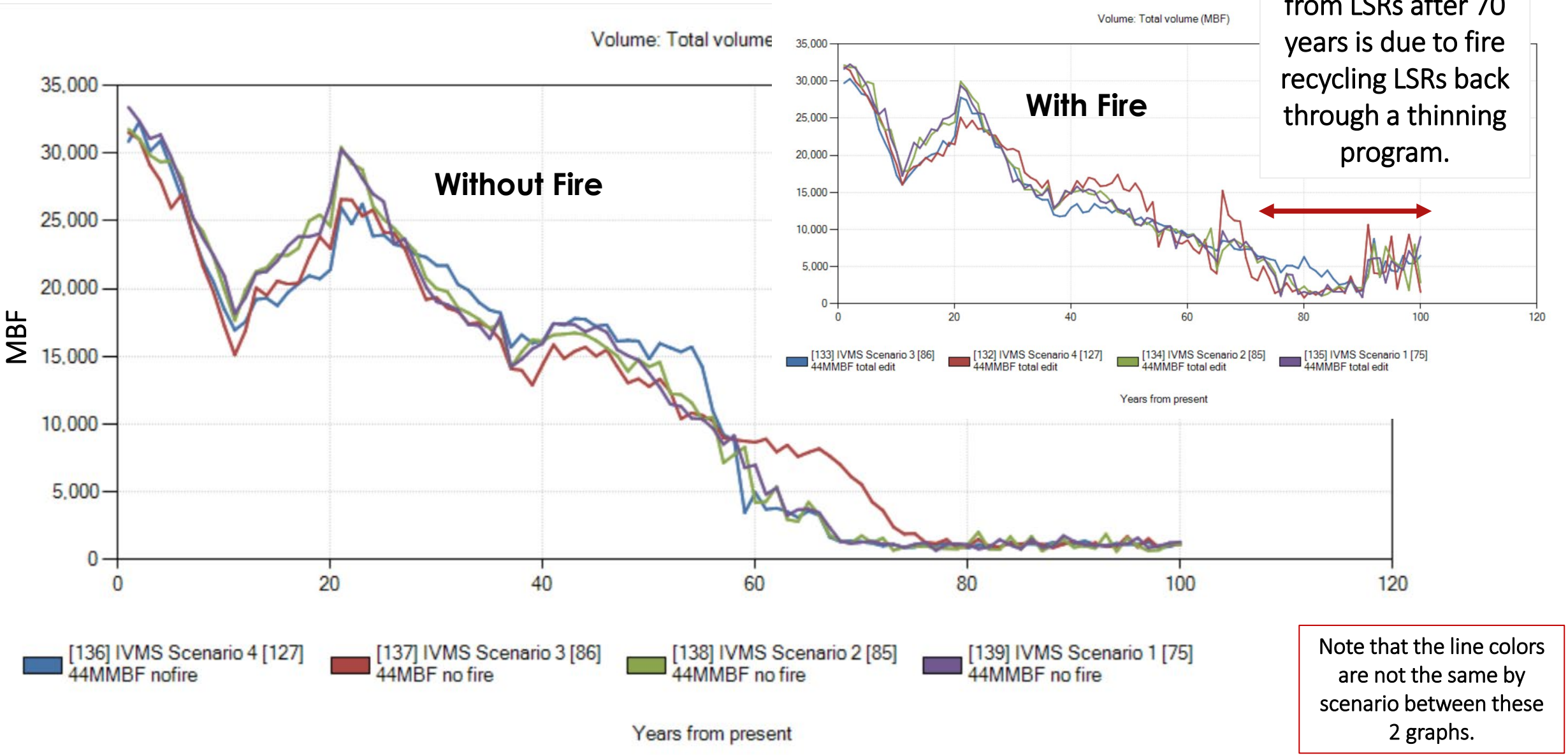
Total Volume by Ranger District and Simulation Year
Scenario 1 – Target 75 MMBF/year





	Grass/Forb	Young	Pole	Small	Medium	Large	Giant	
		<5"	5-9.9"	10-14.9"	15-19.9"	20-29.9"	30+"	
approx. age class>		<26 yr	26-50 yr	51-70 yr	71-100 yr	101-175 yr	>175 yr	Totals
Thinning			1,321	7,239	2,665			11,225
Regen			156	1,901	973	452		3,482
Untreated	35,548	36,323	90,576	381,987	294,337	80,477	9,871	

40 MMBF – LSR Only – Total Volume (MBF)



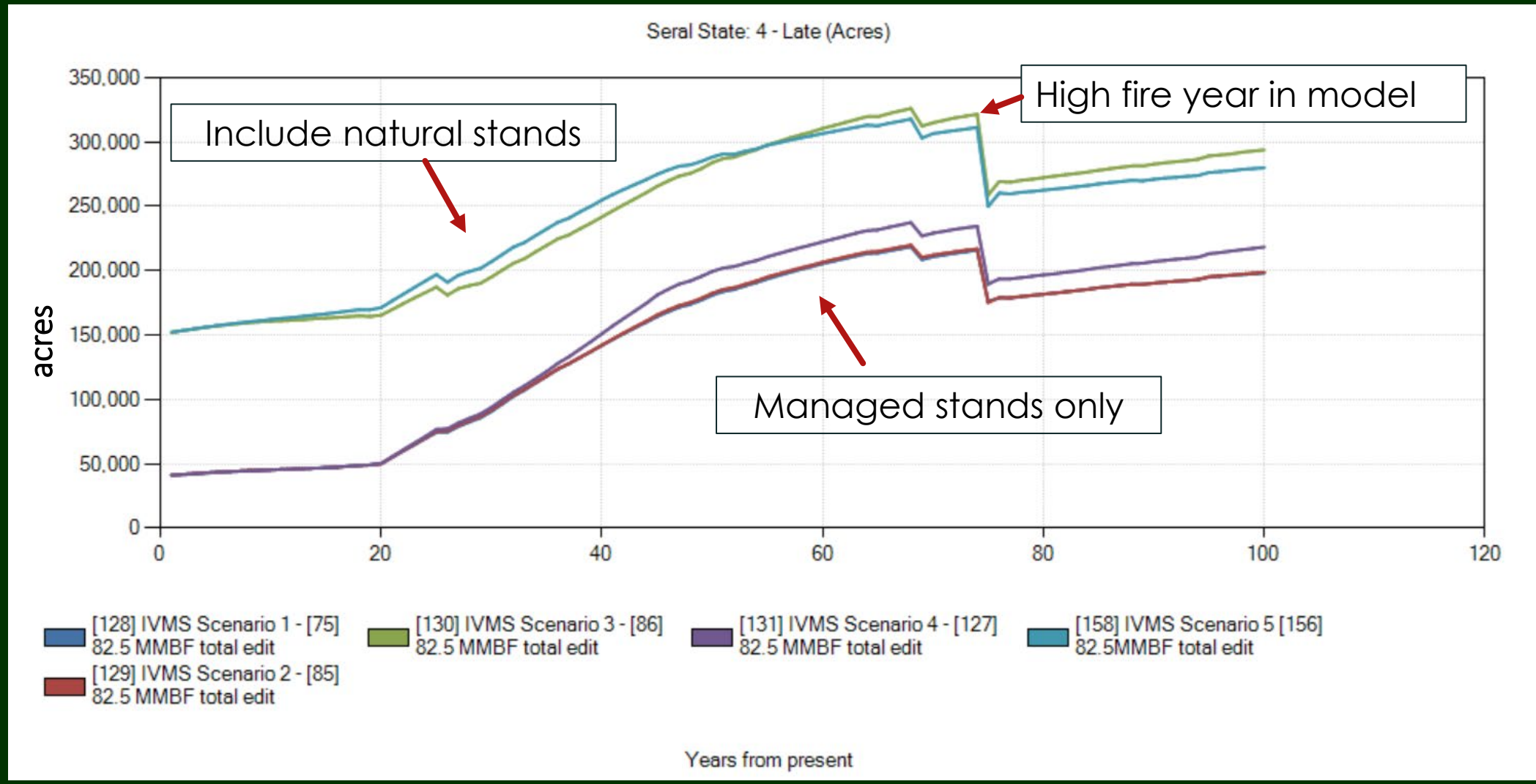
Much of the volume from LSRs after 70 years is due to fire recycling LSRs back through a thinning program.

Note that the line colors are not the same by scenario between these 2 graphs.

Scenarios 1-5 – Trends in Mature and Old Growth
75 MMBF Volume Target

<u>Late Seral</u>
Defined in model as:

- **20” + dbh, low to high % cover**
- **15-20” dbh for higher elevation types**
- **~ 100 + years old**



Includes all large and giant state classes + SFDF: Mc2, SFDF:Mm2, and MH:Mm2

Comparisons to other models	FVS		IVMS Scenario 4	
	Average harvest MBF/acre	Acres harvested	Average harvest MBF/acre	Acres harvested
Analysis Area-wide* – 75% thinning/15% regen harvest (gaps)/10% skips	21	1,233*	19	4,867* (82.5 MMBF)
Analysis Area-wide* – 100% thinning	21		Not modeled	
Analysis Area-wide* – 100% regeneration harvest	31			
RD2 Project Phase 5 vs Scenario 4 with all IVMS stands	19	3,478 (66 MMBF)	17	4,760 (72 MMBF)
RD2 Project Phase 5 vs Scenario 4 with NEPA harvest stands only			17	3,210 (51 MMBF)

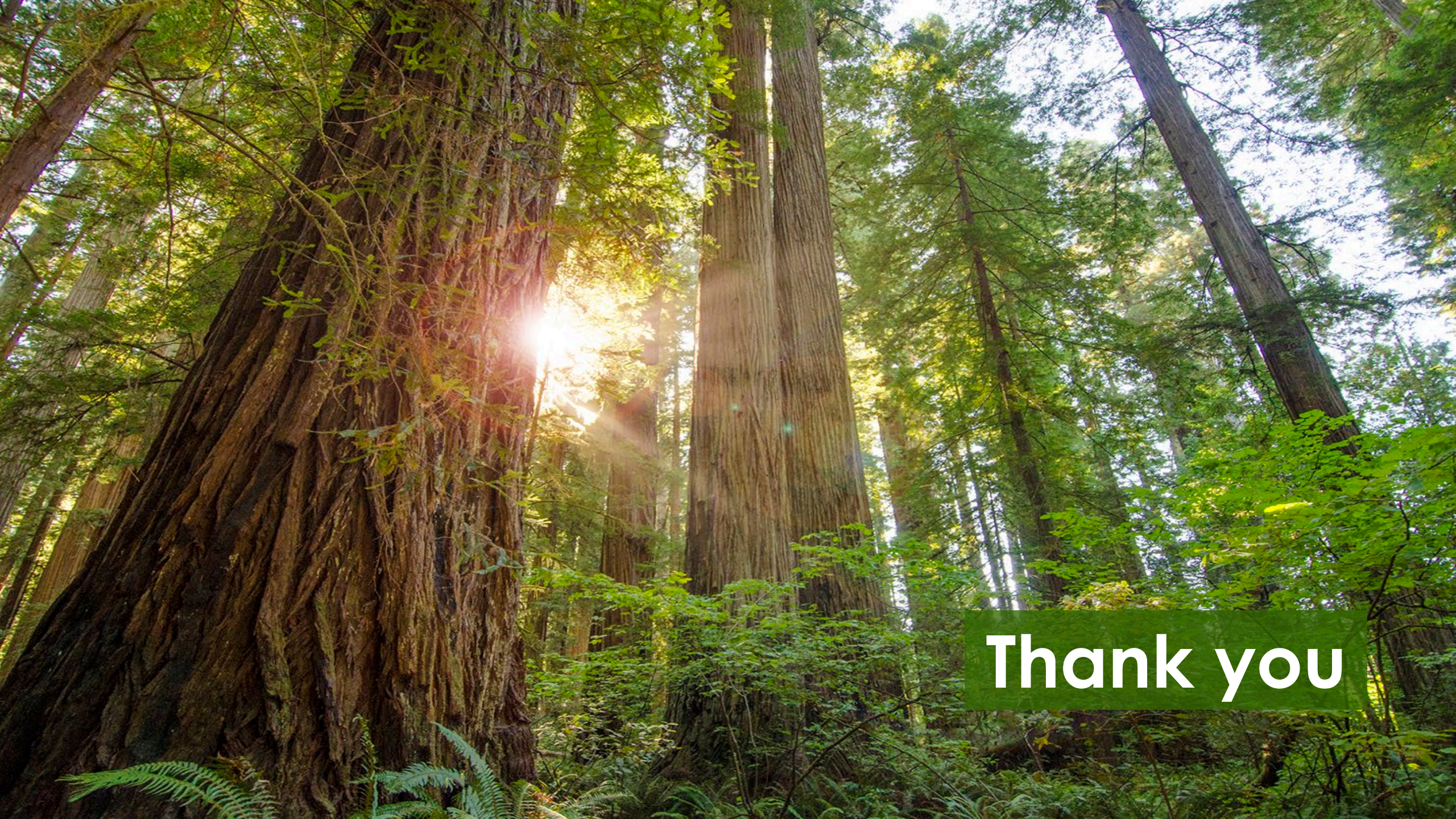
Comparisons to project analyses	NEPA estimate	IVMS Scenario 4
Ranger District 4 Project vs Scenario 4 with 60 MMBF target over 1 year		
Harvest acres	5,920	3,130
Harvest volume	50-60	60
Ranger District 2 Project vs Scenario 4 with 239 MMBF target over 1-2 years		
Harvest acres	15,900	10,530-16,810
Harvest volume	239	193 - 294
Ranger District 3/4 Project vs Scenario 4 with 50 MMBF target over 1 year		
Harvest acres	8,213	2,750
Harvest volume (not provided)	Assume 50	50
Ranger District 1 Project vs Scenario 4 with 34 MMBF target over 1-2 years		
Harvest acres	1,661	1,590 - 2,890
Harvest volume	34	29-51

Summary

- A 75 MMBF target could be sustained for 30-35 years. It would require as much as 4,500 acres of thinning and 2,500 acres of regen per year, depending on scenario.
- A 40 MMBF target could be sustained for 70-80 years.
- Moderate and high severity fires between 2015 and 2022 are likely to lead to a substantial peak in volume production in about 70 years.
- The area available for harvest drops by over 50% in 30 years when “one and done” thinning is complete (e.g., LSRs, Riparian Reserves).
- A boom and bust cycle occurs roughly every 25 years even if the model is carried out 300 years.

Summary

- Future wildfires have an important role in “feeding” the harvest pool.
- The regional Oregon West Cascades model is an adequate foundation for estimating harvest volumes and acres at a Forest level.
- Ranger Districts and watersheds differ in peak volume production, which can be used to schedule forest management projects across geographies.
- Scenario models improved a Forest-wide understanding of the amount and timing of timber volume harvest opportunities and constraints.


Thank you