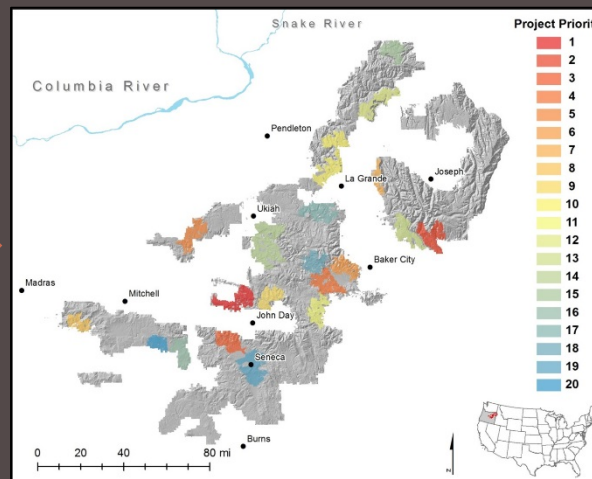
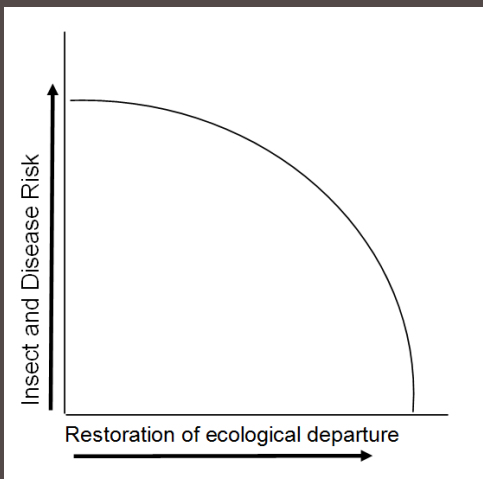


Spatial Optimization of Restoration in Fire Prone Forests: Tradeoffs and Production Possibility Frontiers

Kevin Vogler

Alan Ager, Michelle Day, Stuart Brittain

4 / 27 / 2015

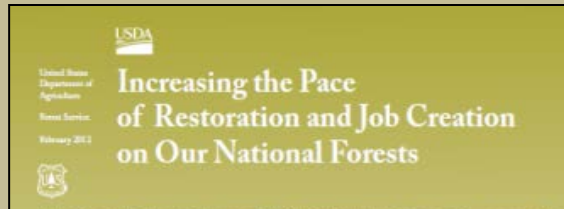


OUTLINE

- **Introduction**
 - Restoration and the USFS
 - Why prioritize treatments?
 - What are PPF curves?
- **Methods**
 - Data inputs
 - LTD Model
- **Preliminary Findings**
 - Tradeoff Curves
 - Evaluating USFS Projects
- **Future Work**



USFS AND FOREST RESTORATION

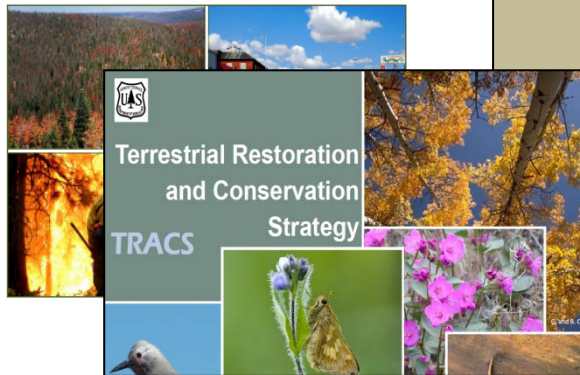


National Forest Health Restoration

An Economic Assessment of
Forest Restoration on
Oregon's Eastside National Forests

Prepared for:
Governor John Kitzhaber and Oregon's Legislative Leaders

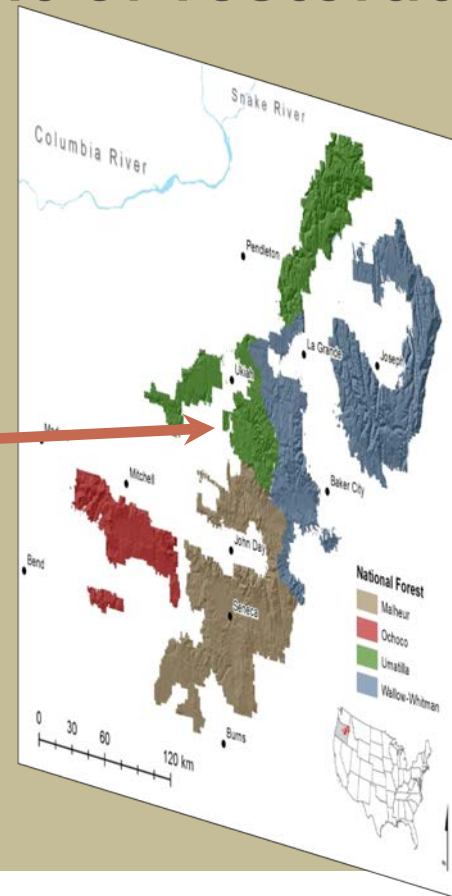
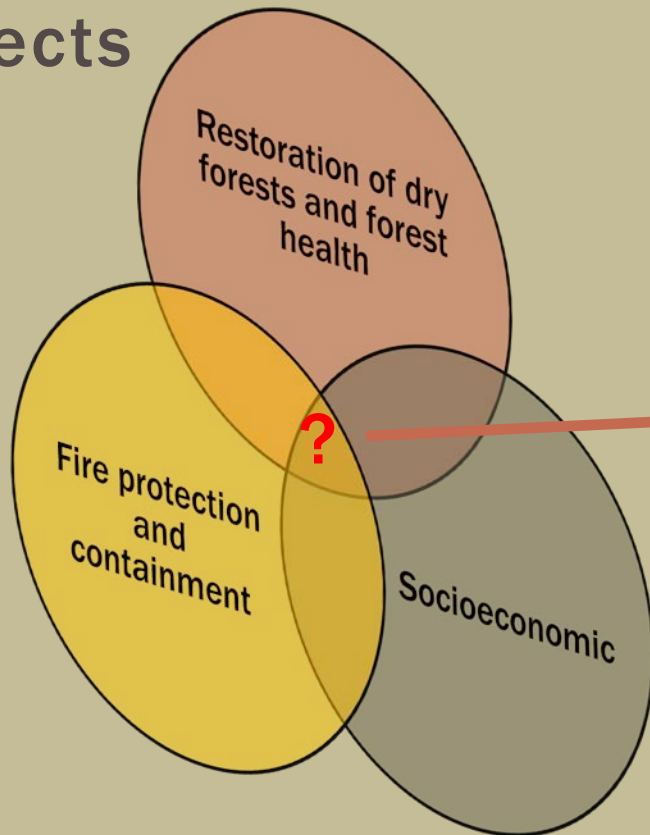
November 26, 2012



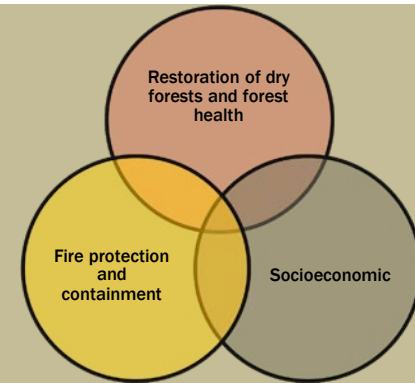
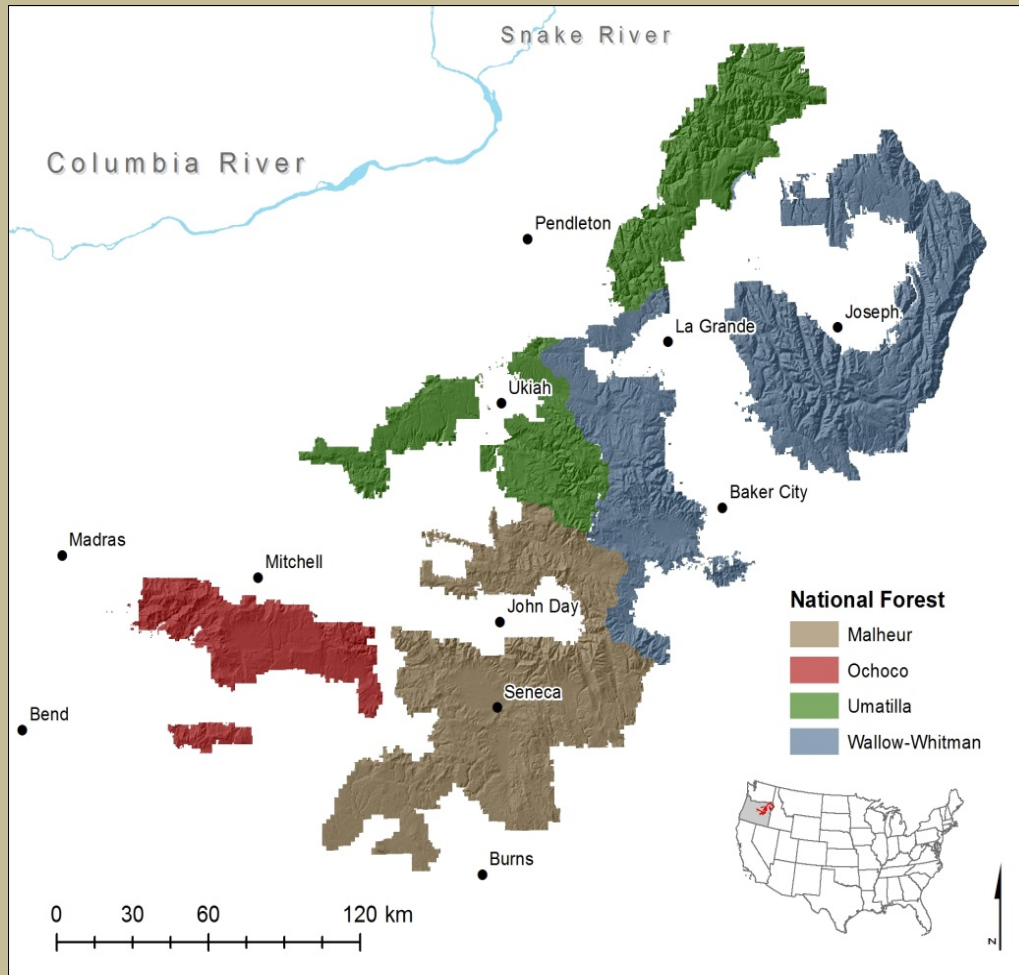
- USFS is currently focusing heavily on restoration
 - (CFLRP, 4FRI)
- New policy documents call for a dramatic increase in the scope and scale of treatments

FOREST RESTORATION GOALS

Multiple goals and landscape conditions complicate the development of restoration projects



QUANTIFYING RESTORATION OBJECTIVES

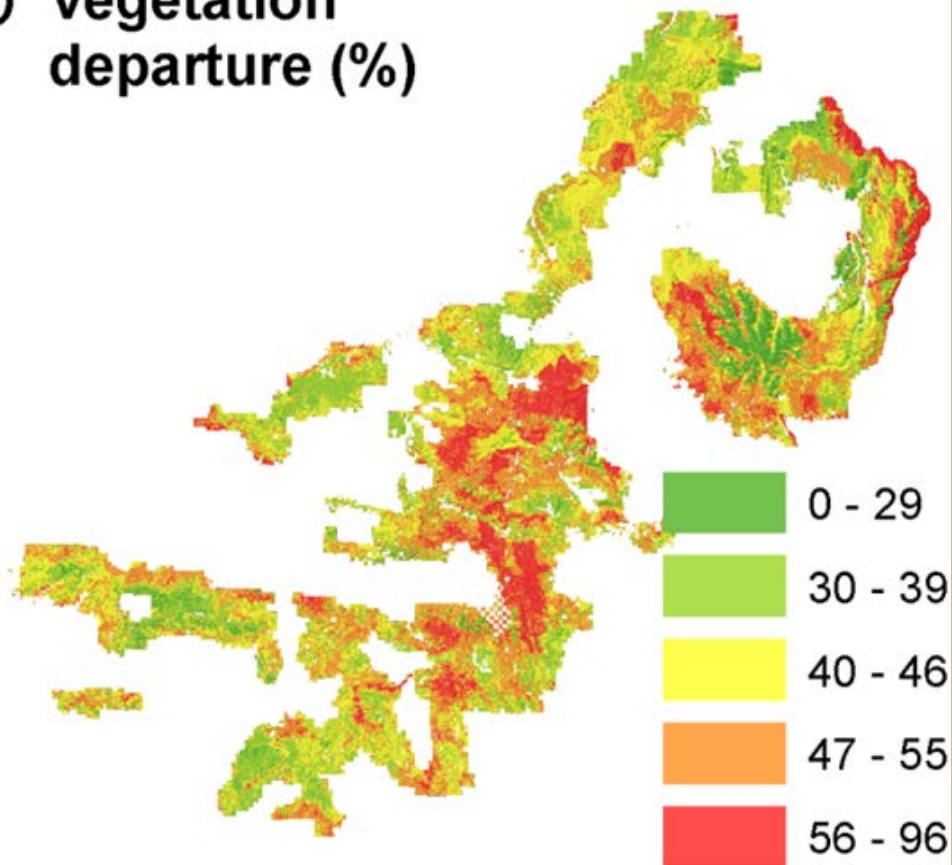


Blue Mountains Oregon:

- Restoration of dry forests and forest health
- Fire Protection and containment
- Socioeconomic

RESTORATION OBJECTIVES

D Vegetation departure (%)



Restoration of dry forests and forest health:

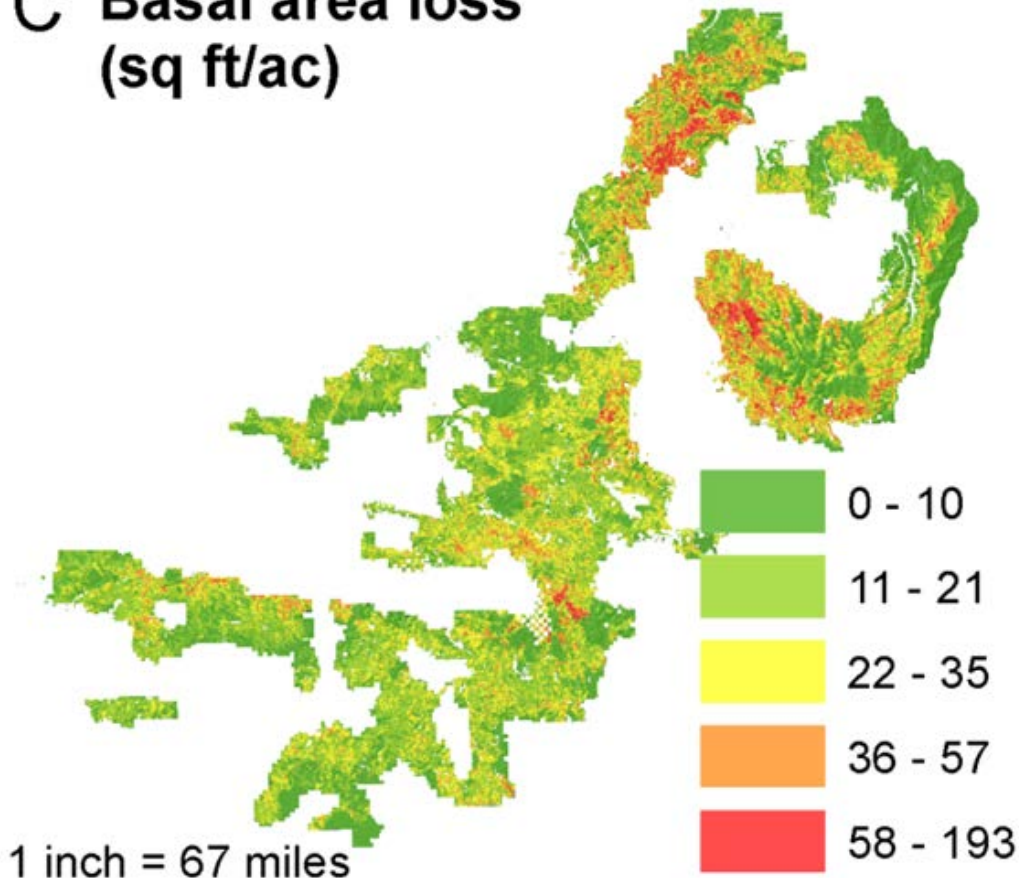
1. Veg Departure

Fire Protection and containment:

Socioeconomic:

RESTORATION OBJECTIVES

**C Basal area loss
(sq ft/ac)**



Restoration of dry forests and forest health:

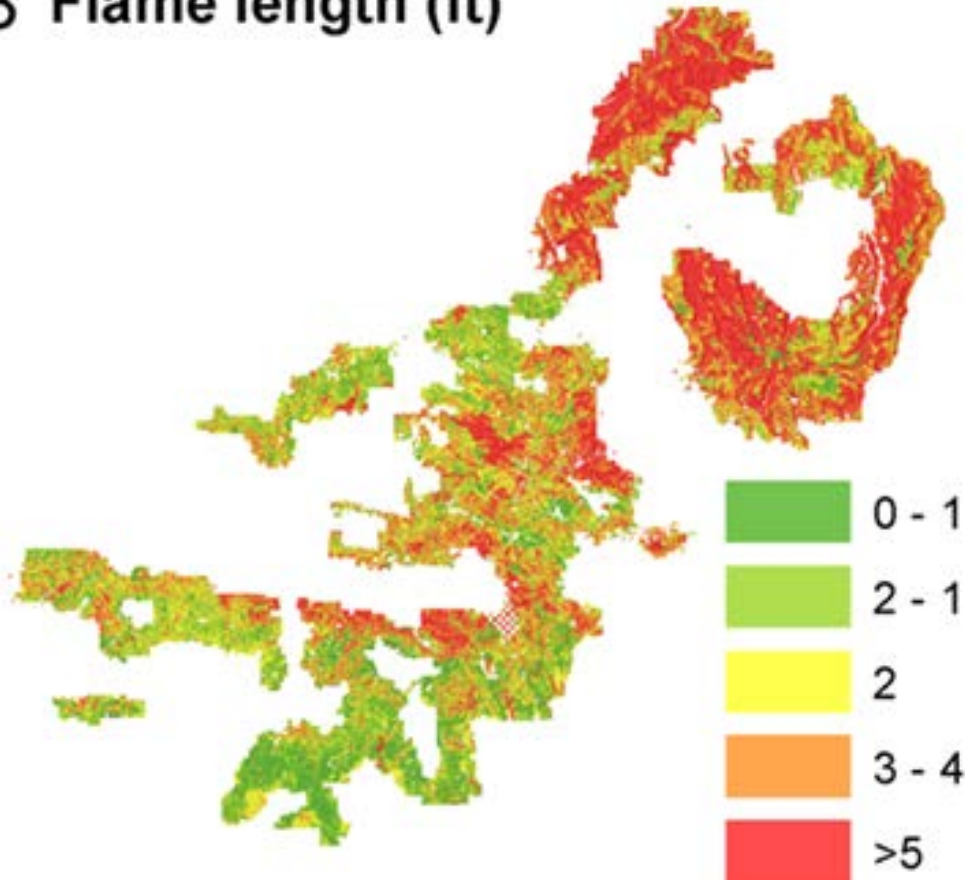
1. Veg Departure
2. Insect and Disease

Fire Protection and containment:

Socioeconomic

RESTORATION OBJECTIVES

B Flame length (ft)



Restoration of dry forests and forest health:

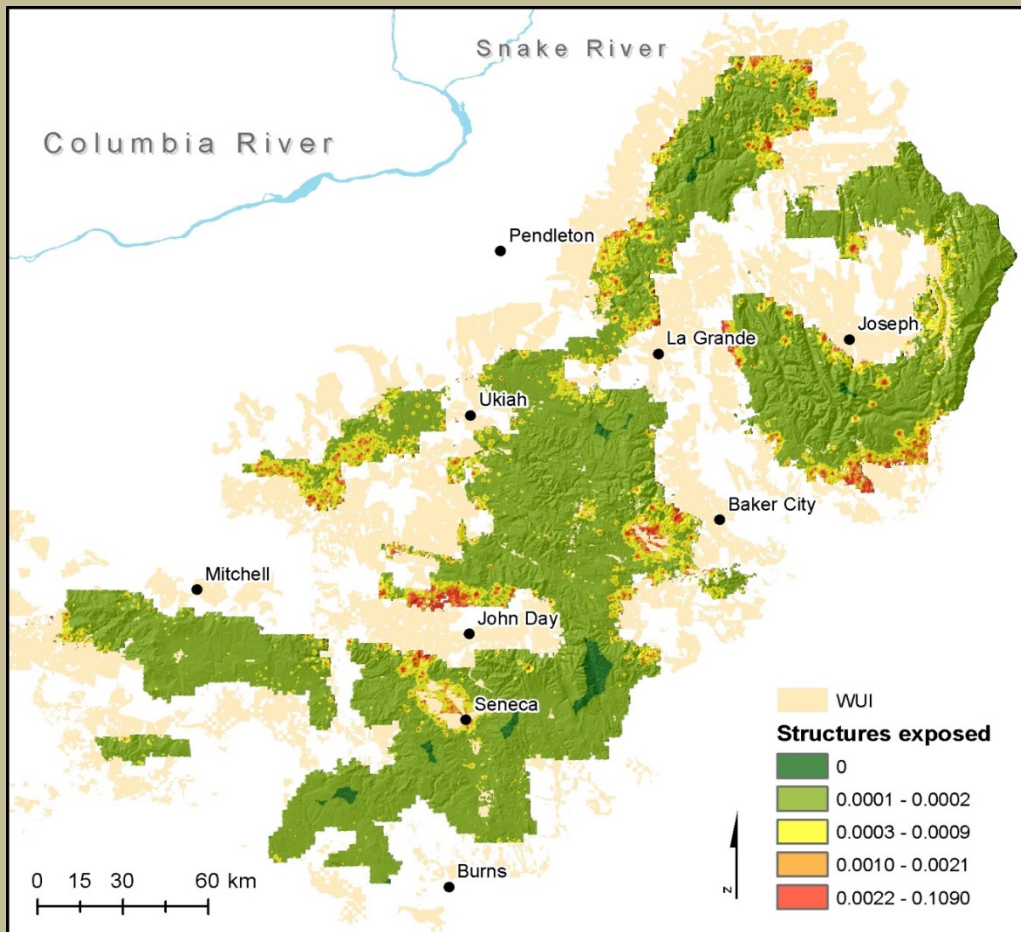
1. Veg Departure
2. Insect and Disease

Fire Protection and containment:

1. Fire Hazard

Socioeconomic

RESTORATION OBJECTIVES



Restoration of dry forests and forest health:

1. Veg Departure
2. Insect and Disease

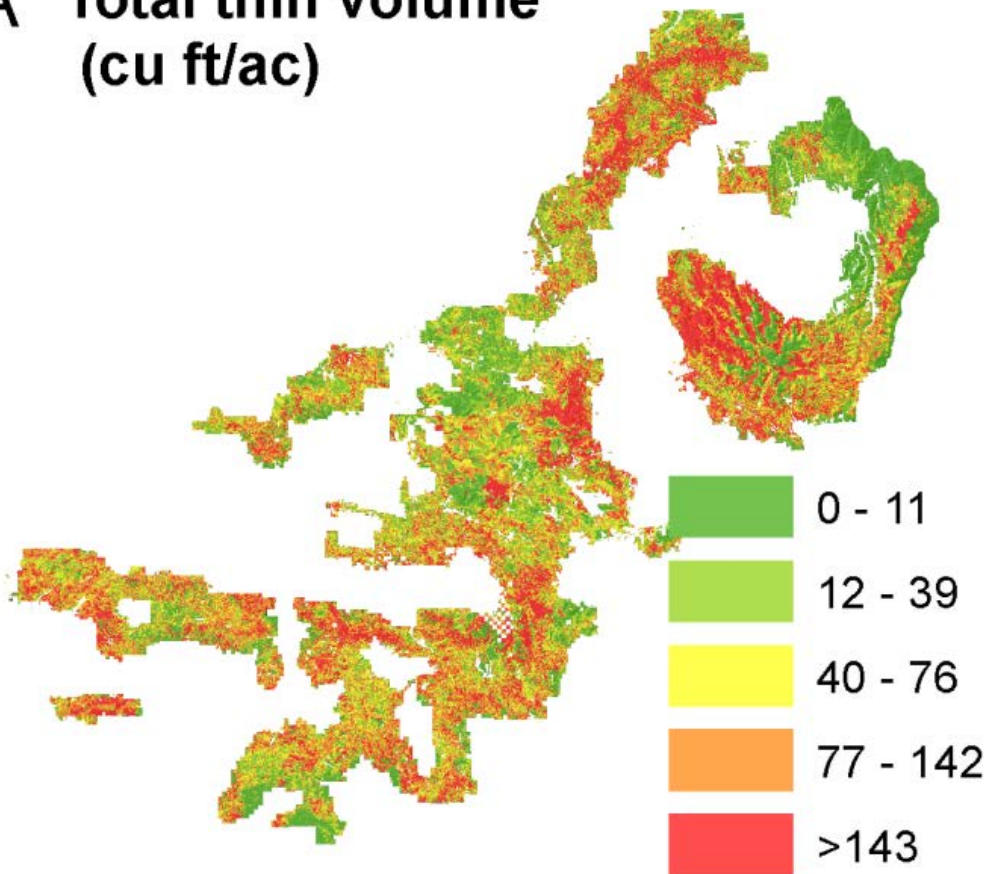
Fire Protection and containment:

1. Fire Hazard
2. WUI Risk

Socioeconomic

RESTORATION OBJECTIVES

A Total thin volume
(cu ft/ac)



Restoration of dry forests and forest health:

1. Veg Departure
2. Insect and Disease

Fire Protection and containment:

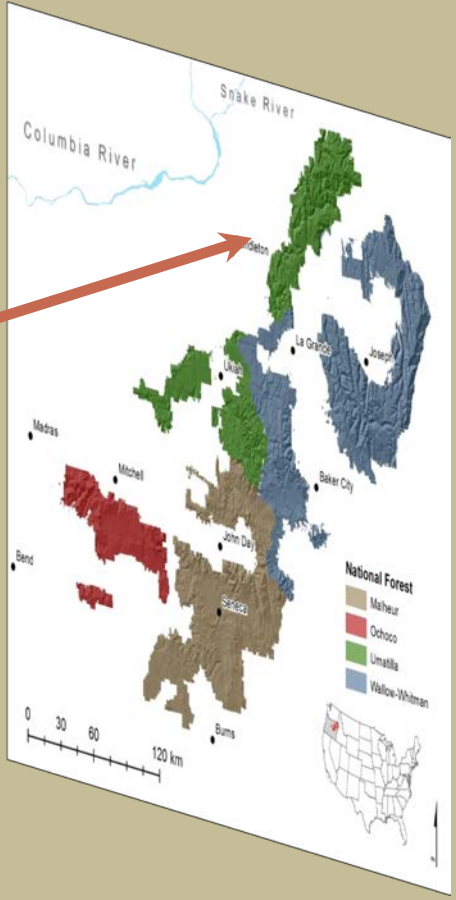
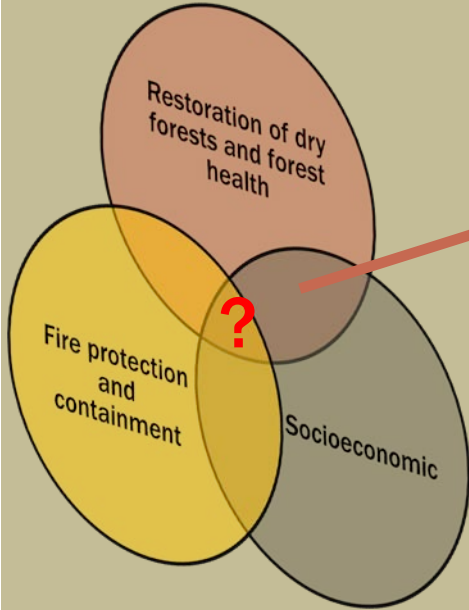
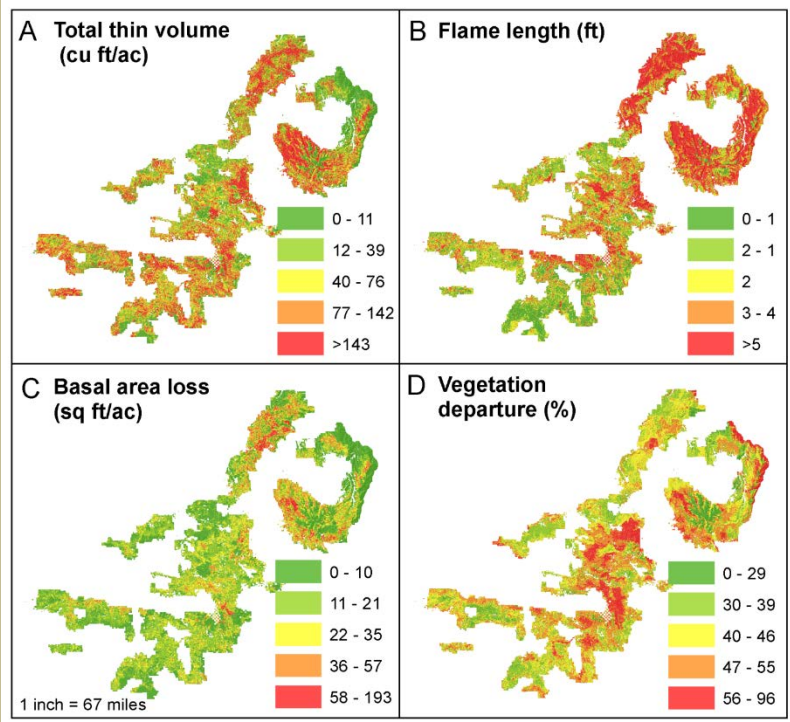
1. Fire Hazard
2. WUI Risk

Socioeconomic

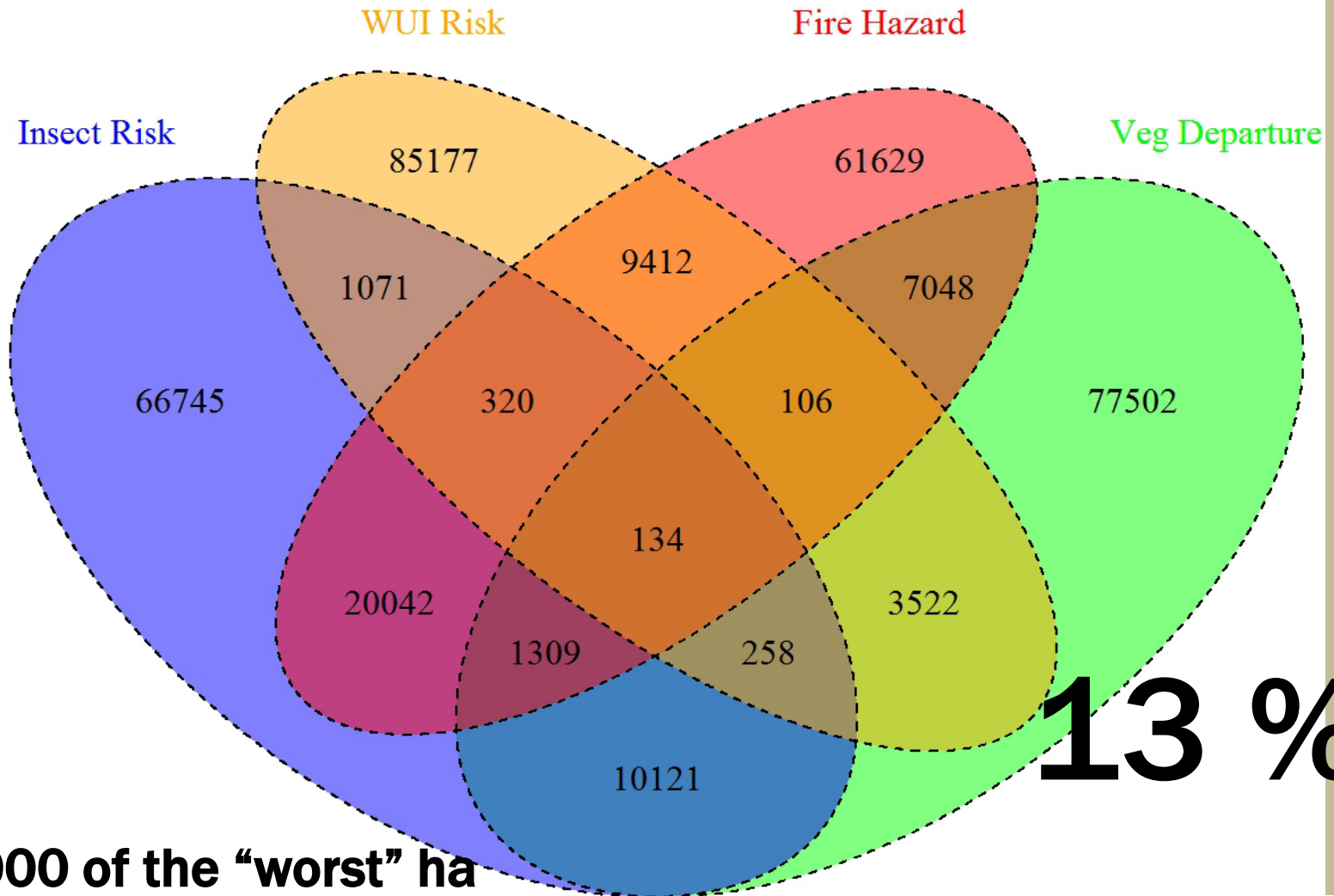
1. Timber Volume

RESTORATION OBJECTIVES

Can a restoration project achieve all goals?

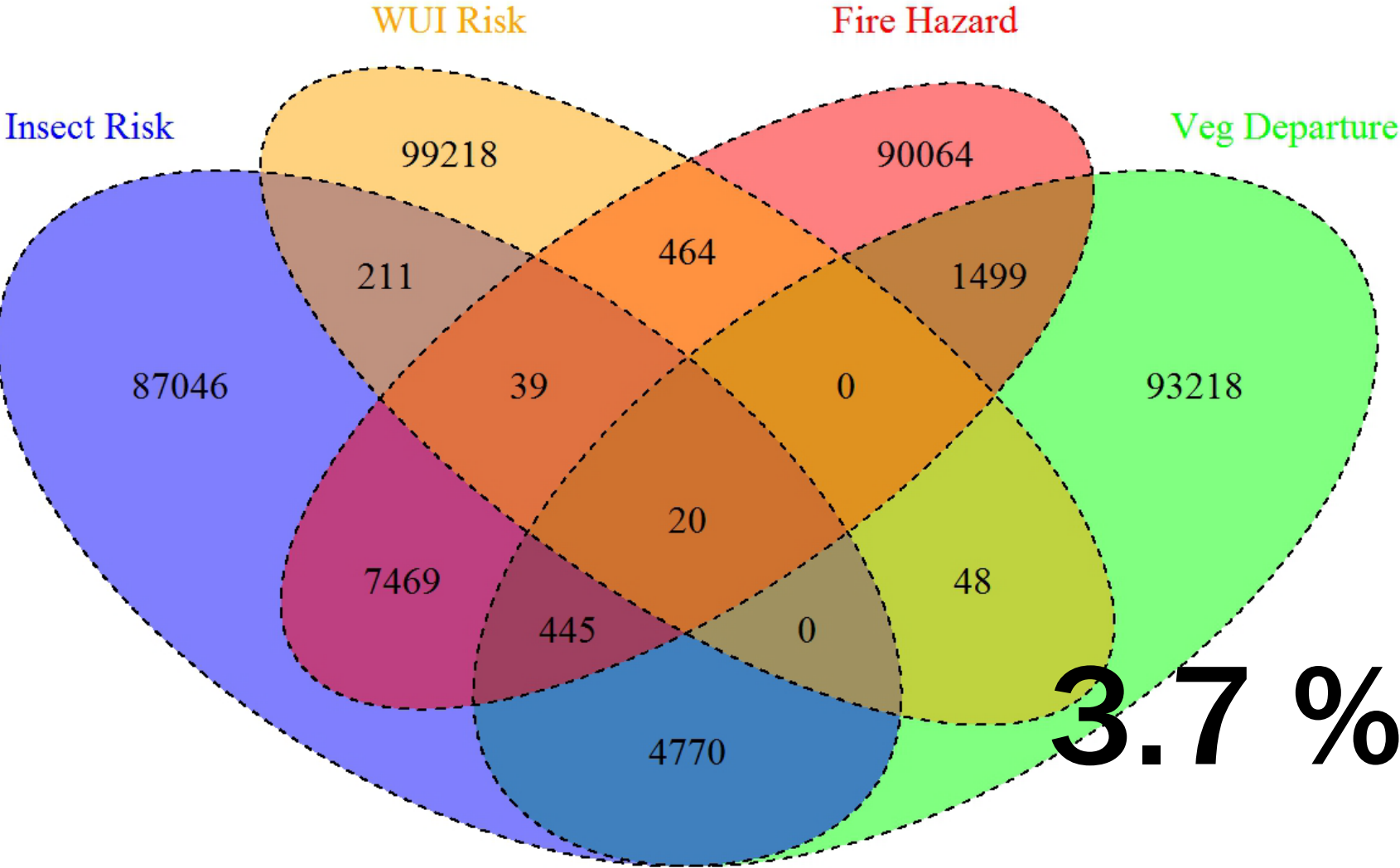


RESTORATION OBJECTIVES



100,000 of the "worst" ha

RESTORATION OBJECTIVES




LANDSCAPE TREATMENT DESIGNER

USDA
United States Department of Agriculture
Forest Service
Pacific Northwest Research Station
General Technical Report PNW-GTR-859
February 2012

Overview and Example Application of the Landscape Treatment Designer

Alan A. Ager, Nicole M. Vaillant, David E. Owens, Stuart Brittain, and Jeff Hamann



Landscape Treatment Designer

Input Shapefile: C:\Users\voglerk\Desktop\WAW\LD_RUNS\DATA\WWPoly_Treat.shp
Outputs Base Name: C:\Users\voglerk\Desktop\WAW\LD_RUNS\RESULTS\NonAg_MCuFtVlbt
Use Adjacency: C:\Users\voglerk\Desktop\WAW\LD_RUNS\DATA\ADJ_WAW_TRT_ADJ.csv

Mandatory Field Mappings
StandID: STANDID X Coordinate: CENTROID_X
Area: AREA_ac Y Coordinate: CENTROID_Y

Area Weight Averaging

Priorities and Weights

Field Name	Min Weight	Max Weight	Step
MCuFT_SPM	.00	5.00	1.00
FL_SPM	.00	5.00	1.00

Options

Objective Direction: 1 - Maximize
Max Project Diameter (meters): -1
Aggregate:
Objective Search Depth: 1
Check Availability: Availability Field:
Check Exclusions: Exclusion Field:
Max Number Projects: 1
Load Objective Steps:
Step File: C:\Users\voglerk\Desktop\WAW\LD_RUNS\DA1

Constraints - Treat until following constraints are met

Field Name	Min Value	Max Value
AREA_ac	3,000.00	4,000.00

Effects

Field Name
MCuFT_PCP
DEP_AVG
WUJ_PCP
FL_PCP
WW_BUG_PCP
MCuFT_STND

Subunits

Enable Subunits:
Subunit Field: PRJ_AREA
Iterate thru Subunits:
Single Subunit:

Buttons: Load, Save As, Save, Run, Close, Save Archive, Load Archive

1. Optimal Projects
2. Tradeoffs: PPF curves

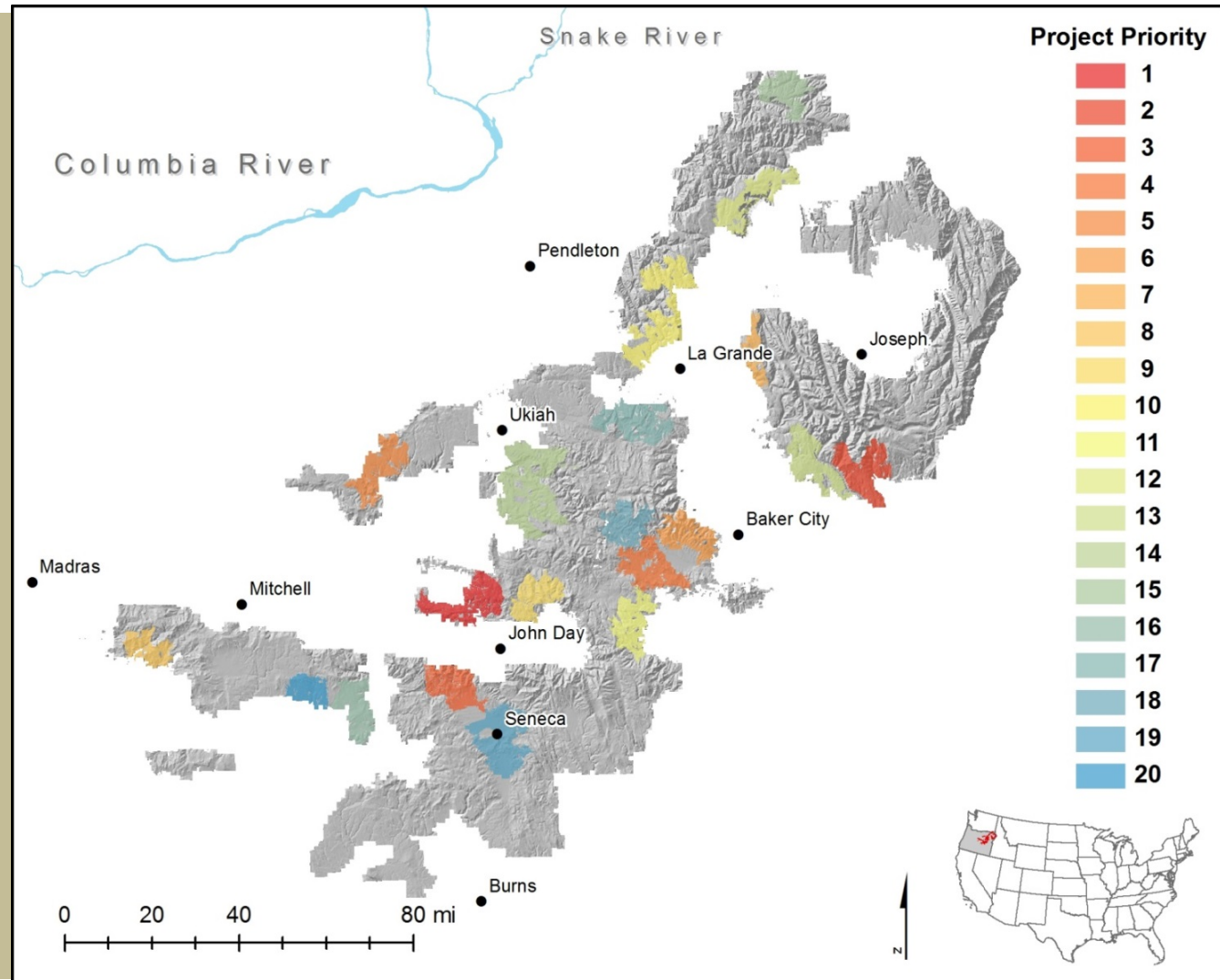
<http://www.fs.fed.us/wwetac/ltd/>

OPTIMAL PROJECTS

WUI Protection

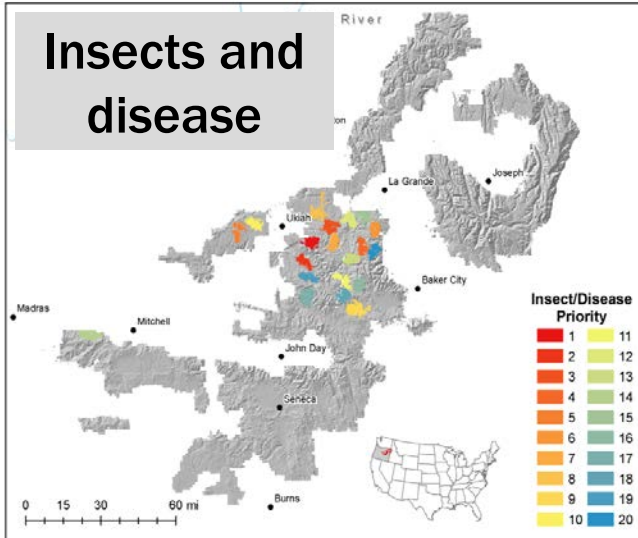
5 Years of work:

- 20 Projects
- 5,000 ha each

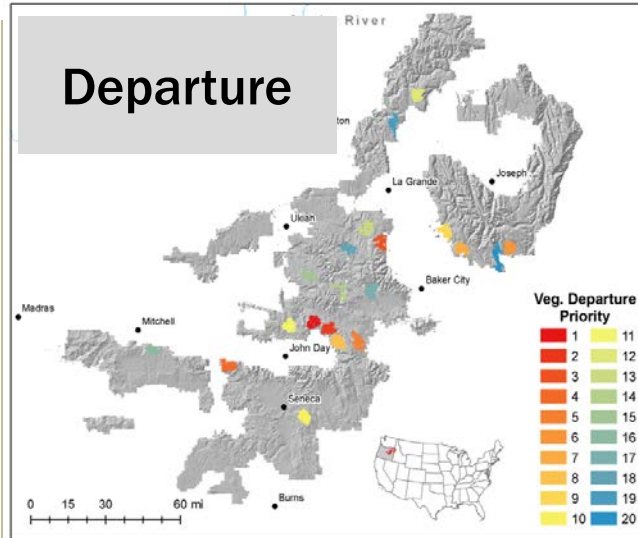


OPTIMAL PROJECTS

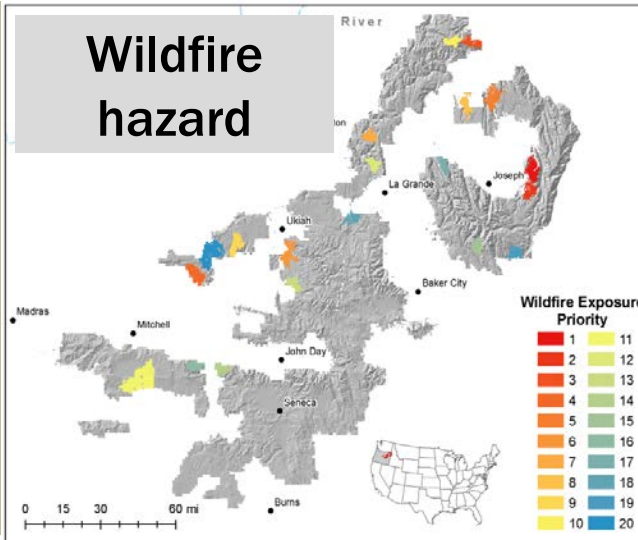
Insects and disease



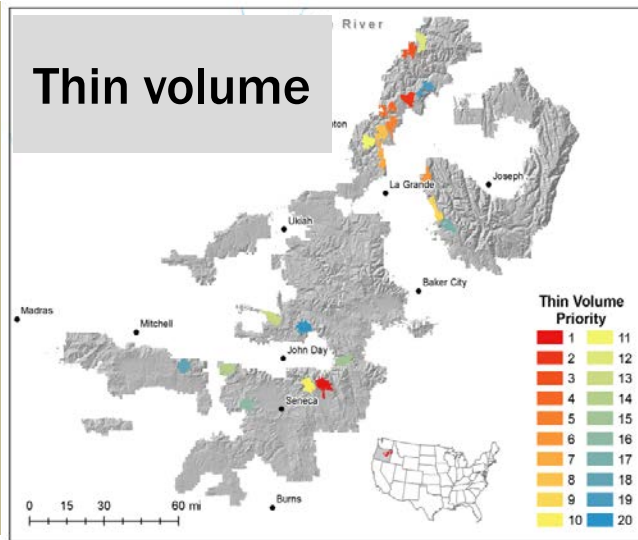
Departure



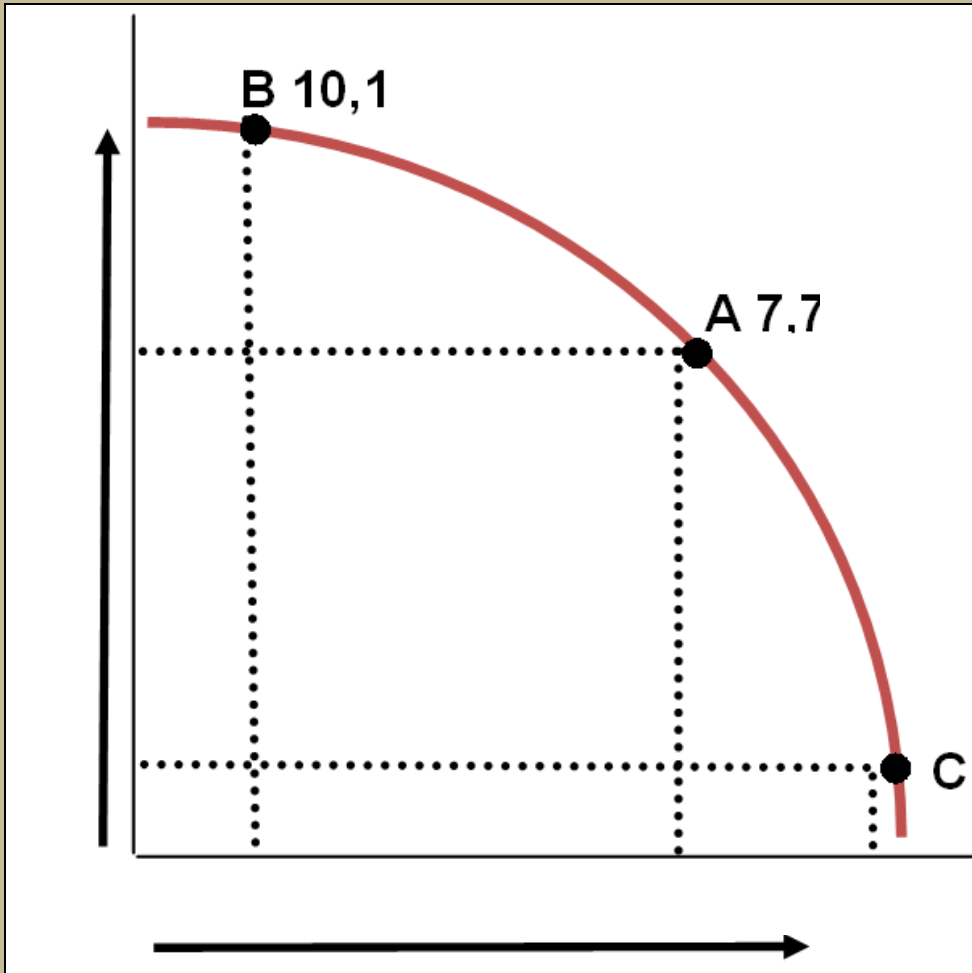
Wildfire hazard



Thin volume



PRODUCTION POSSIBILITY FRONTIER CURVES

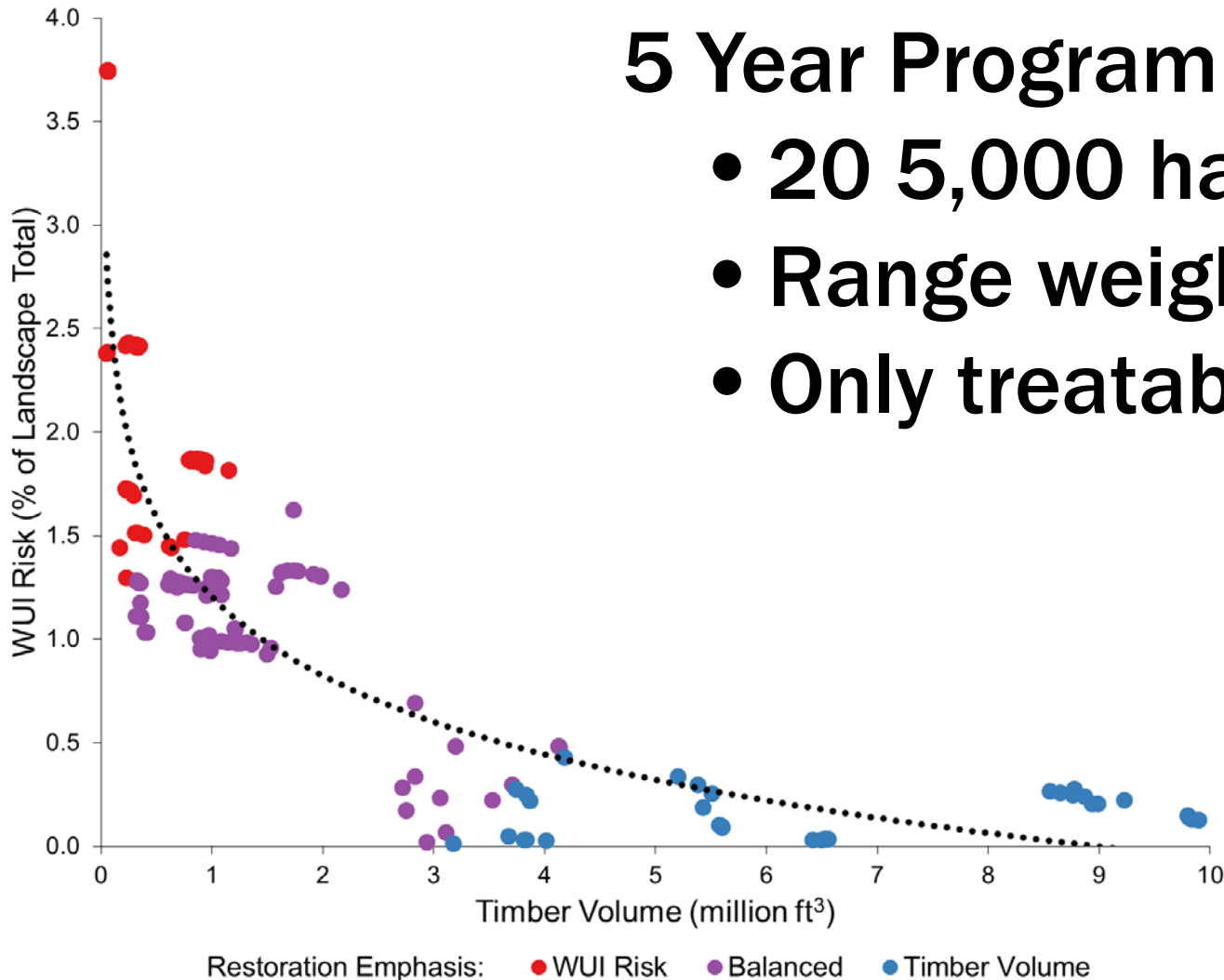


- Econ Theory
- Guns and Butter

PPF: WUI VS TIMBER

5 Year Program of work:

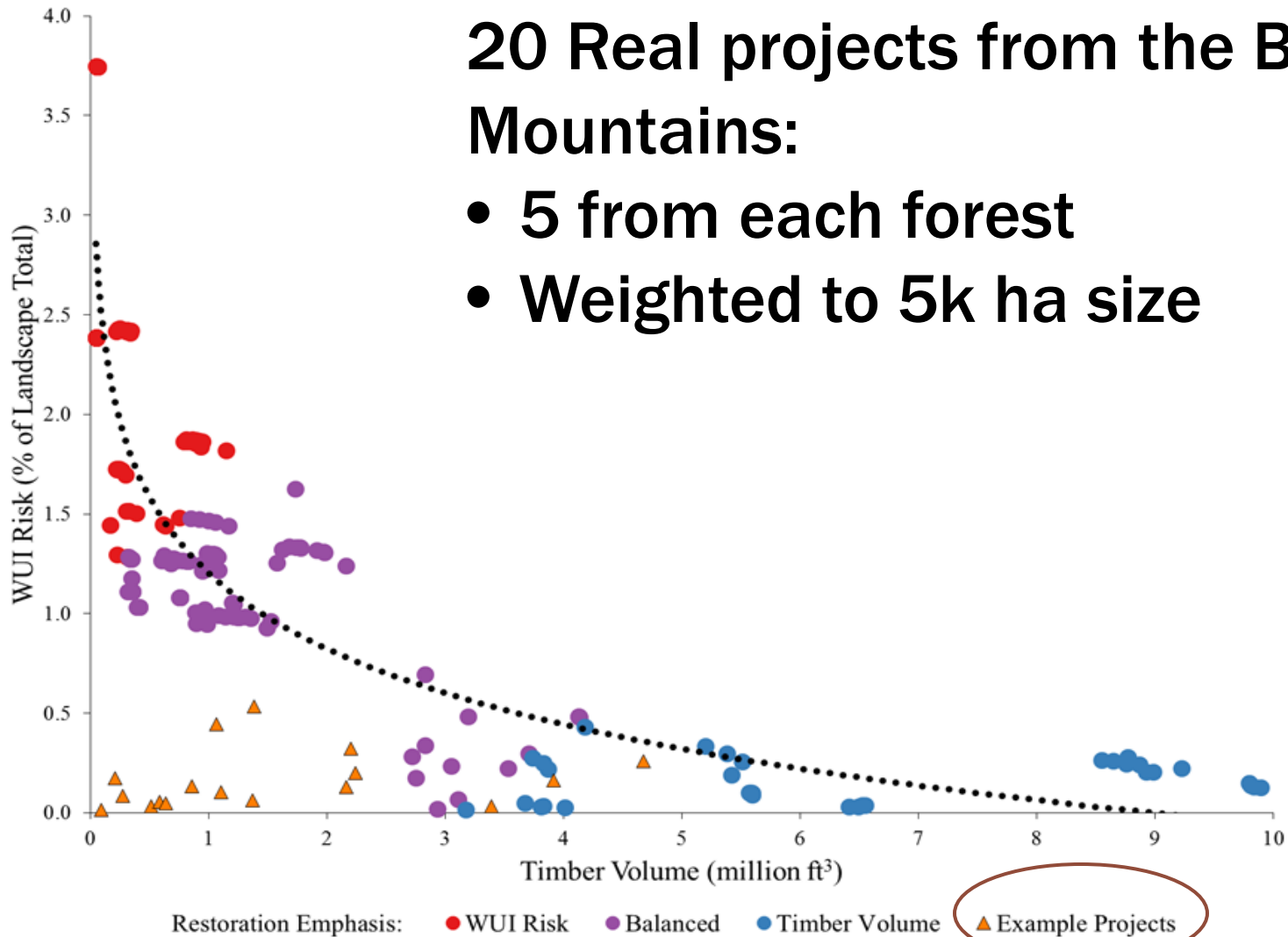
- 20 5,000 ha projects
- Range weights from 0-5
- Only treatable lands



PPF: WUI VS TIMBER

20 Real projects from the Blue Mountains:

- 5 from each forest
- Weighted to 5k ha size

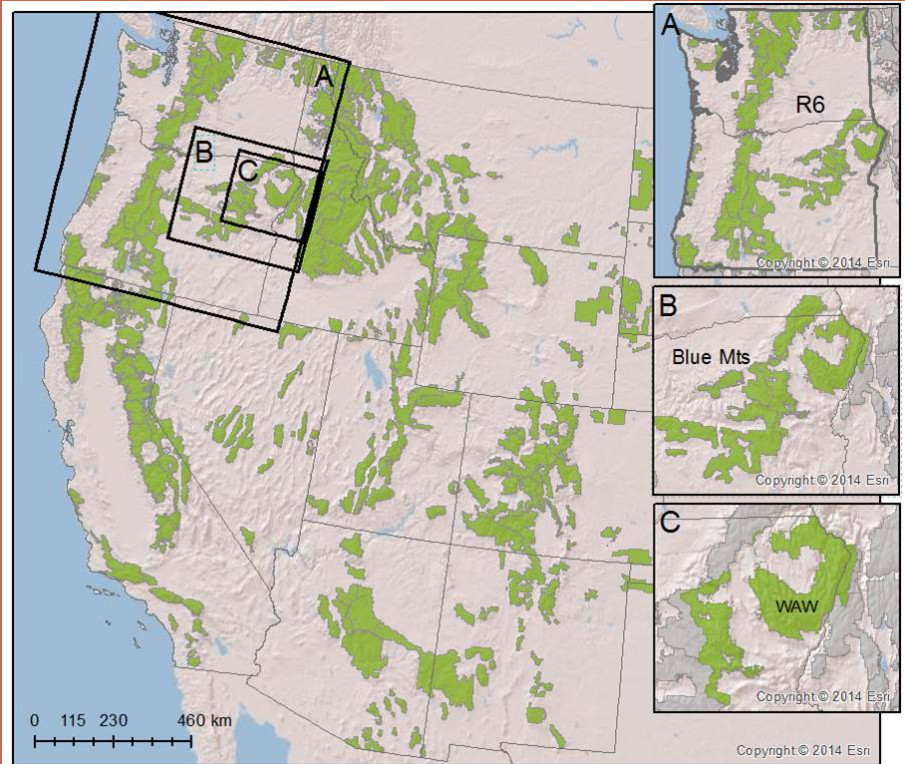


CONCLUSIONS

- Restoration objectives are often not located on the same acres
 - Or project area!
- PPF curves can show opportunity costs of different restoration strategies
 - And highlight USFS ability to meet goals

FUTURE WORK

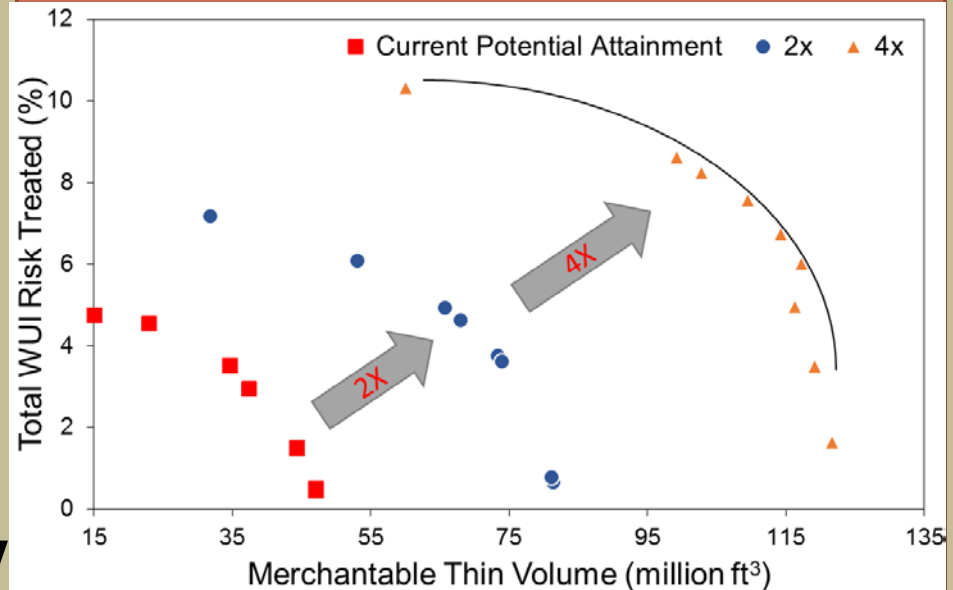
- 1. PPF curves at multiple scales***
- 2. How does PPF curve change with different levels of investment?**
- 3. What is opportunity cost of Project Areas?**



FUTURE WORK

1. PPF curves at multiple scales
2. *How does PPF curve change with different levels of investment?*
3. What is opportunity cost of Project Areas?

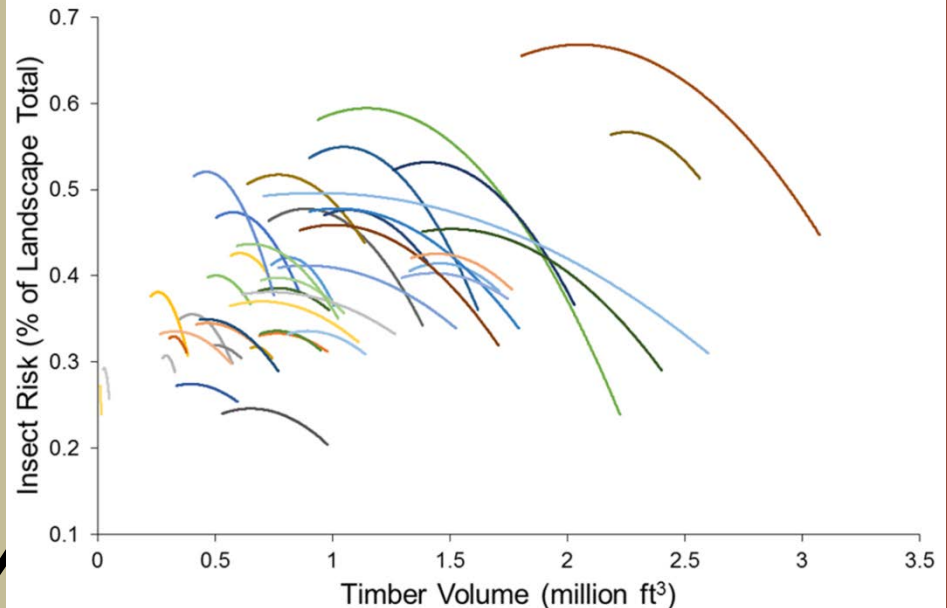
Increased investment in restoration



FUTURE WORK

1. PPF curves at multiple scales
2. How does PPF curve change with different levels of investment?
3. *What is opportunity cost of Project Areas?*

Wallowa-Whitman NF: 42 Project Areas



QUESTIONS?



LTD Website + Online Tutorial: <http://www.fs.fed.us/wwetac/ltd/>