

New Tools for Prioritizing Restoration Projects

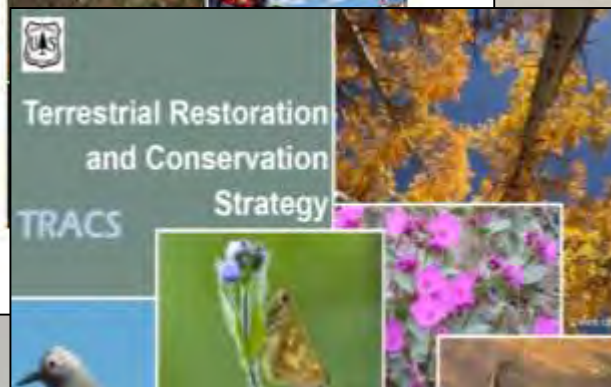
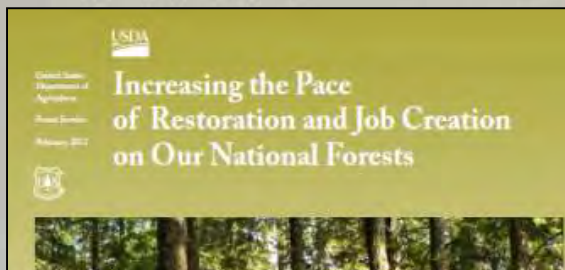
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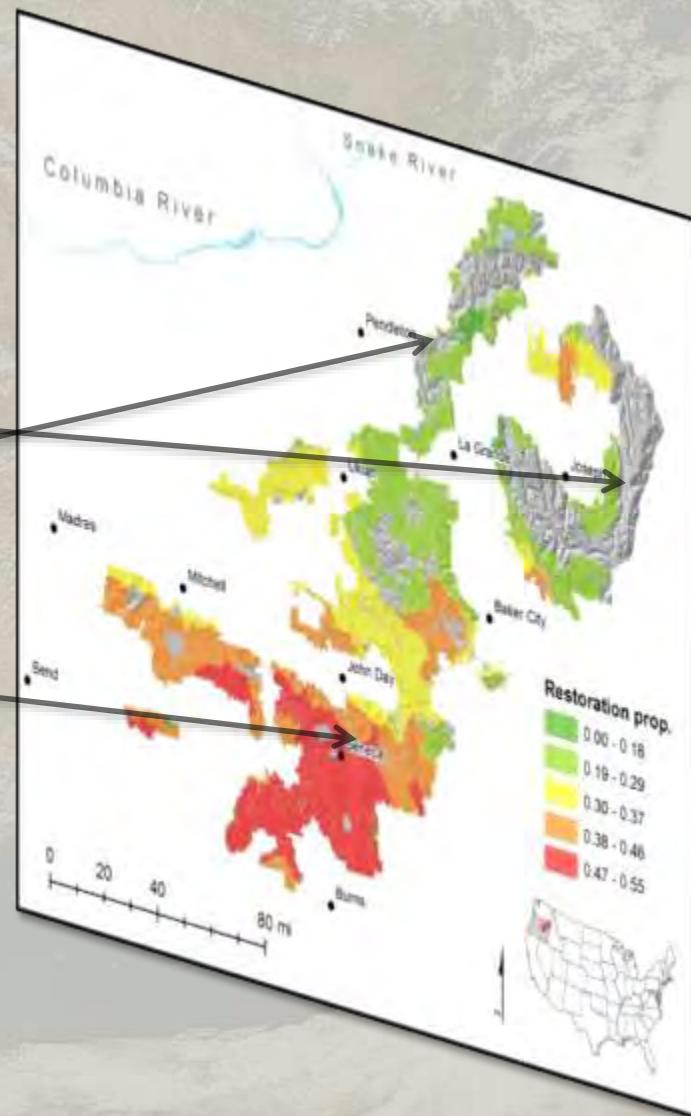
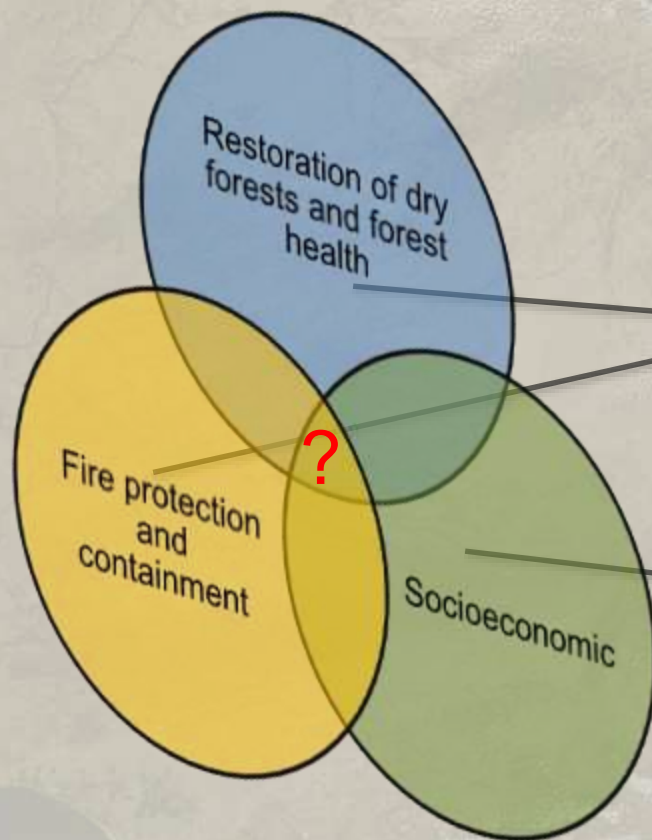
How do we achieve the multiple goals of restoration programs?

- Economics AND ecological restoration
- Conservation AND restoration
- Fire protection AND fire restoration





How do we identify optimal projects for specific goals?

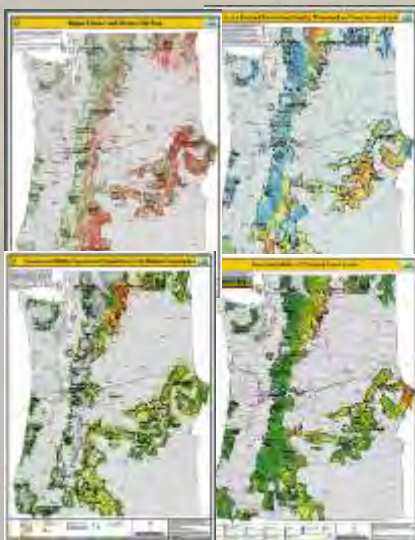




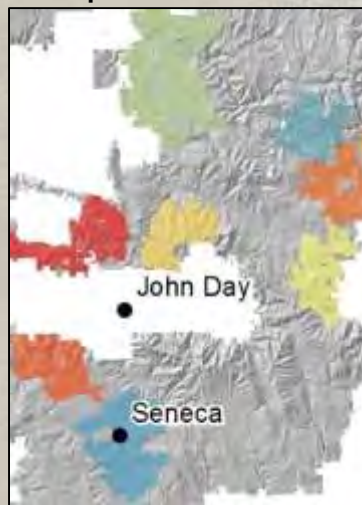
Analytical Gap

- How do we turn maps and assessments into projects and priorities?
- Optimal mix for multiple goals?
- Tradeoffs?
- Restoration storylines?

Maps



Projects and priorities

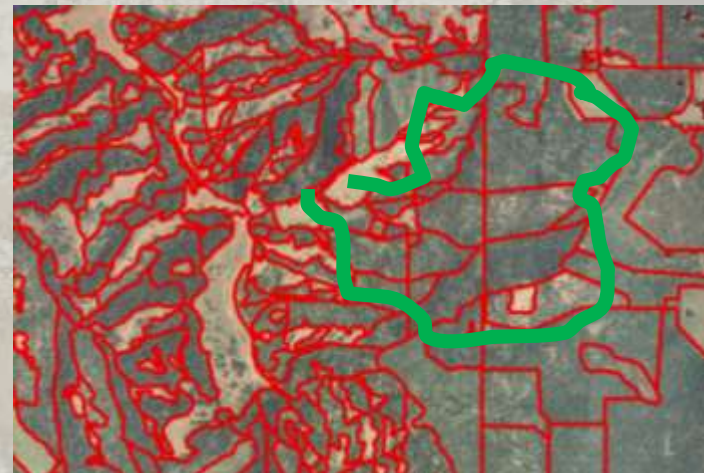


Treatments



The Landscape Treatment Designer

- Translates restoration objectives into spatially optimized project areas
- Performs tradeoff analyses
- Inputs:
 1. The restoration priorities
 2. The constraints – total area per project, available lands
 3. Management thresholds - what conditions trigger a treatment





Landscape Treatment Designer

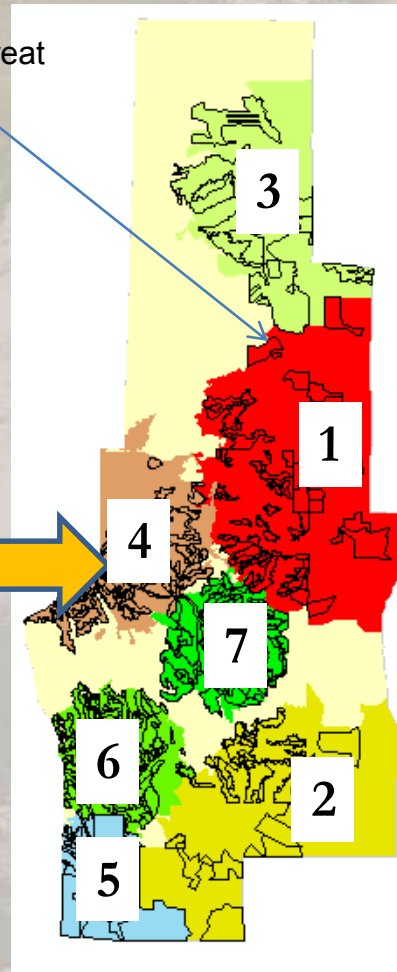
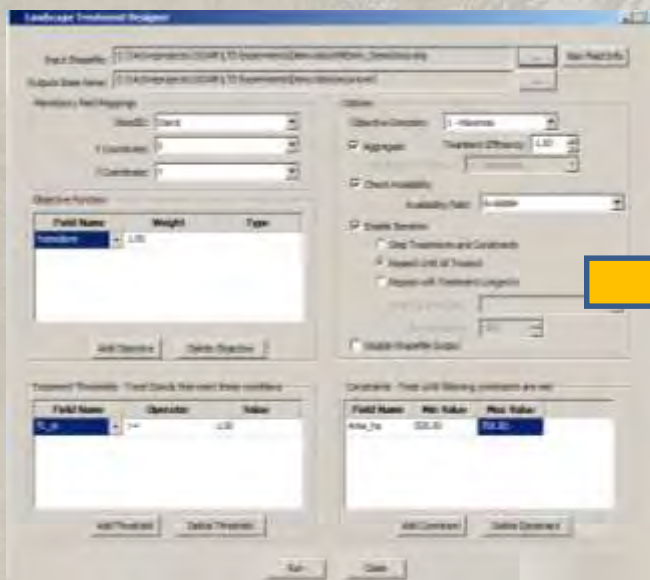
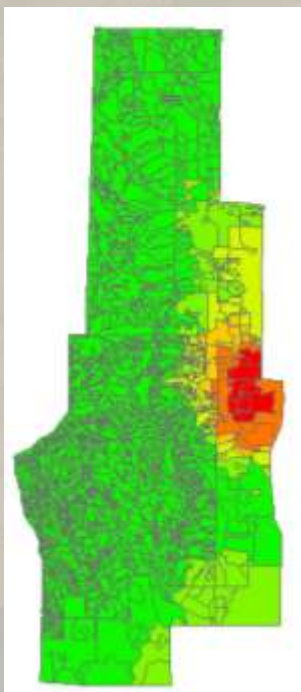
- Converts maps into project areas with treatment units and priorities
- Uses spatial optimization

Fire behavior

Density of residential structures

Objectives, treatment thresholds constraints,

Stands to treat



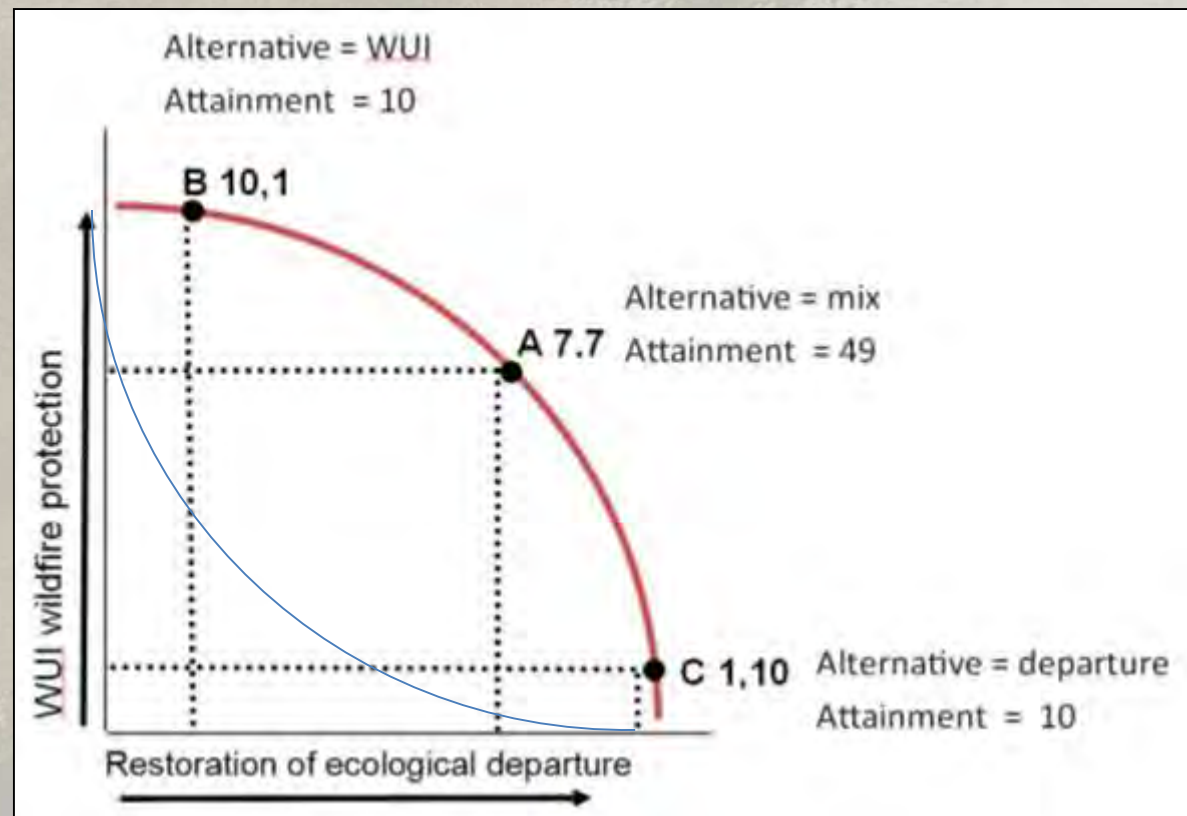
Priority projects and treatments



Tradeoff analyses

- Tradeoffs exist because restoration goals are not always co-located
- **Production possibility frontiers – quantifies tradeoffs**
- Generated from LTD

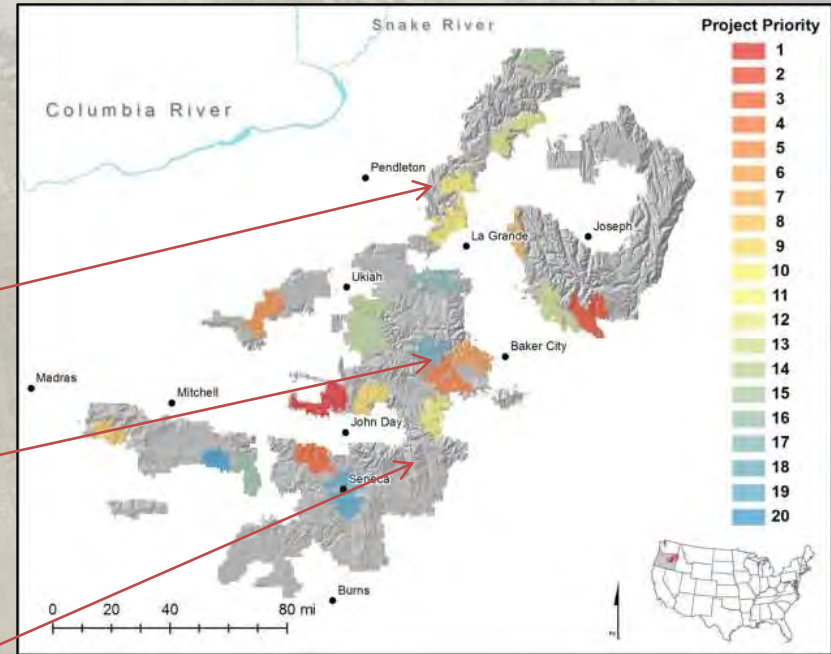
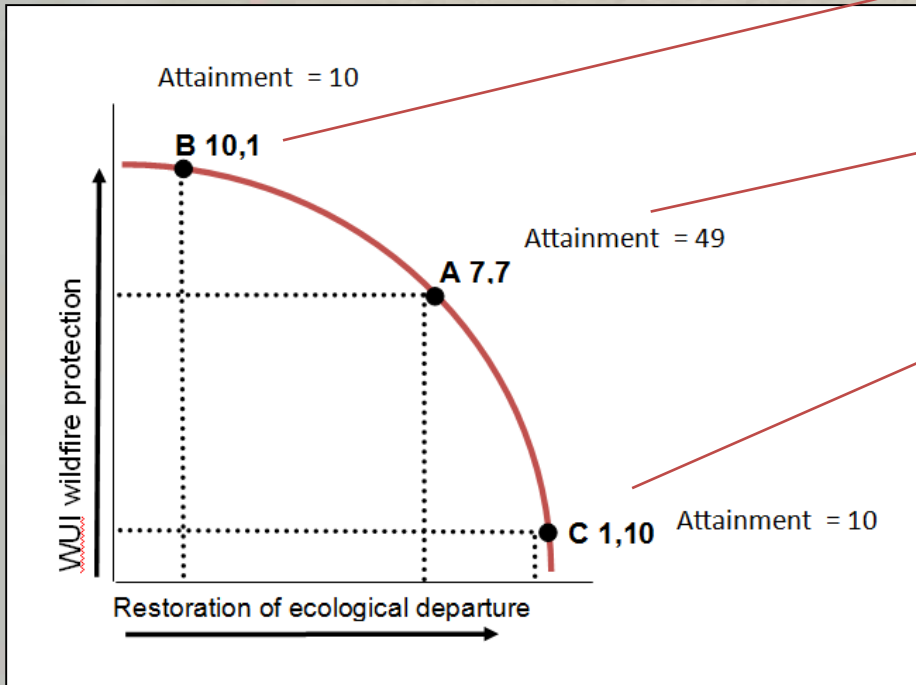
Suppose you can treat 1000 acres, and focus on either wildfire protection or restoration, **or a mix** – what are the possibilities?





Mapping the production possibility frontier

LTD program defines and maps the frontier

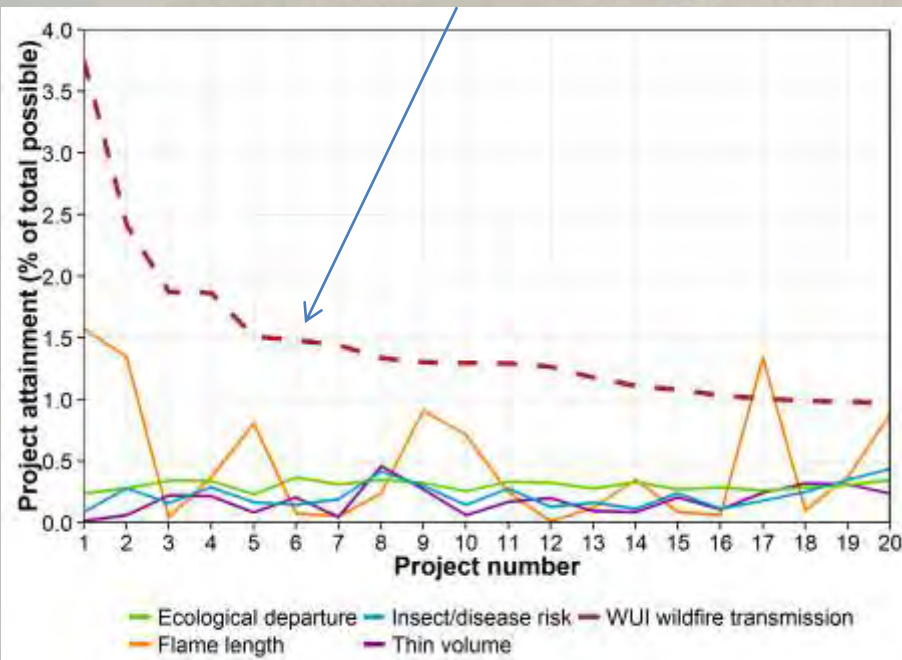


April 8/31/2015

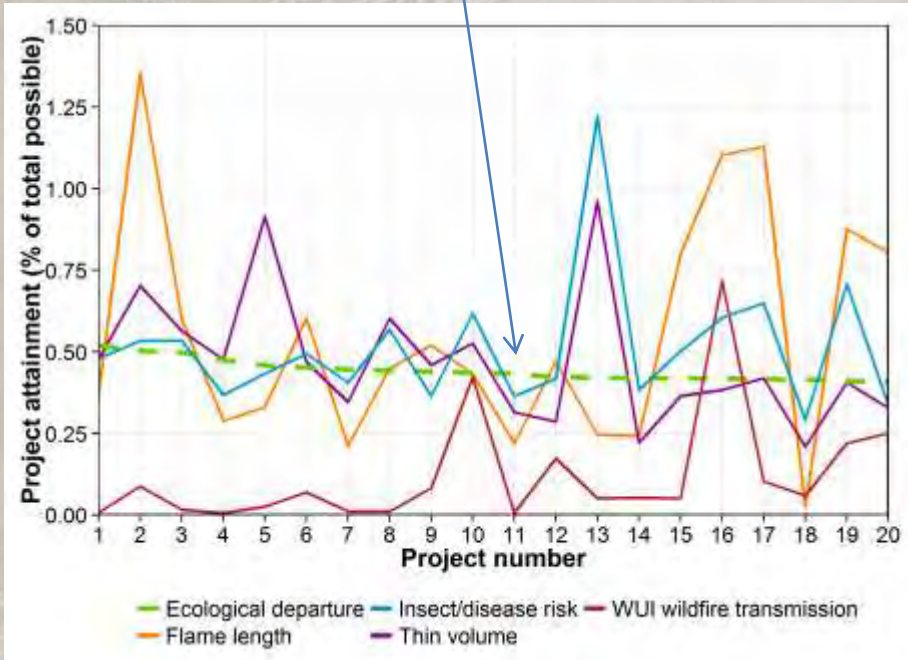
Is it worthwhile prioritizing projects?

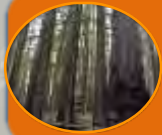
- Depends on the restoration goal

WUI fire transmission



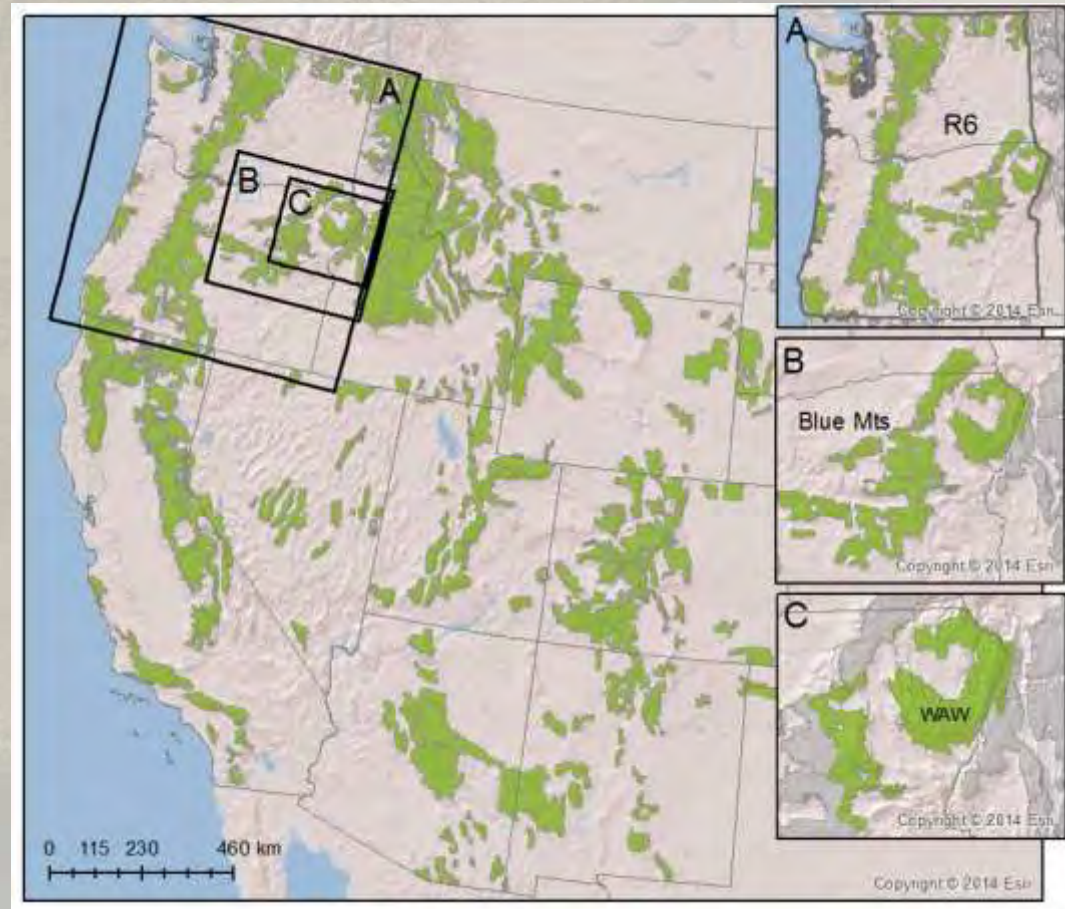
Ecological departure



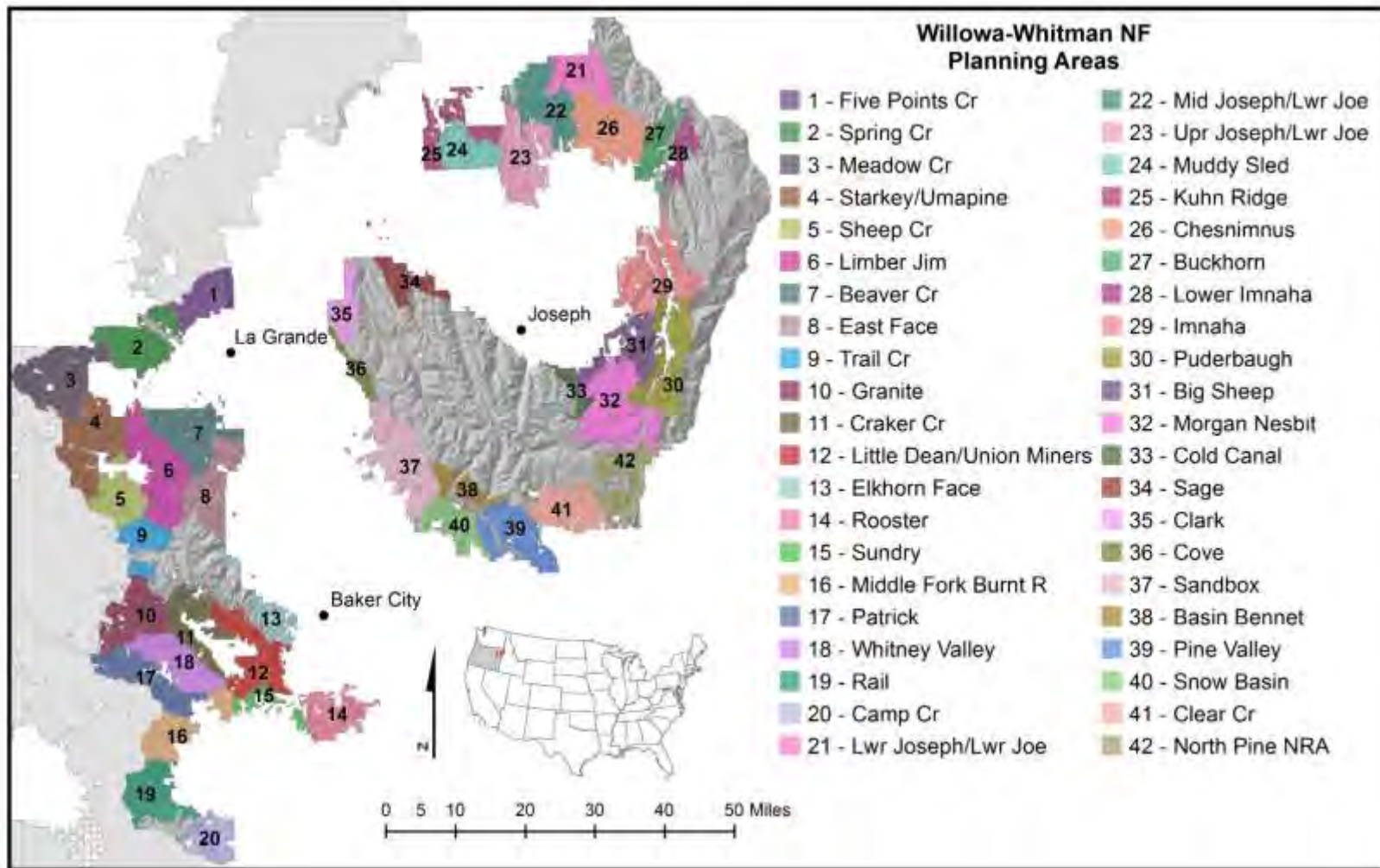


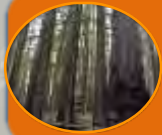
Experiments

- Four scales
 - Wallowa Whitman NF
 - Blue Mountains (4 forests)
 - Region 6
 - Western national forests
- Create a “restoration planning framework” - a container for the analyses

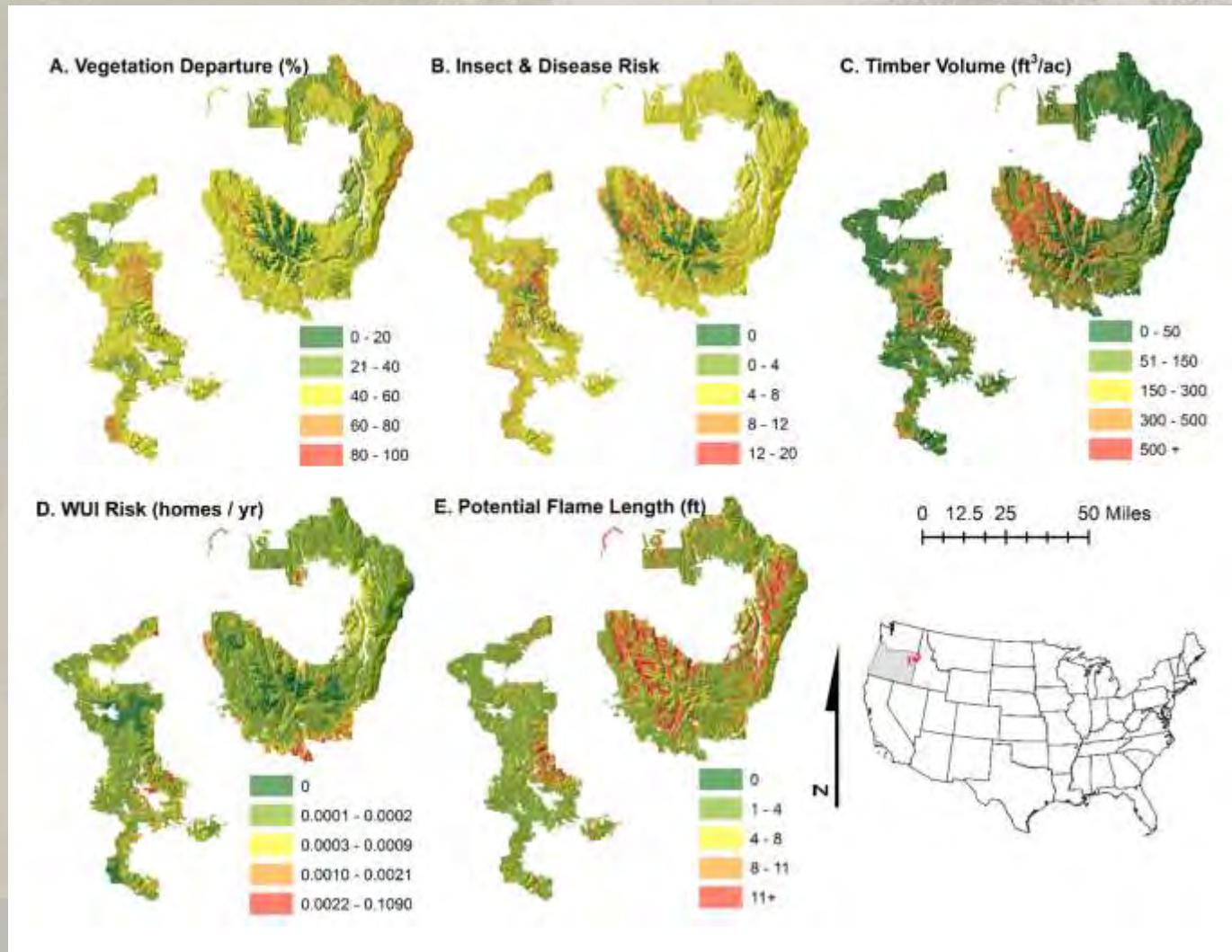


Wallowa Whitman Planning Areas





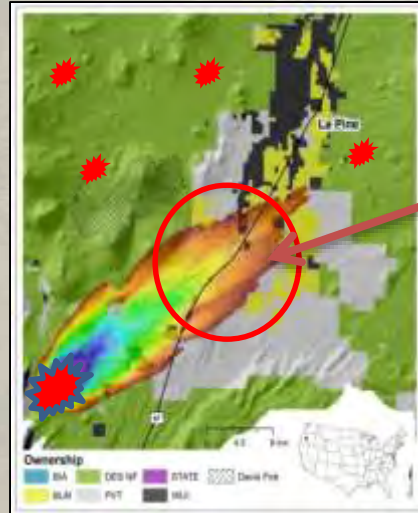
Wallowa Whitman Project - Data





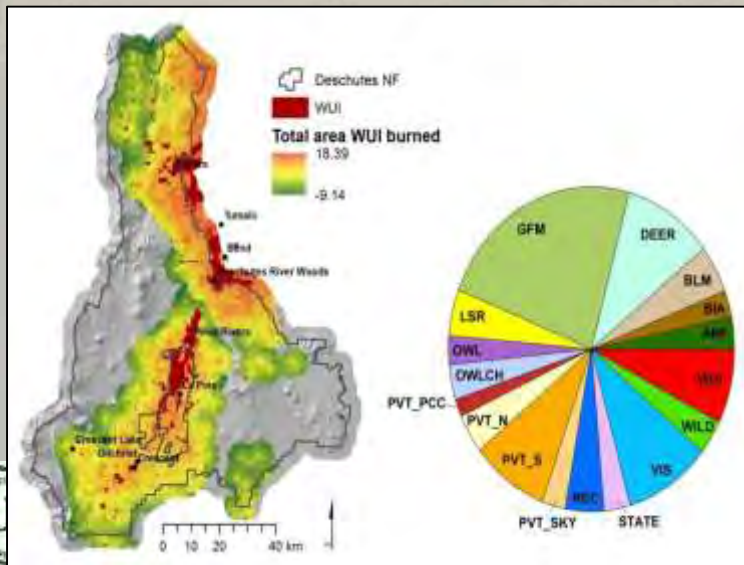
Fire transmission to the WUI

- Fire transmission is quantified with simulation modeling

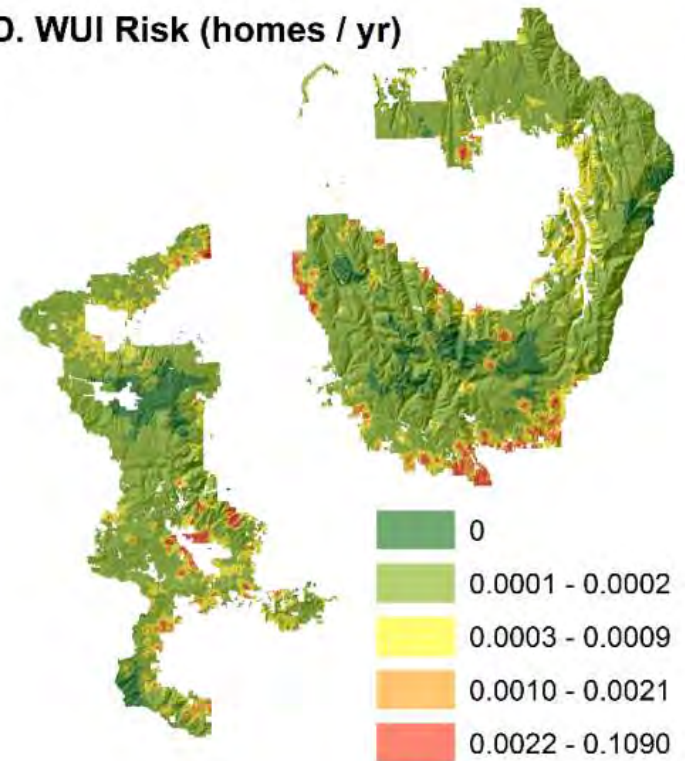


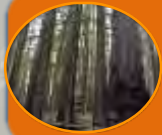
Area of WUI burned by FS ignition

- Deschutes NF firesheds



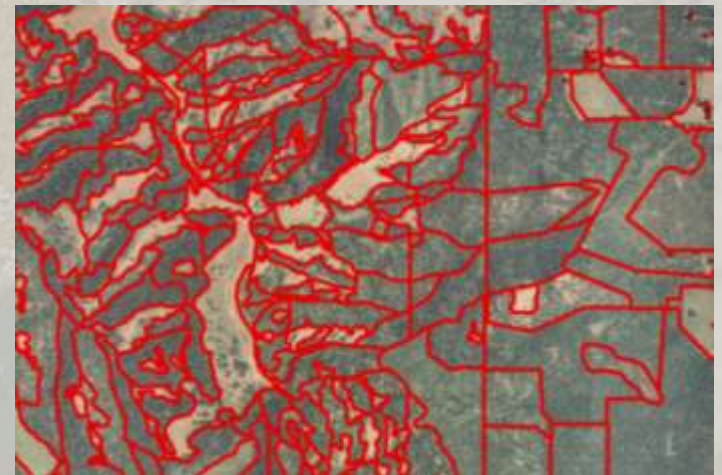
D. WUI Risk (homes / yr)





Prioritization scenario

- For each of the 42 planning areas treat 4000 acres
- Identify the specific stands that optimize each of the objectives (fire risk, thin volume, etc)
- Rank the planning areas for each objective
- Analyze tradeoffs – what does it cost to mix objectives within each planning area?





Rankings by planning area

Project Planning Area	Objective Attainment					Planning Area Rank by Objective				
	Vegetation Departure	Insect Risk	Timber Volume	WUI Risk	Wildfire Hazard	Vegetation Departure	Insect Risk	Timber Volume	WUI Risk	Wildfire Hazard
1 Five Points Cr	0.31	0.42	1,007,013	2.10	1.52	31	18	22	10	12
2 Spring Cr	0.32	0.33	977,380	1.13	0.24	27	34	25	18	41
3 Meadow Cr	0.32	0.35	573,251	0.69	0.32	29	28	36	24	38
4 Starkey/Umapine	0.31	0.38	384,798	0.75	0.68	33	26	38	23	29
5 Sheep Cr	0.37	0.47	862,246	0.01	0.50	9	11	27	41	32
6 Limber Jim	0.42	0.60	2,223,890	0.39	0.94	3	2	5	30	26
7 Beaver Cr	0.45	0.55	1,620,439	0.32	1.15	1	4	12	36	23
8 East Face	0.43	0.67	3,075,049	0.54	1.40	2	1	1	27	14
9 Trail Cr	0.36	0.47	1,383,829	0.01	0.22	10	12	15	42	42
10 Granite	0.34	0.52	1,135,450	0.55	0.88	19	7	18	26	27
11 Craker Cr	0.33	0.48	1,405,336	3.71	1.58	23	10	14	6	10
12 Little Dean/Union Miners	0.36	0.38	985,626	2.10	1.62	12	24	23	11	9
13 Elkhorn Face	0.38	0.41	1,709,455	5.77	1.68	7	20	10	2	8
14 Rooster	0.35	0.35	695,122	0.64	1.24	14	30	32	25	17
15 Sundry	0.30	0.31	330,151	1.12	0.26	35	38	40	19	39
16 Middle Fork Burnt R	0.32	0.43	730,408	1.70	0.38	26	16	31	14	36
17 Patrick	0.34	0.52	750,439	0.34	0.35	18	6	29	34	37
18 Whitney Valley	0.31	0.40	650,620	1.21	0.46	34	22	33	16	34
19 Rail	0.42	0.48	1,793,407	0.86	1.09	4	9	7	21	24
20 Camp Cr	0.32	0.33	378,971	1.21	1.21	24	35	39	17	20
21 Lwr Joseph/Lwr Joe	0.27	0.32	610,533	0.23	1.37	42	36	34	37	15
22 Mid Joseph/Lwr Joe	0.31	0.32	743,518	0.22	1.22	30	37	30	38	18
23 Upr Joseph/Lwr Joe	0.28	0.27	595,186	2.86	1.07	40	40	35	7	25
24 Muddy Sled	0.28	0.34	949,313	0.08	1.52	41	31	26	40	11
25 Kuhn Ridge	0.29	0.34	1,139,136	0.44	1.17	39	33	17	29	22
26 Chesnimus	0.32	0.34	566,412	0.38	0.72	28	32	37	32	28
27 Buckhorn	0.30	0.29	49,800	0.39	0.57	36	39	41	31	31
28 Lower Innaha	0.35	0.27	16,487	0.34	0.45	15	41	42	33	35
29 Innaha	0.40	0.40	1,748,270	0.89	2.05	5	21	9	20	2
30 Puderbaugh	0.34	0.40	1,049,079	0.44	2.11	20	23	20	28	1
31 Big Sheep	0.32	0.35	770,193	0.84	2.00	25	29	28	22	3
32 Morgan Nesbit	0.33	0.46	1,708,291	0.33	1.96	21	13	11	35	4
33 Cold Canal	0.34	0.24	977,887	1.99	0.25	16	42	24	12	40
34 Sage	0.29	0.57	2,564,283	2.42	1.88	37	3	3	9	5
35 Clark	0.29	0.53	2,030,018	4.44	0.50	38	5	6	4	33
36 Cove	0.31	0.46	2,402,144	2.66	1.30	32	14	4	8	16





Planning area rank by objective

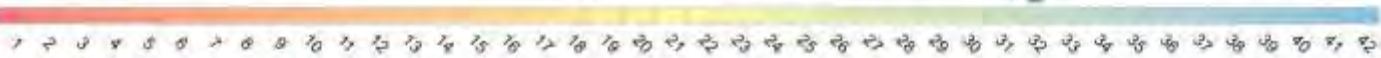
A. Vegetation Departure



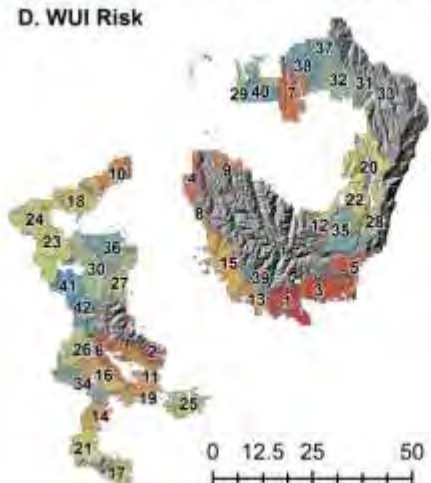
B. Insect Risk



C. Timber Volume



D. WUI Risk



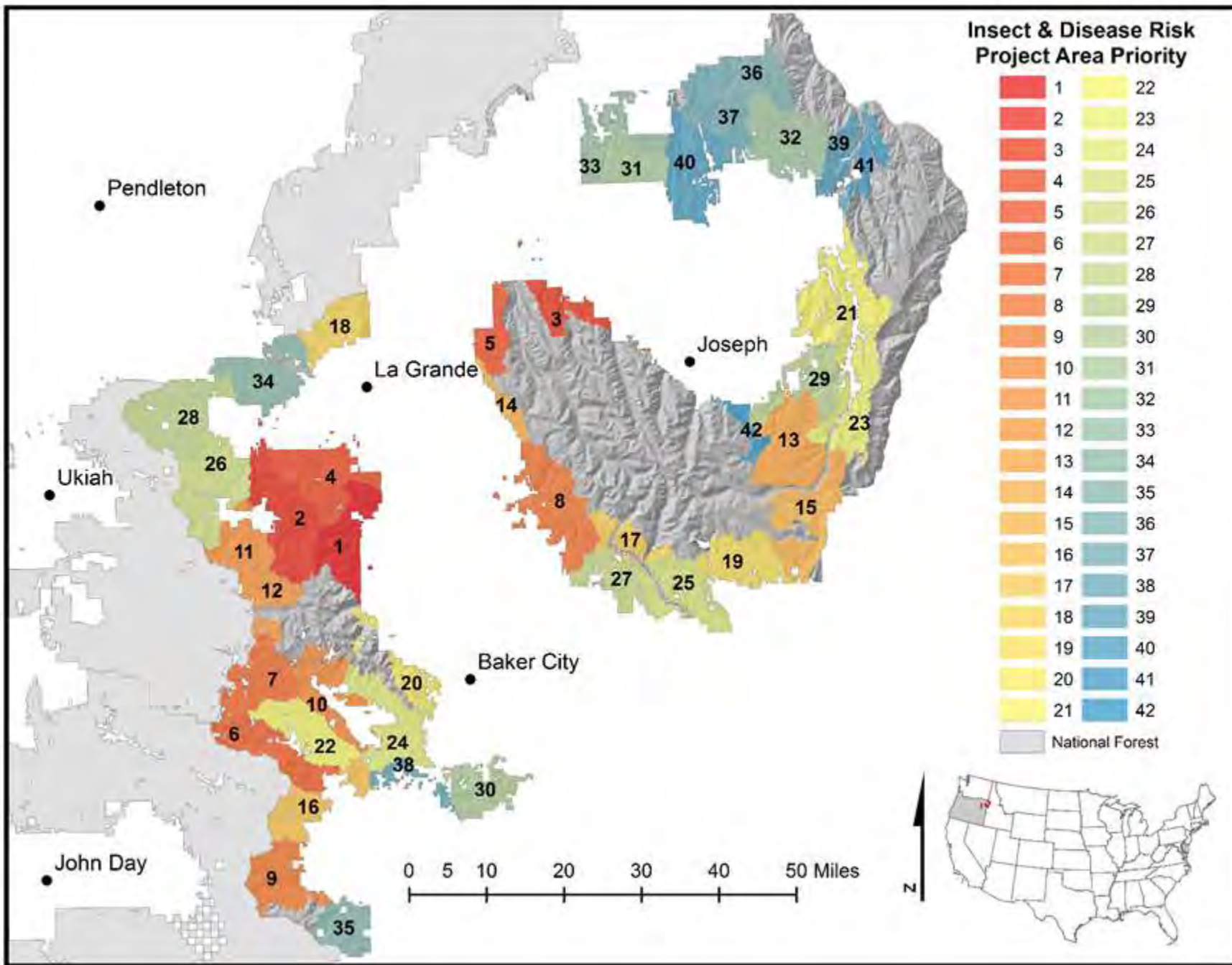
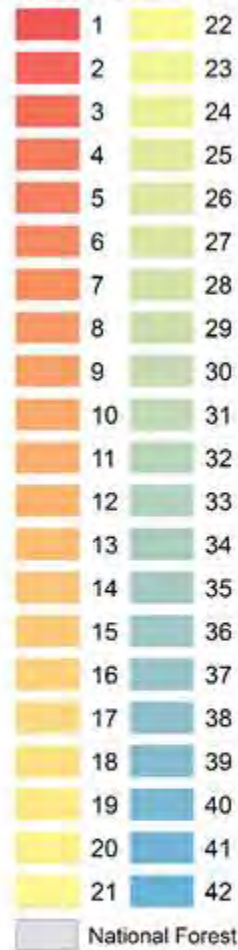
E. Potential Flame length



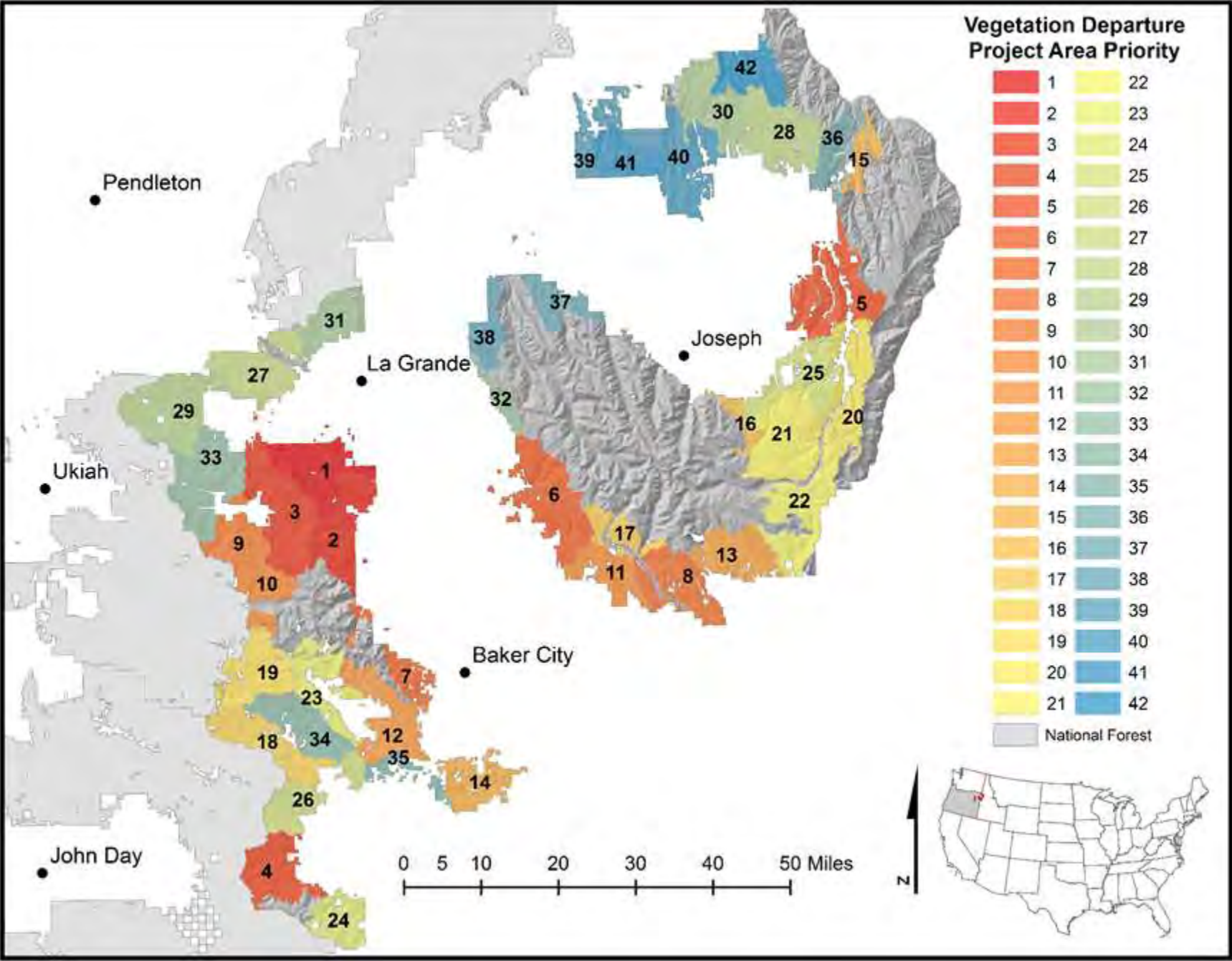
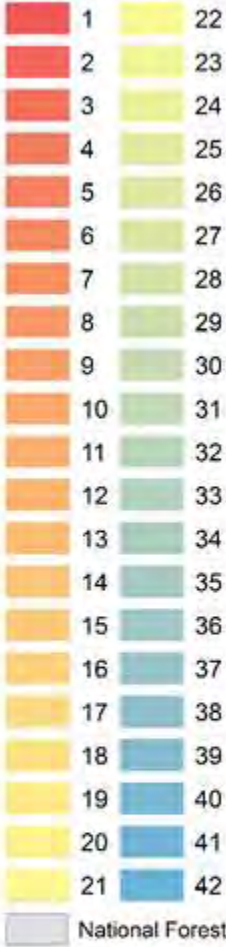
0 12.5 25 50 Miles



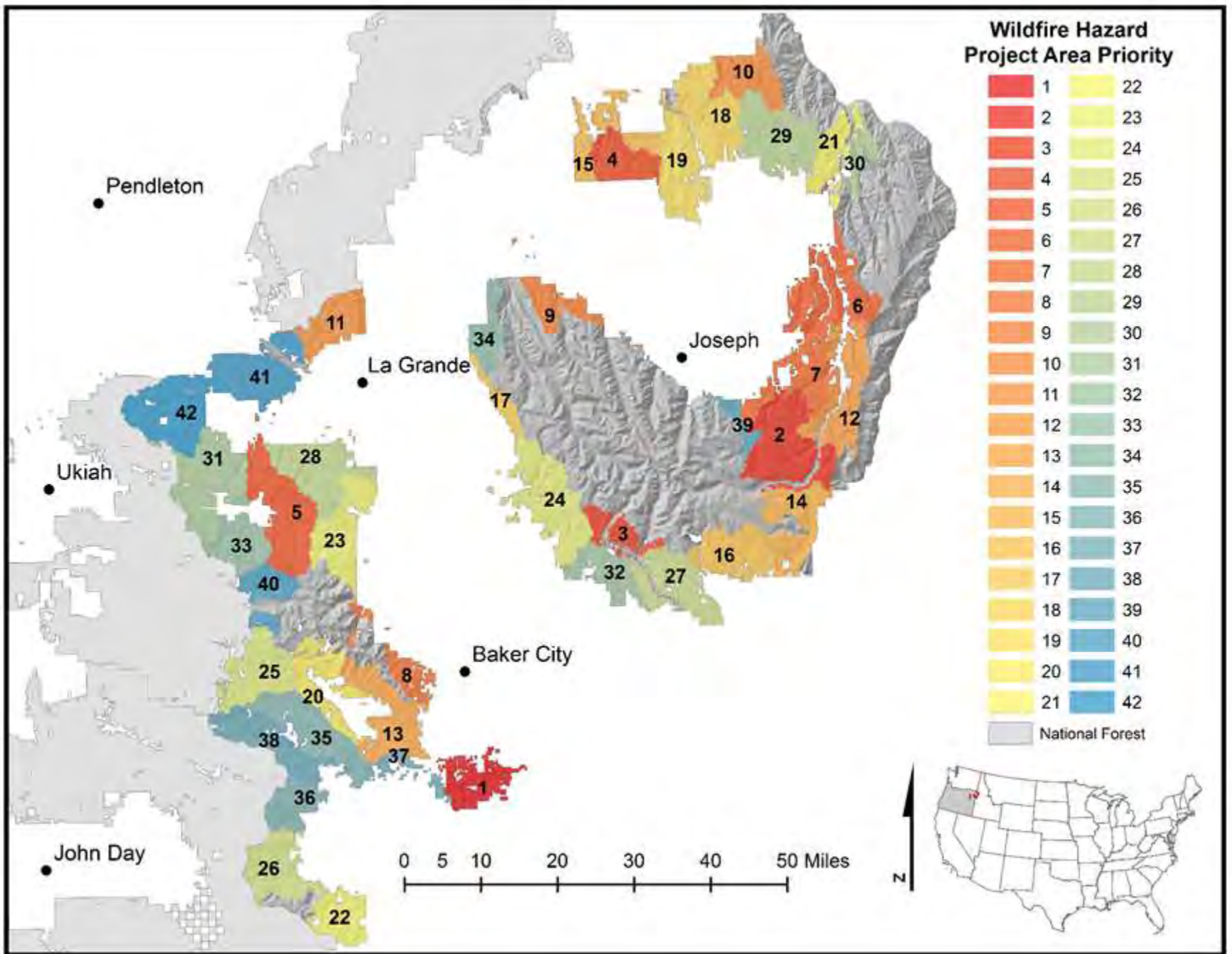
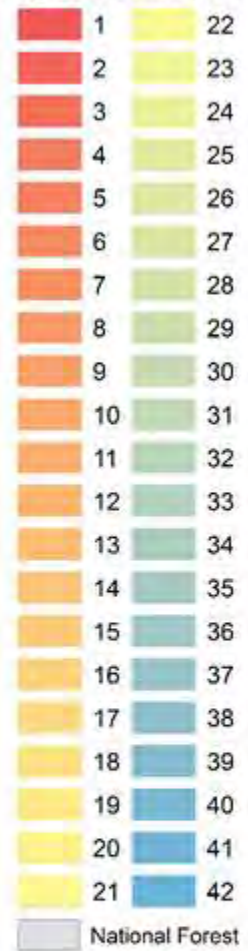
Insect & Disease Risk Project Area Priority

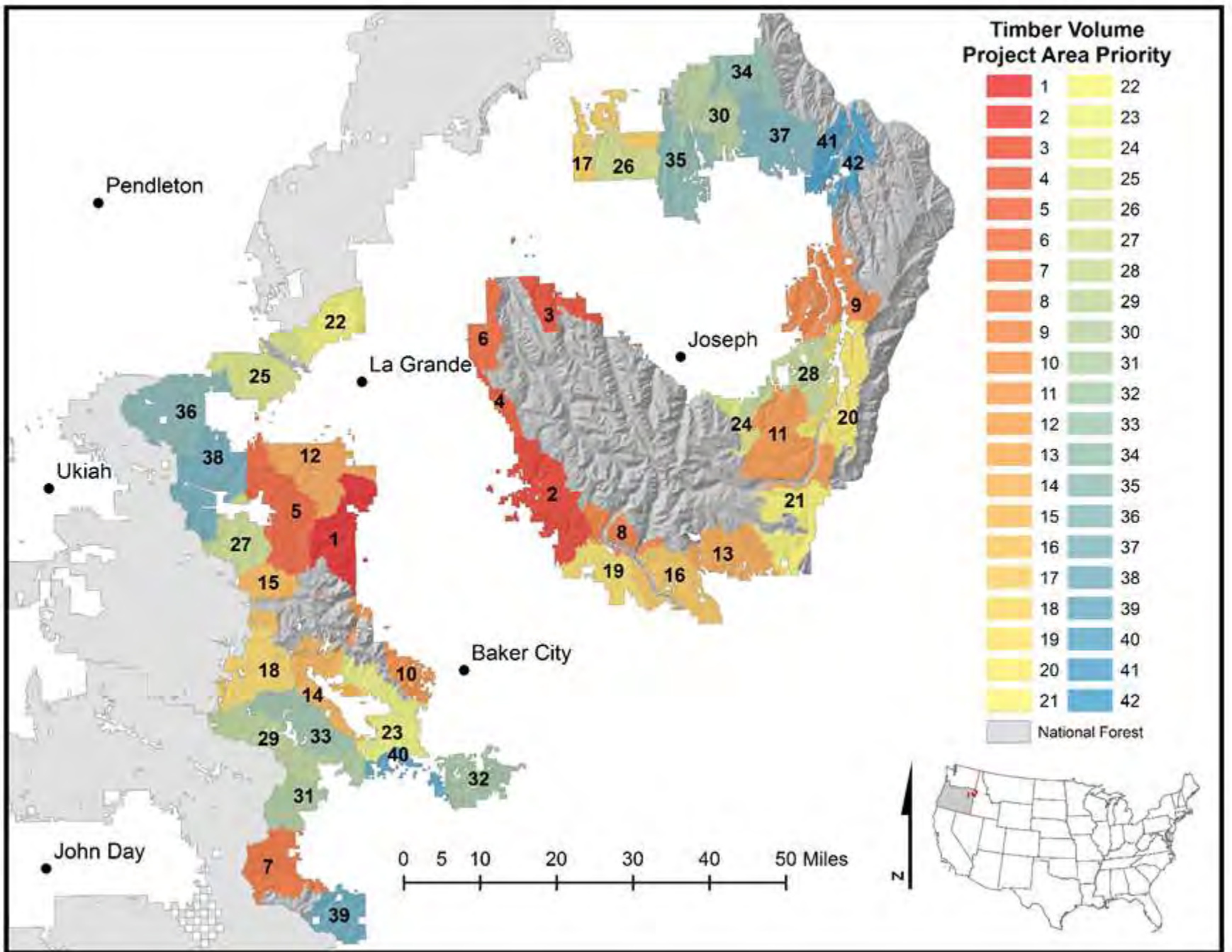


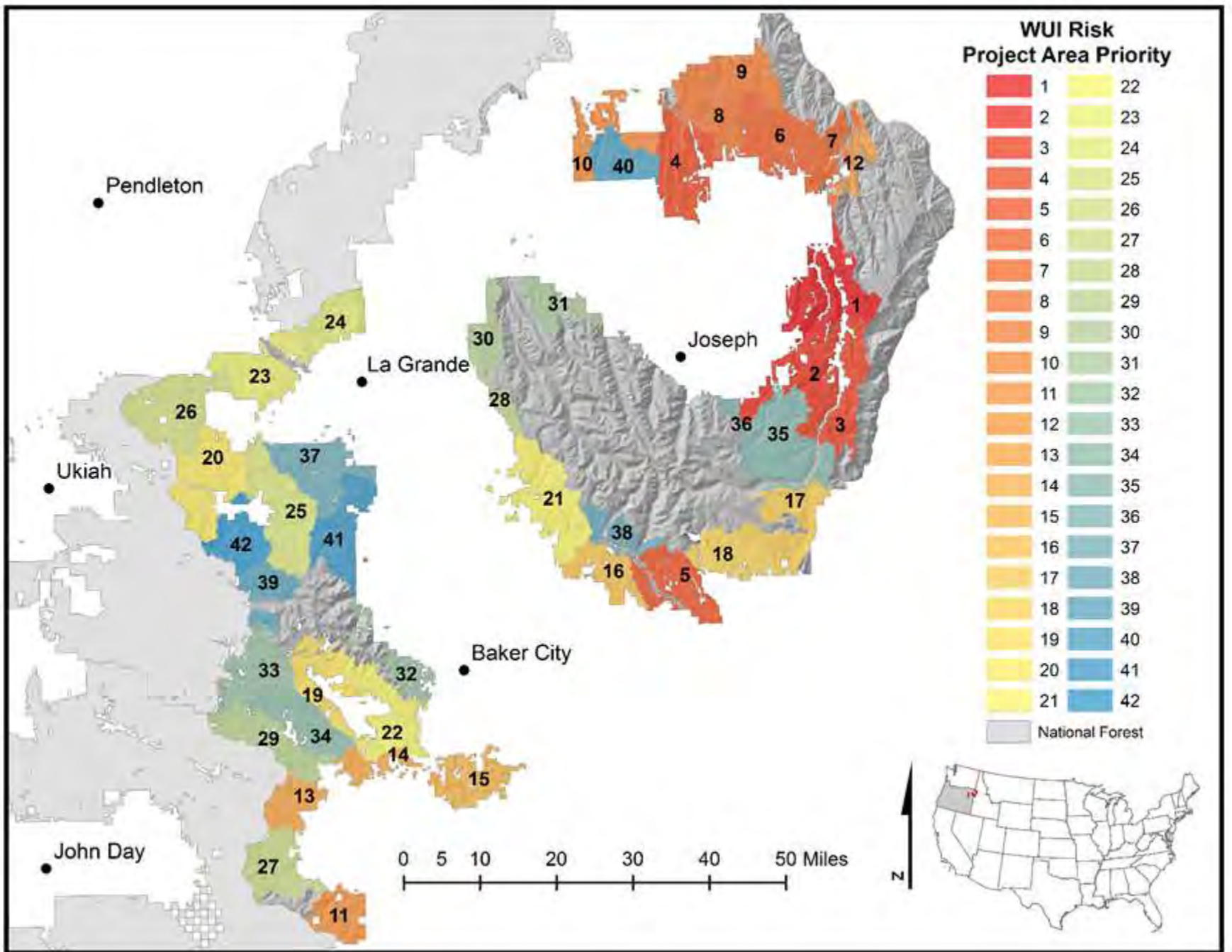
Vegetation Departure Project Area Priority



Wildfire Hazard Project Area Priority



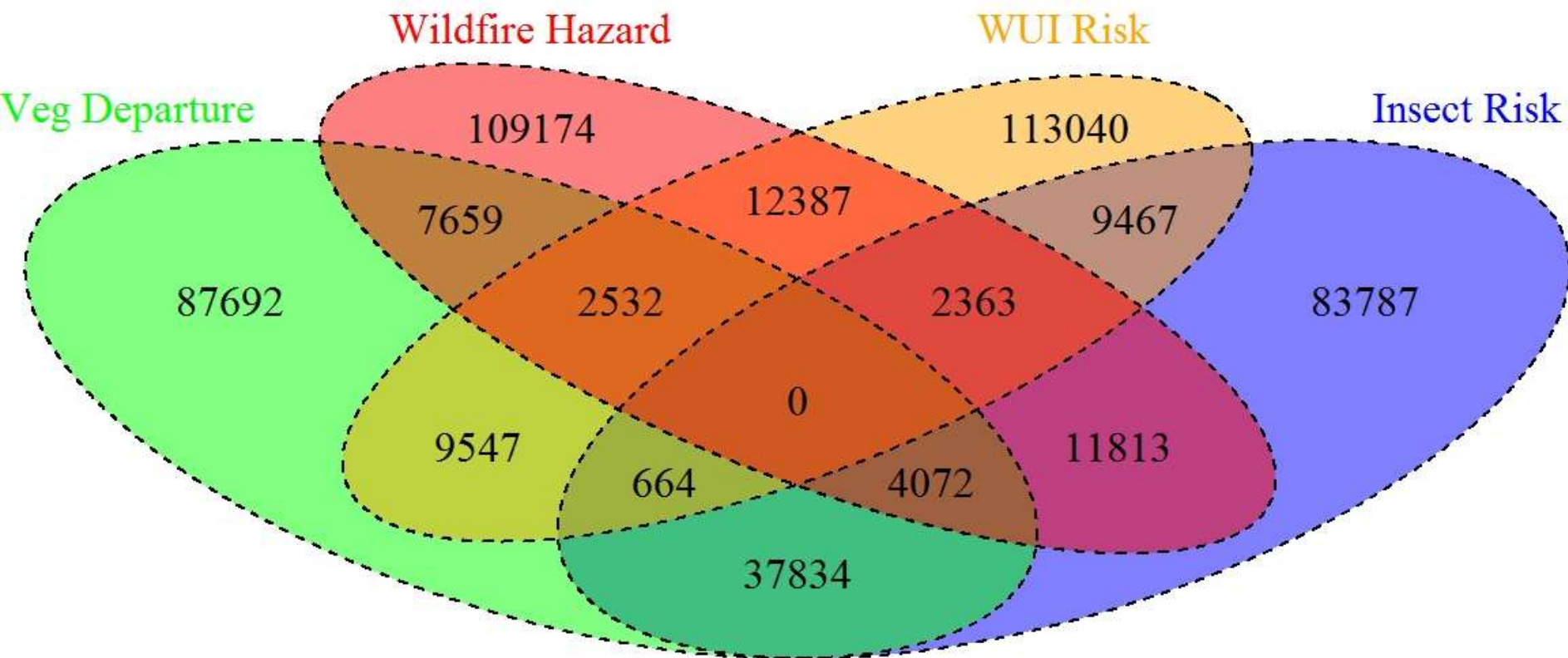






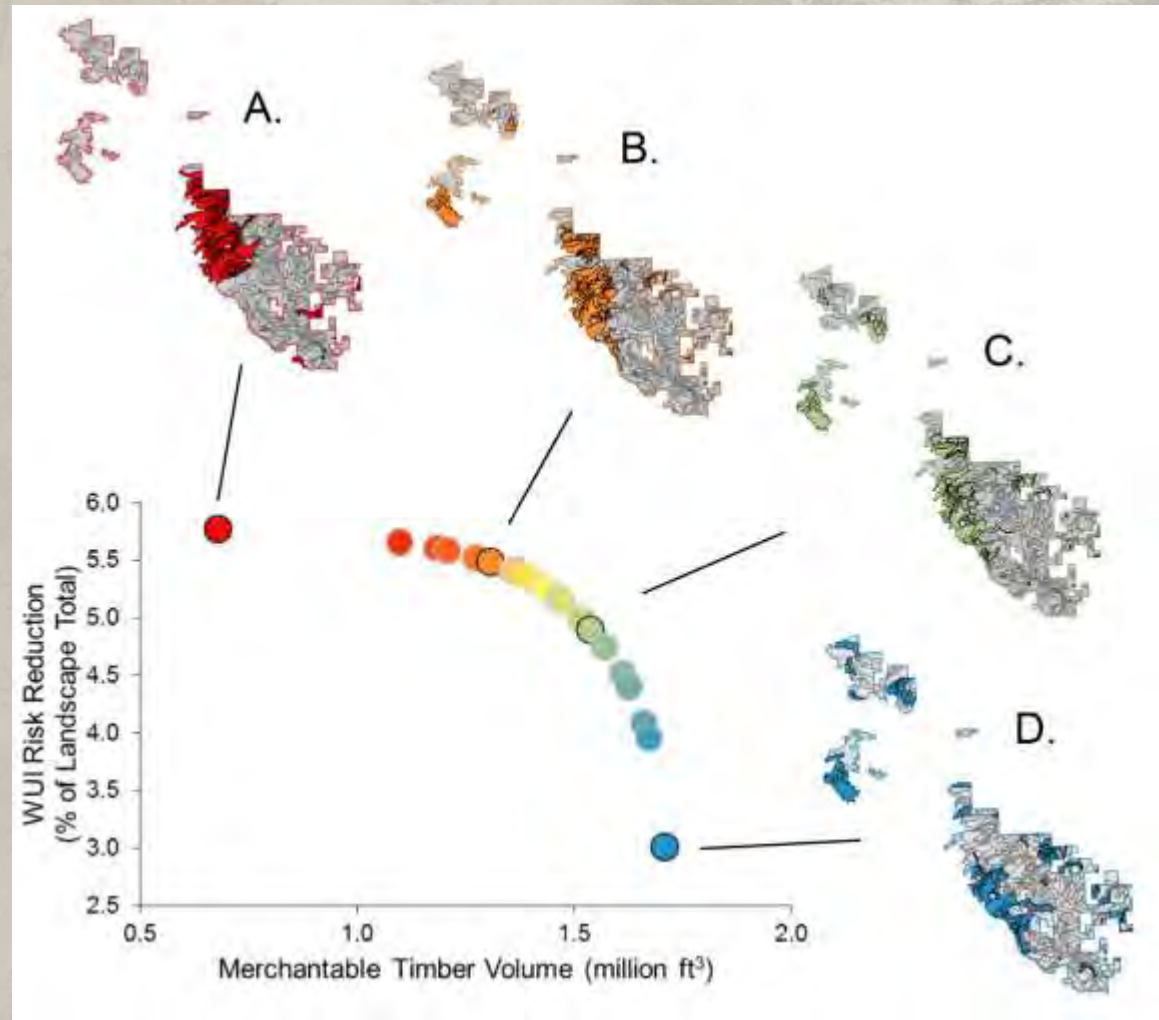
Overlap of restoration objectives

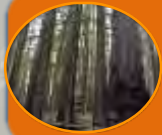
- Overlap of 150k acres of the highest problem area for each objective



Tradeoffs for a single planning area

Elkhorn face PA13





Tradeoffs by planning area

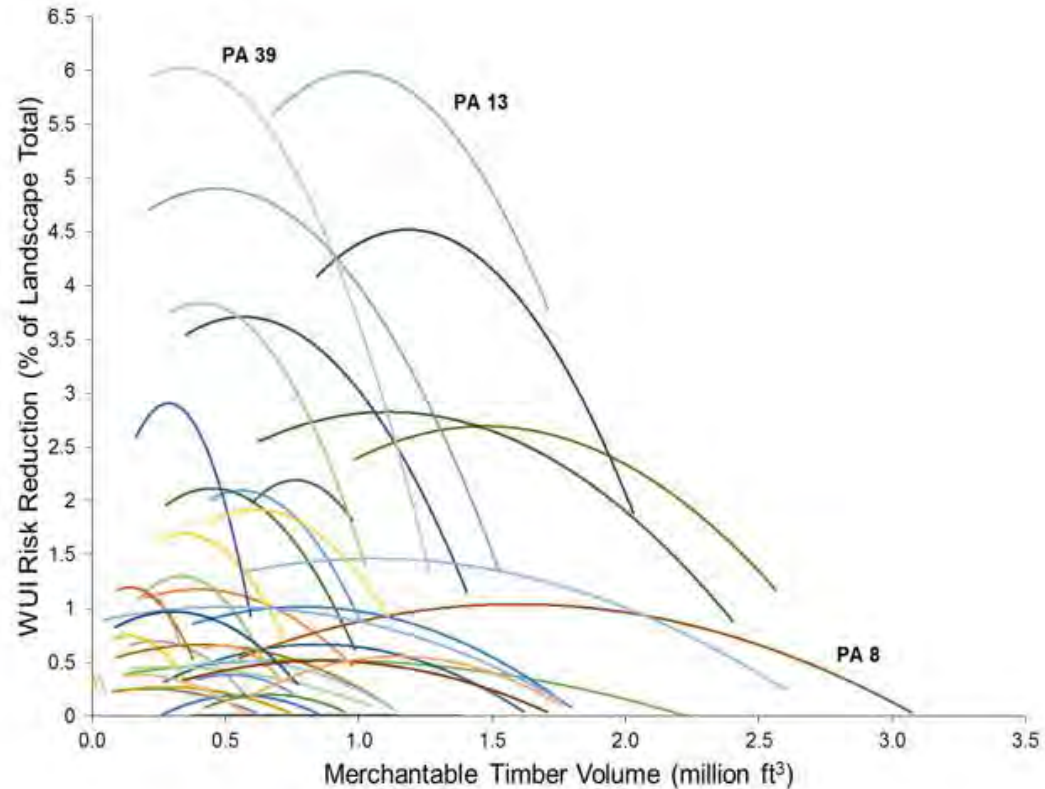


Figure 15. PPF curve of the tradeoff between restoration projects that prioritize the reduction of wildfire risk to the WUI to the production of timber volume grouped by the 42 planning areas within the Wallowa-Whitman National Forest. Elkhorn Face (PA13) and Pine Valley (PA39) planning areas achieved the highest possible attainment in WUI risk reduction, while East Face (PA8) achieved the highest level of timber production at the high cost of, and loss of opportunity, for WUI risk reduction.





Tradeoffs by planning area

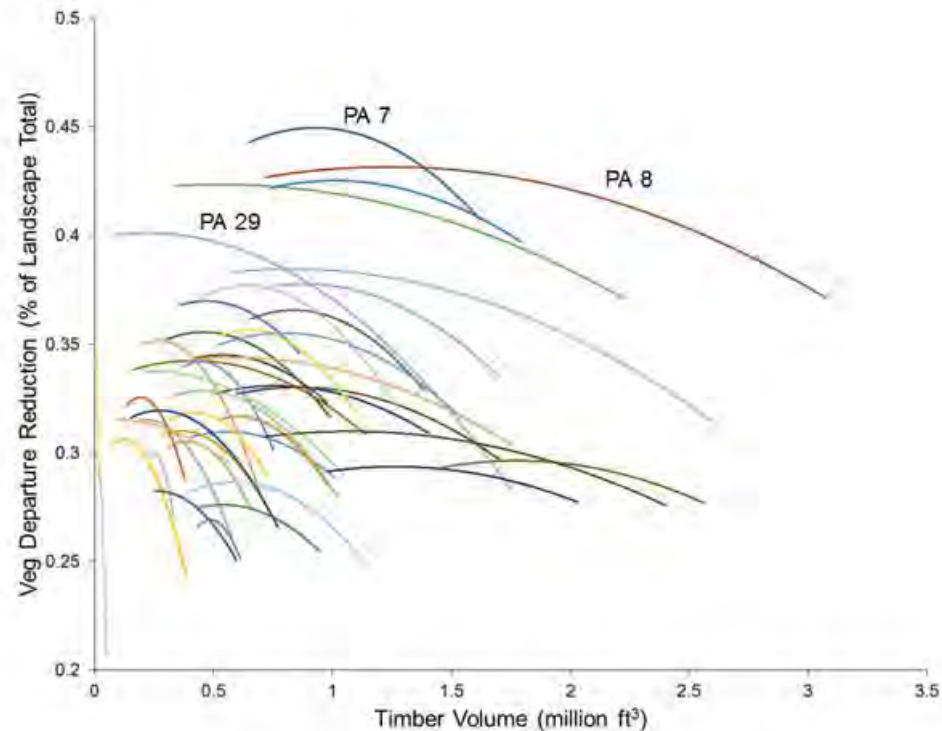
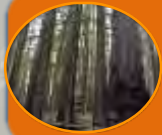


Figure 13. PPF curve of the tradeoff between restoration projects that prioritize the reduction of vegetation departure to the production of timber volume grouped by the 42 planning areas (PA) within the Wallowa-Whitman National Forest. Beaver Creek (PA7) and East Face (PA8) planning areas had the two highest levels of objective attainment. A steeper tradeoff relationship was seen in Imnaha (PA29) with a steep loss in restoration of vegetation departure as timber volume increased. The marginal opportunity cost of increasing timber production was greater (resulted in less restoration of vegetation departure) than in Beaver Creek or East Face.





Tradeoffs by planning area

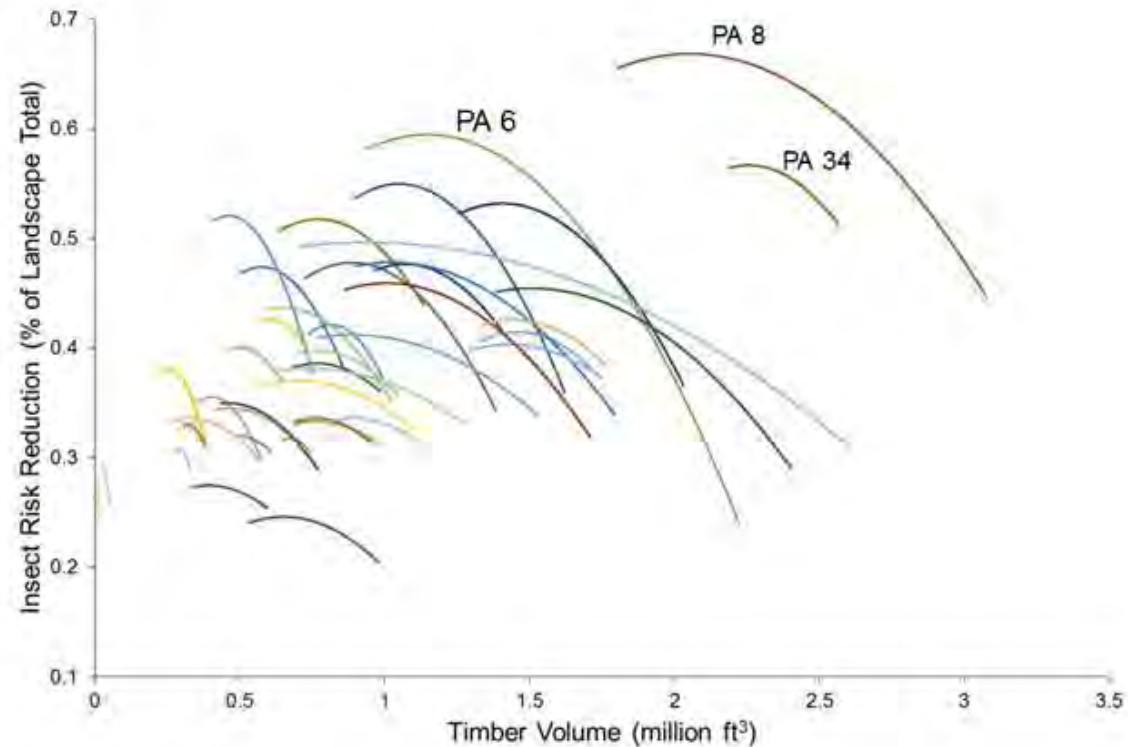


Figure 14. PPF curve of the tradeoff between restoration projects that prioritize the reduction of insect risk to the production of timber volume grouped by the 42 planning areas (PA) within the Wallowa-Whitman National Forest. East Face (PA8), Sage (PA34) and Limber Jim (PA6) planning areas have the highest possible levels of attainment for the two objective variables.





Tradeoffs by planning area

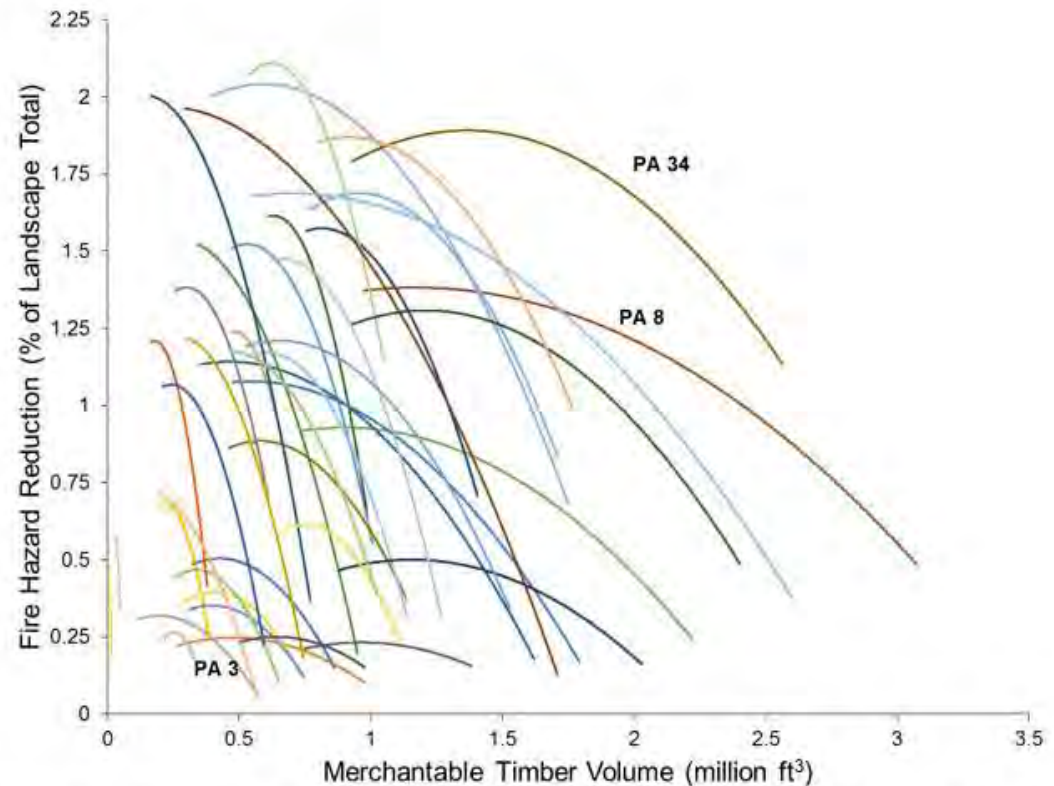
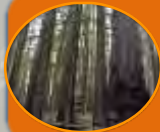
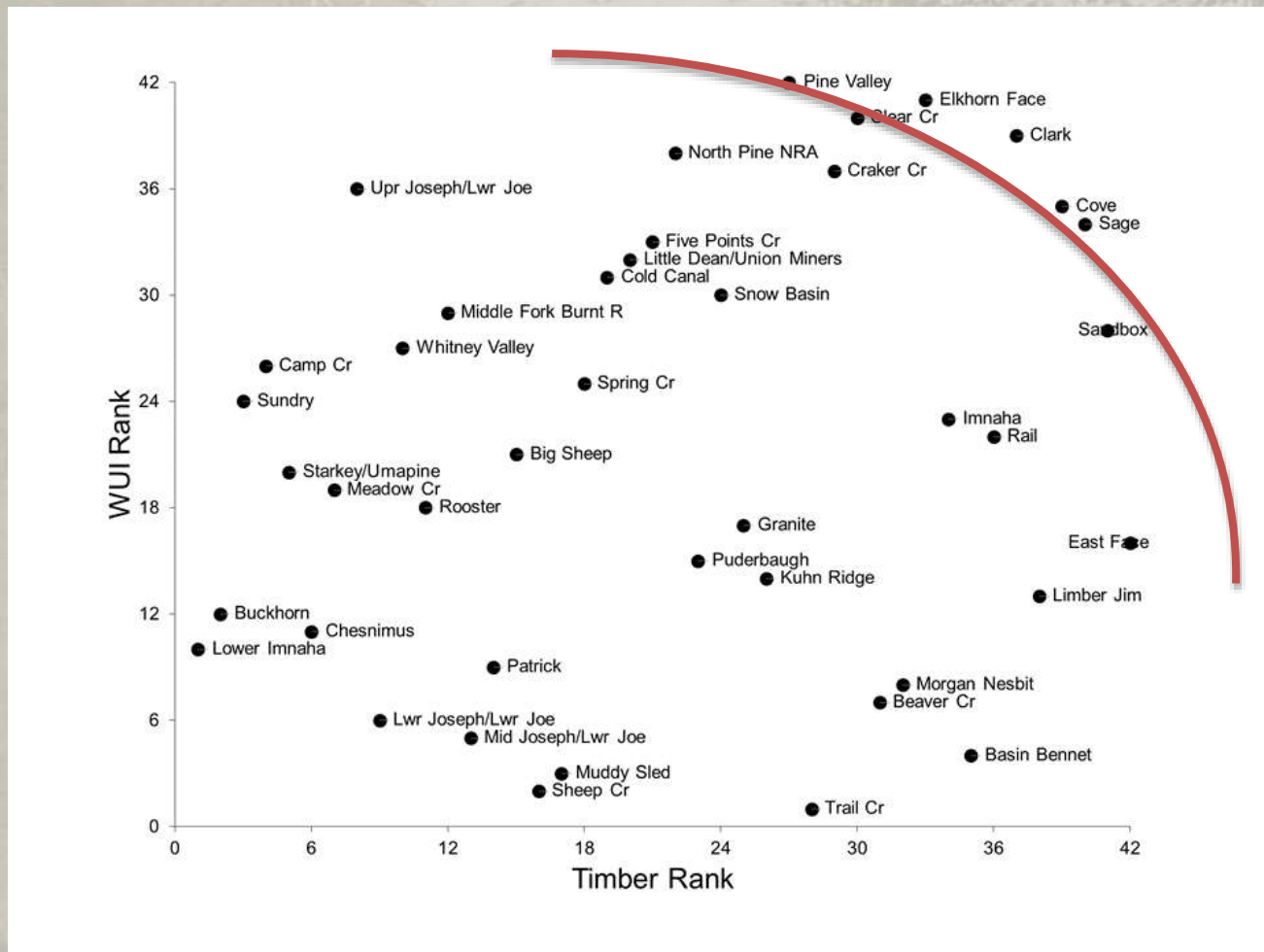


Figure 16. PPF curve of the tradeoff between restoration projects that prioritize the reduction of wildfire hazard to the production of timber volume grouped by the 42 planning areas (PA) within the Wallowa-Whitman National Forest. Sage (PA34) and East Face (PA8) planning areas produced the greatest volume of timber while also maximizing wildfire hazard reduction. Meadow Creek (PA3) represents an area where there were very few choices in regards to both timber production and wildfire hazard reduction and could be considered a low restoration priority.





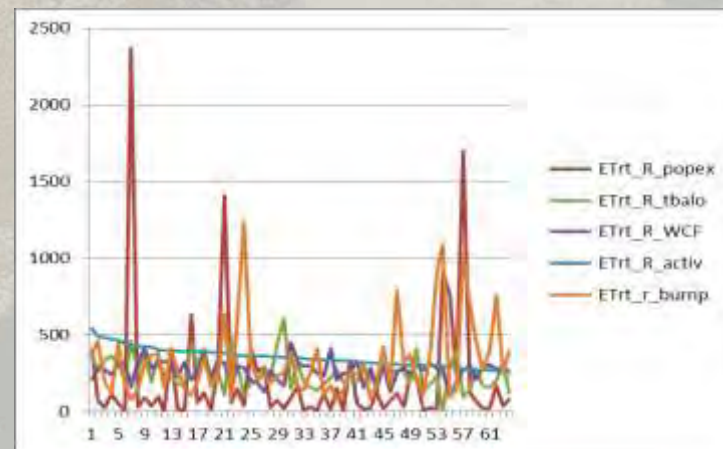
Production frontier among planning areas

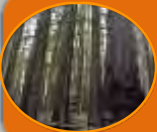




Take home message

- Analysis provides a systematic and defensible approach to prioritization
- Stakeholders can see economic principles applied to restoration programs
- Tradeoff analyses demonstrate restoration conflicts and opportunities
- Each planning area has a unique tradeoffs and restoration storyline
- .





Ramping up restoration

