Risk-based prioritization of dry forest restoration

Alan A. Ager, Western Wildland Threat Assessment Center, *USDA Forest Service, Pacific Northwest Research Station, Prineville, OR, USA*

DNF/COFMS Collaborators

- Nicole Vaillant
- Dave Owens
- Dana Simon
- Geoff Babb
- Helen Maffei
- Pete Powers
- Leo Yanez
- Mike Simpson
- Brian Tandy

Wildfire Risk

$$E(L) = \sum_i p(f_i) * RF(f_i)$$

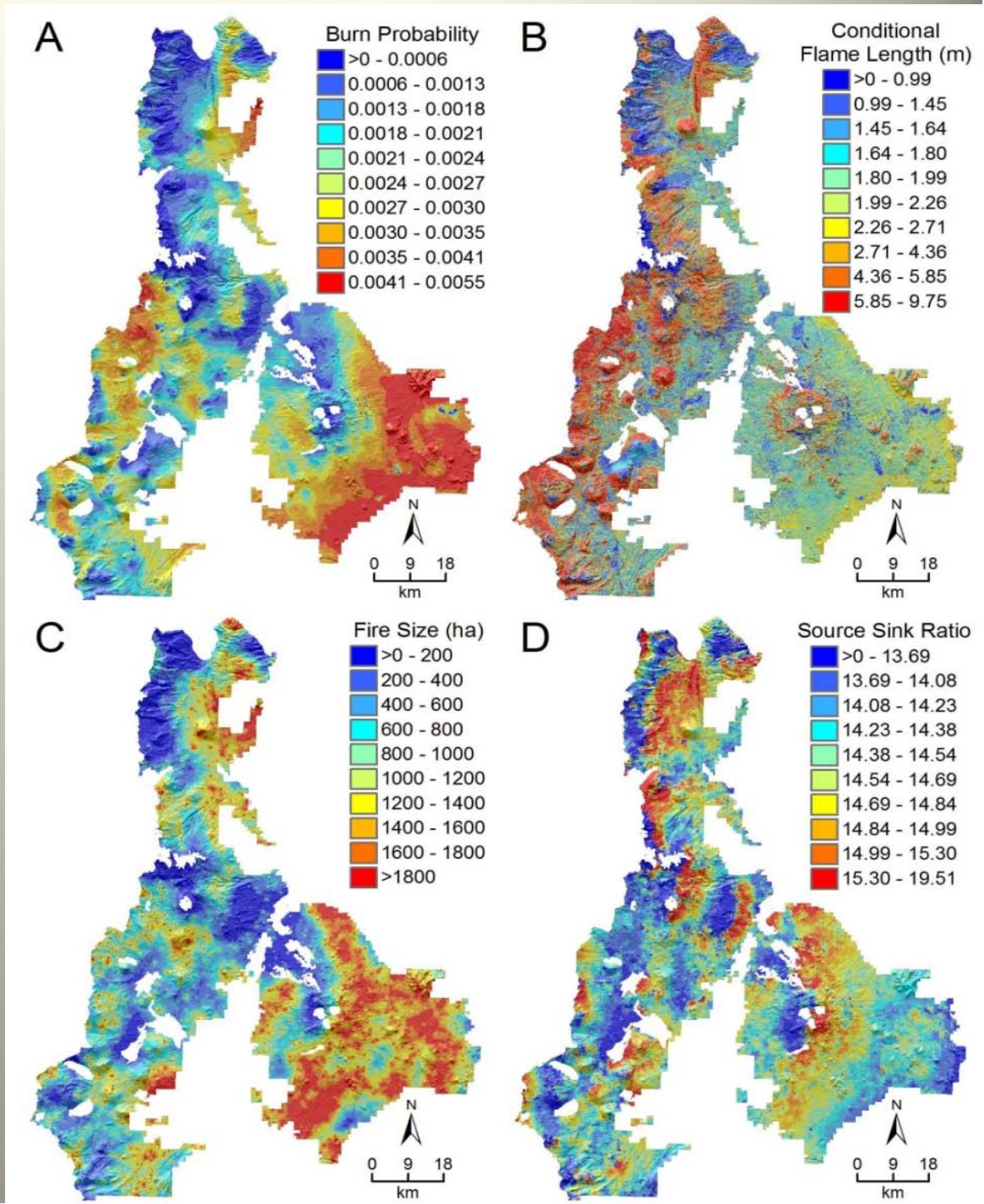
1. Exposure Analysis	$p(f_i)$	Fire probability at intensity level *i*
2. Effects Analysis	$RF(f_i)$	Response function intensity *i*
3. Expected loss	$E(L)$	Expected loss

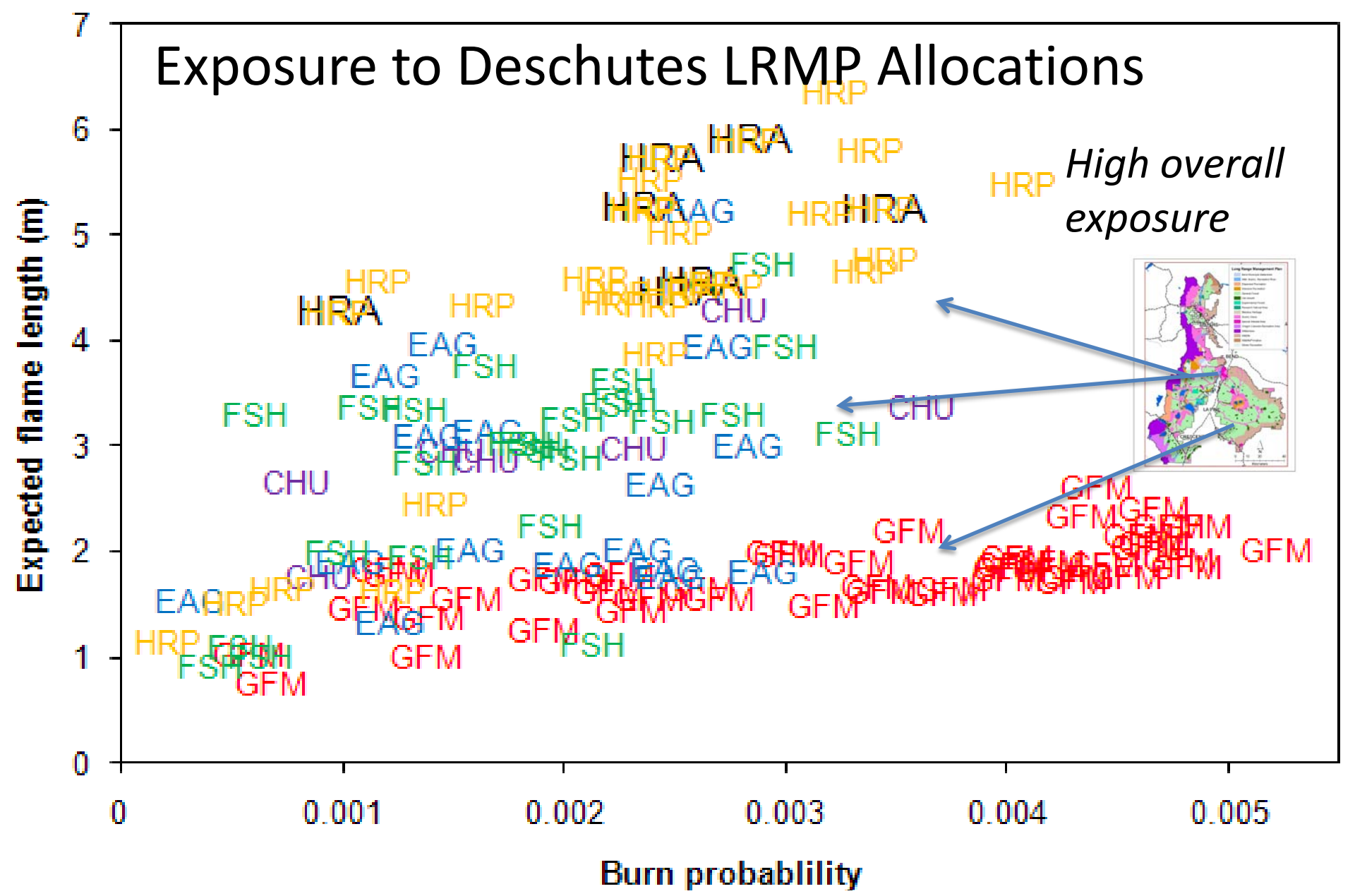
More Definitions

- Wildfire Hazard = the potential for loss (risk given a disturbance)
- Wildfire Vulnerability = risk considering adaptive capacity
- Wildfire Danger – near term exposure within a fire season

Exposure Analysis Deschutes NF from wildfire simulation

A) Burn probability
B) Flame length
C) Fire size
D) Source sink ratio

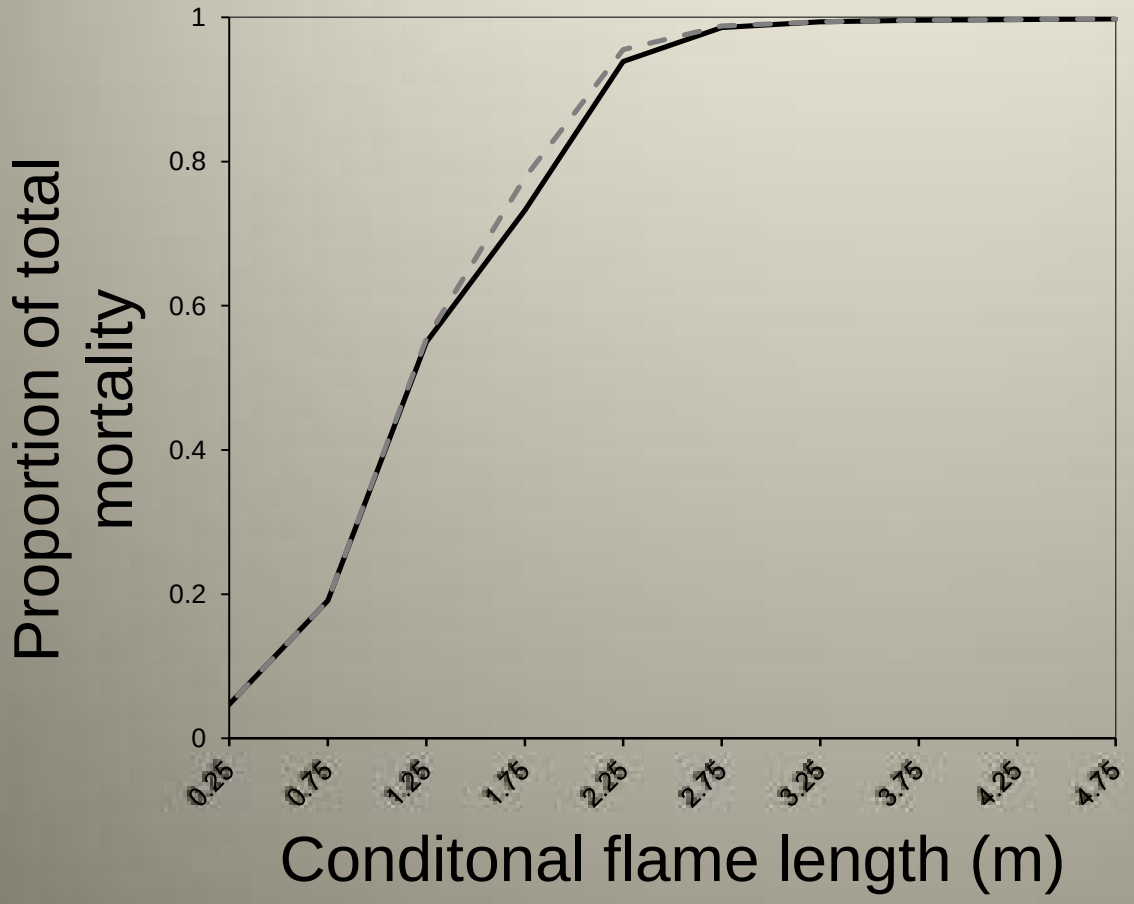


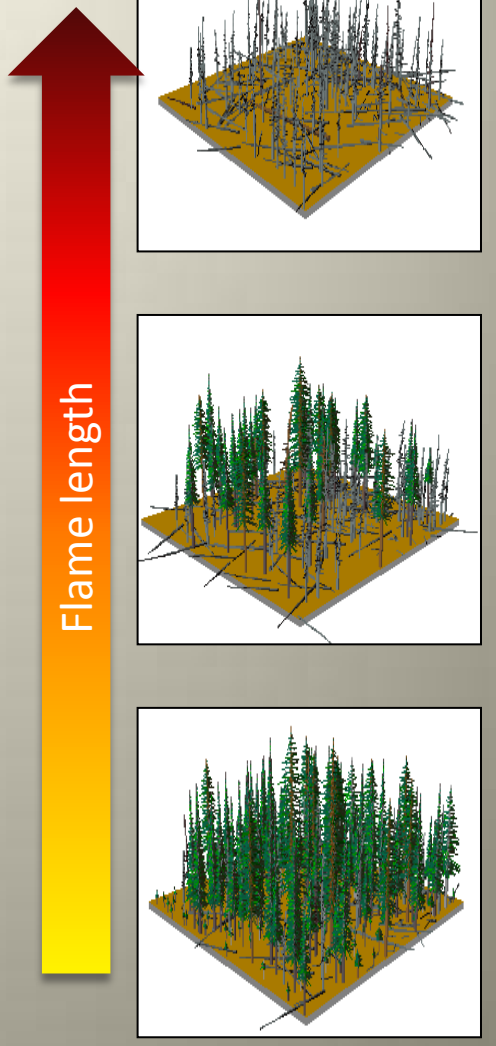


GFM – general forest matrix **EAG** – eagle habitat **CHU** – NSO critical habitat units
FSH – stream conservation areas **HRA** – NSO home range active **HRP** – NSO home range potential

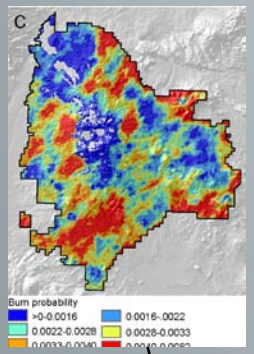
Response functions $RF\ (f_i)$

- Examples: owl habitat, carbon, old growth

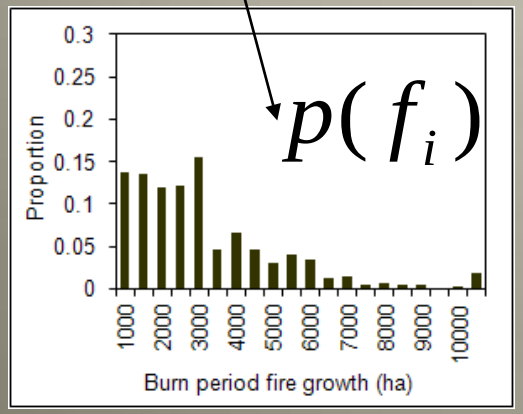


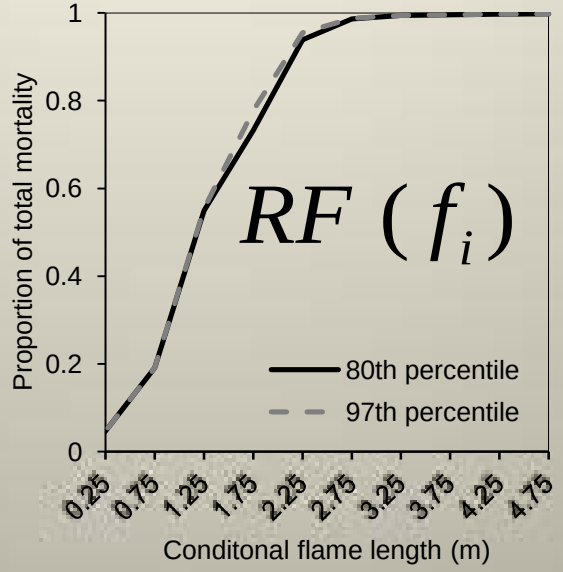


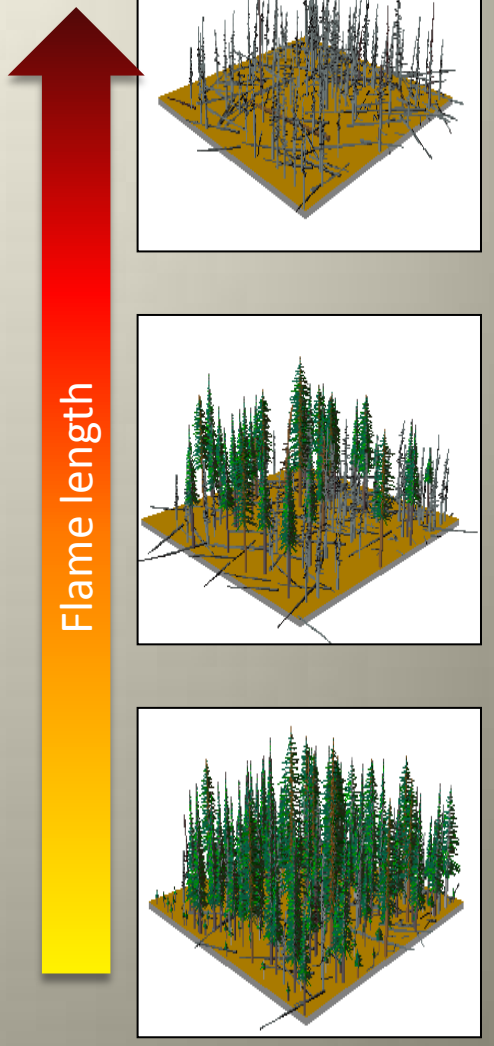
Estimating risk - exposure + effects



Burn probability – intensity map



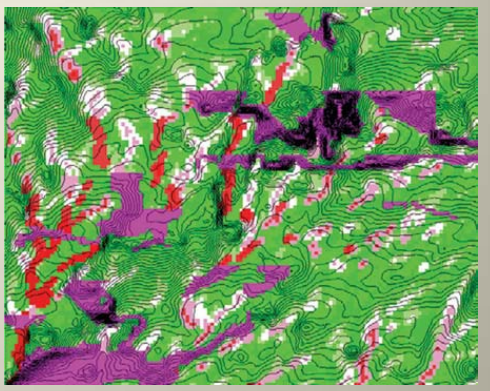




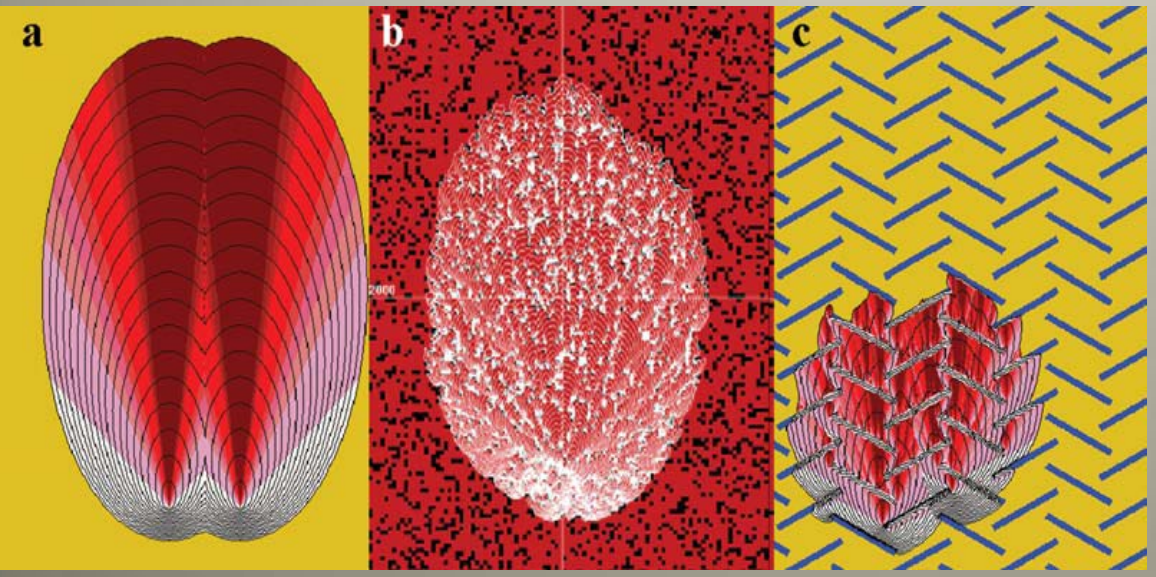
$$E(L_j) = \sum_i p(f_i) RF_j(f_i)$$

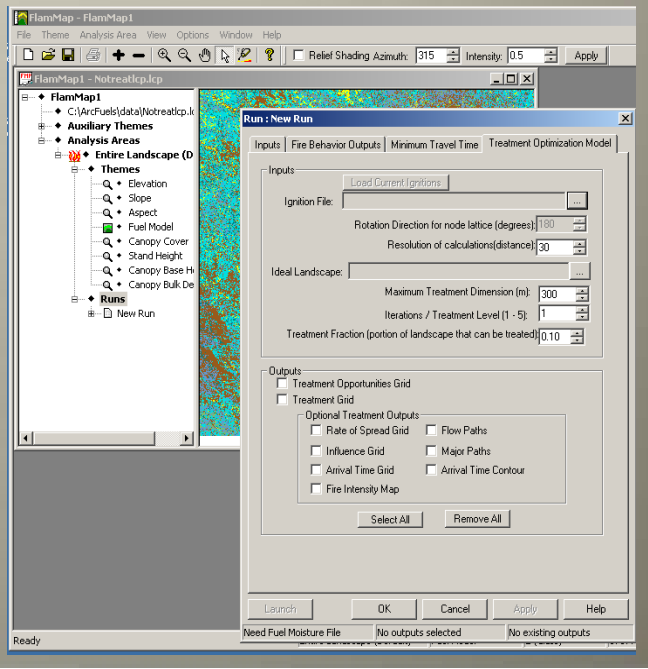
Reducing risk requires strategic fuel treatment

- Large fires transmit risk over large areas [hazard <> Risk!!!]
- Strategic treatments and landscape approaches are needed to address large fire spread
- SPOTS/SPLATS/TOM/CFLR

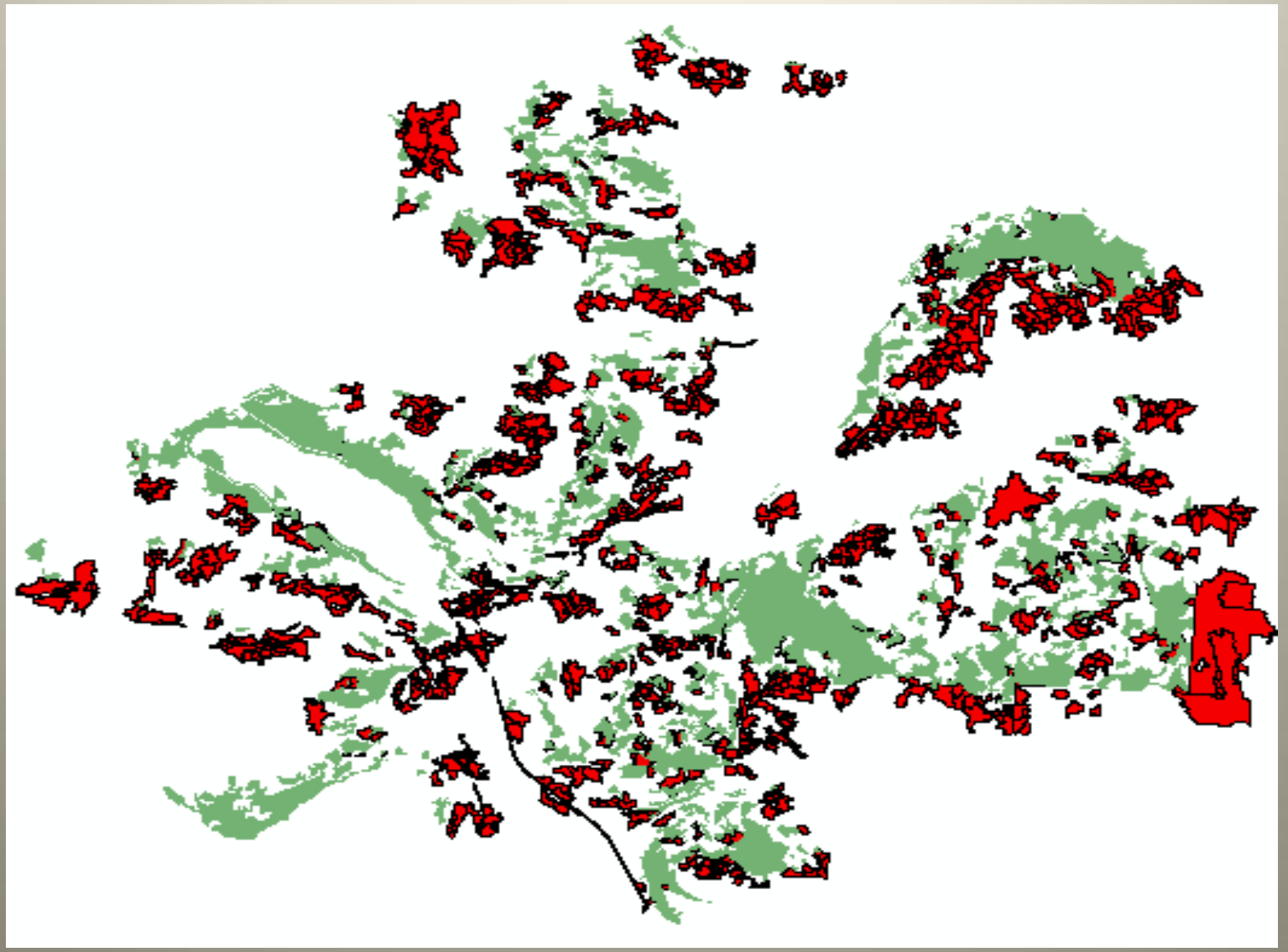


Treatment Optimization Model – TOM in FlamMap

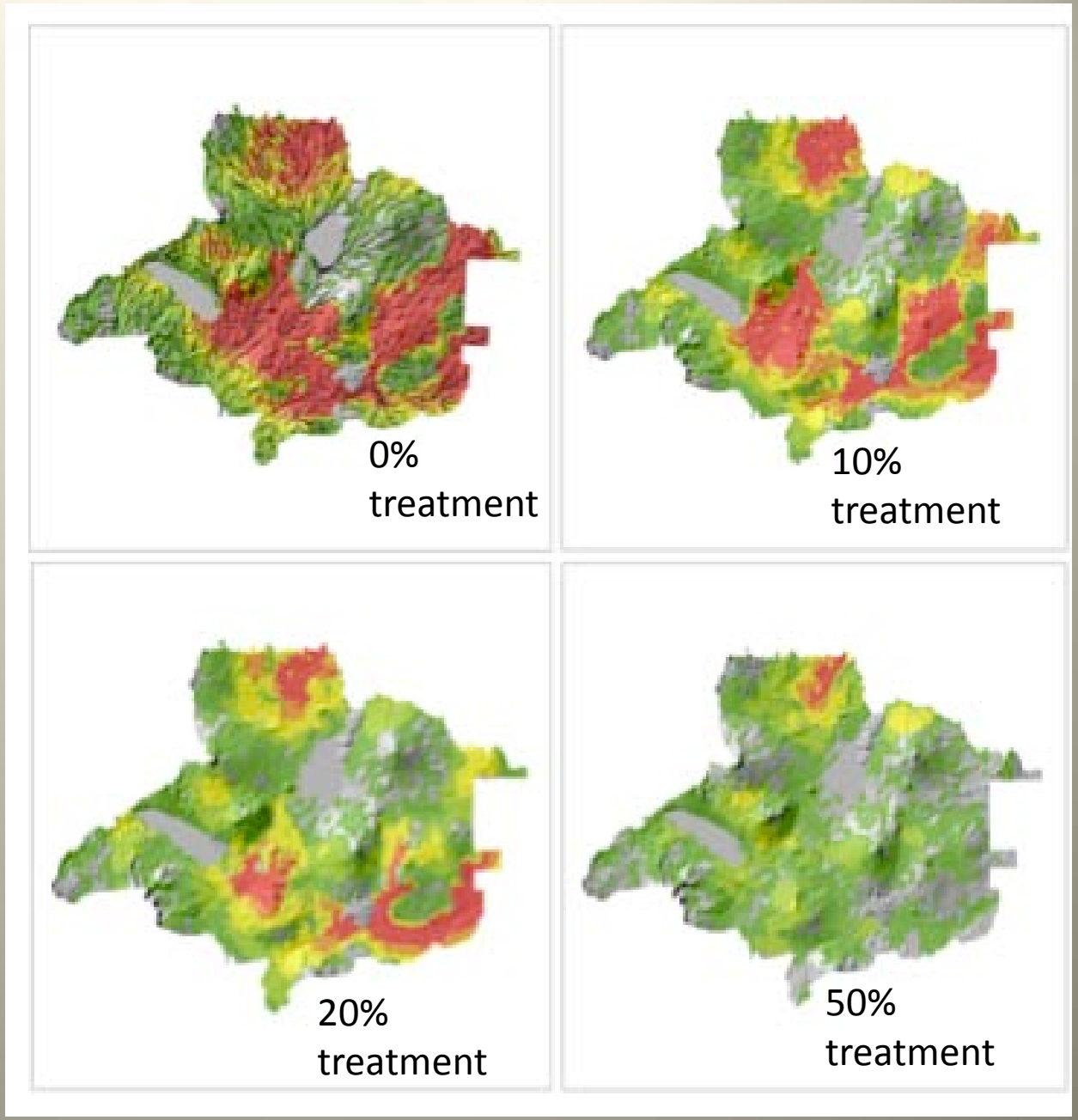




Strategic fuel treatments Five Buttes

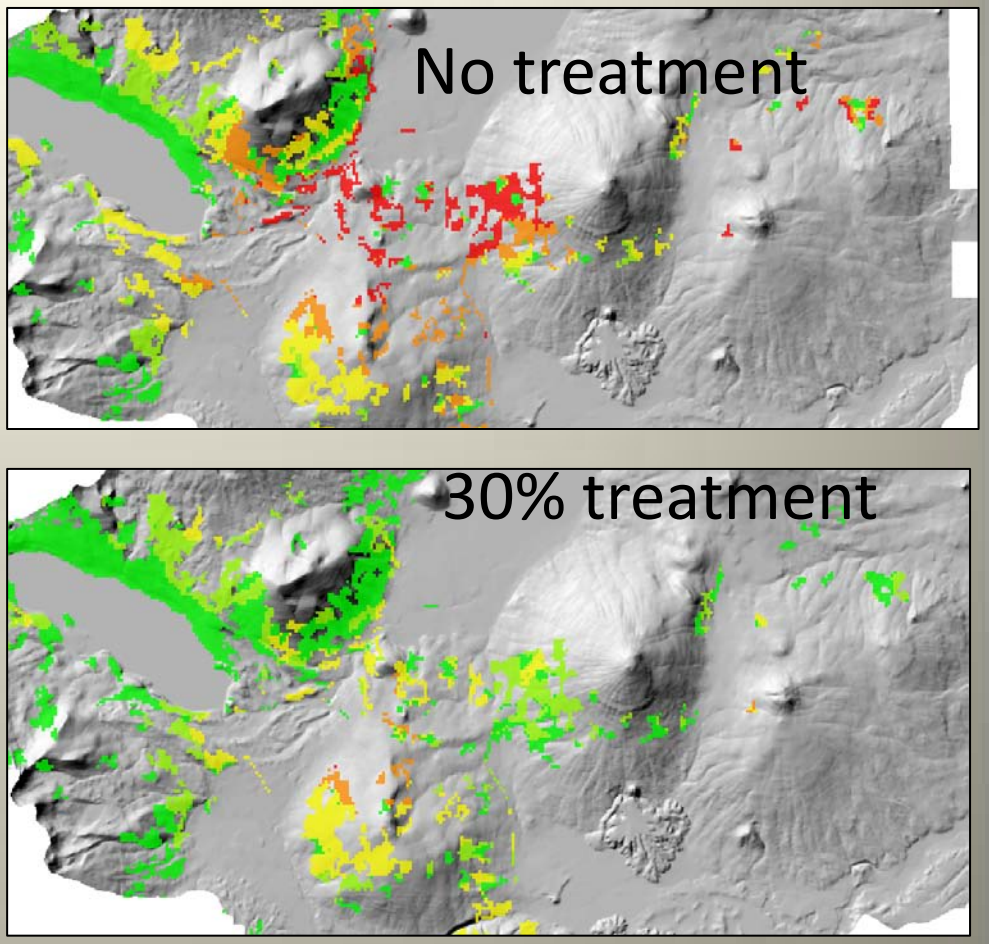


Effect of fuel treatments on burn probability – Five Buttes



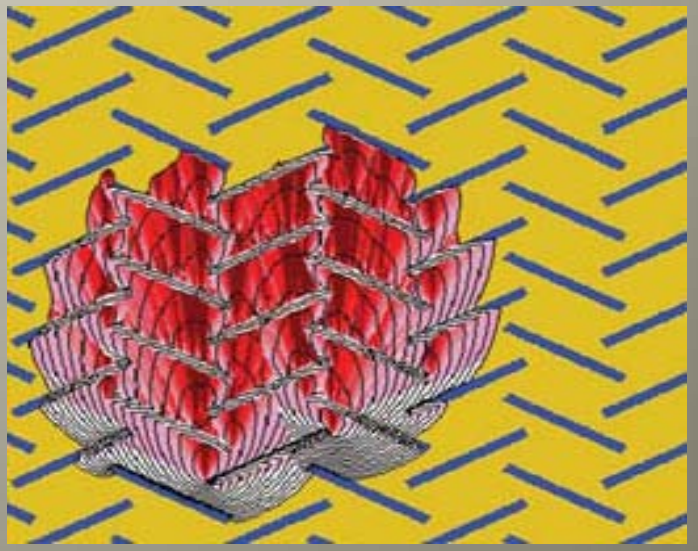
Effect of treatments on expected loss of owl habitat Five Buttes

$$E(L) = \sum_i p(f_i) * RF(f_i)$$



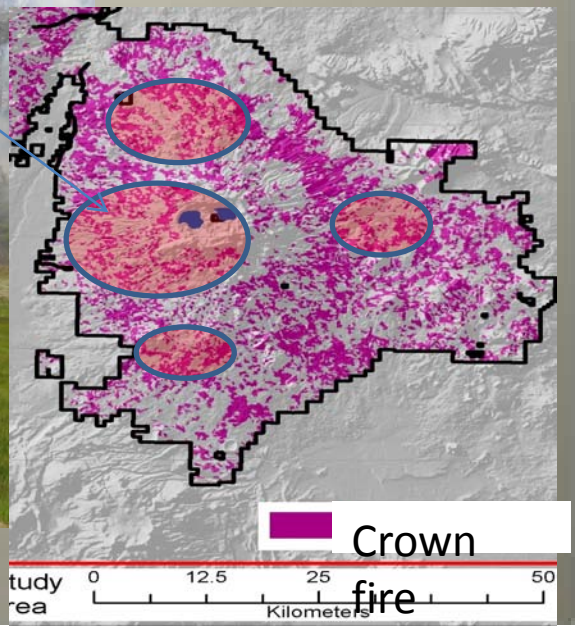
– Is the SPOTS/SPLATS and TOM appropriate for DFR?
  - Current models and concepts focus on excluding fire to protect fire sensitive values
  - E.g. TOM maximizes the reduction in spread with minimal treated area
  - Restoration uses fuel treatments to reduce hazard to fire resilient forests and allow increased use of natural and prescribed fire
  - i.e. re-introduce fire

≠

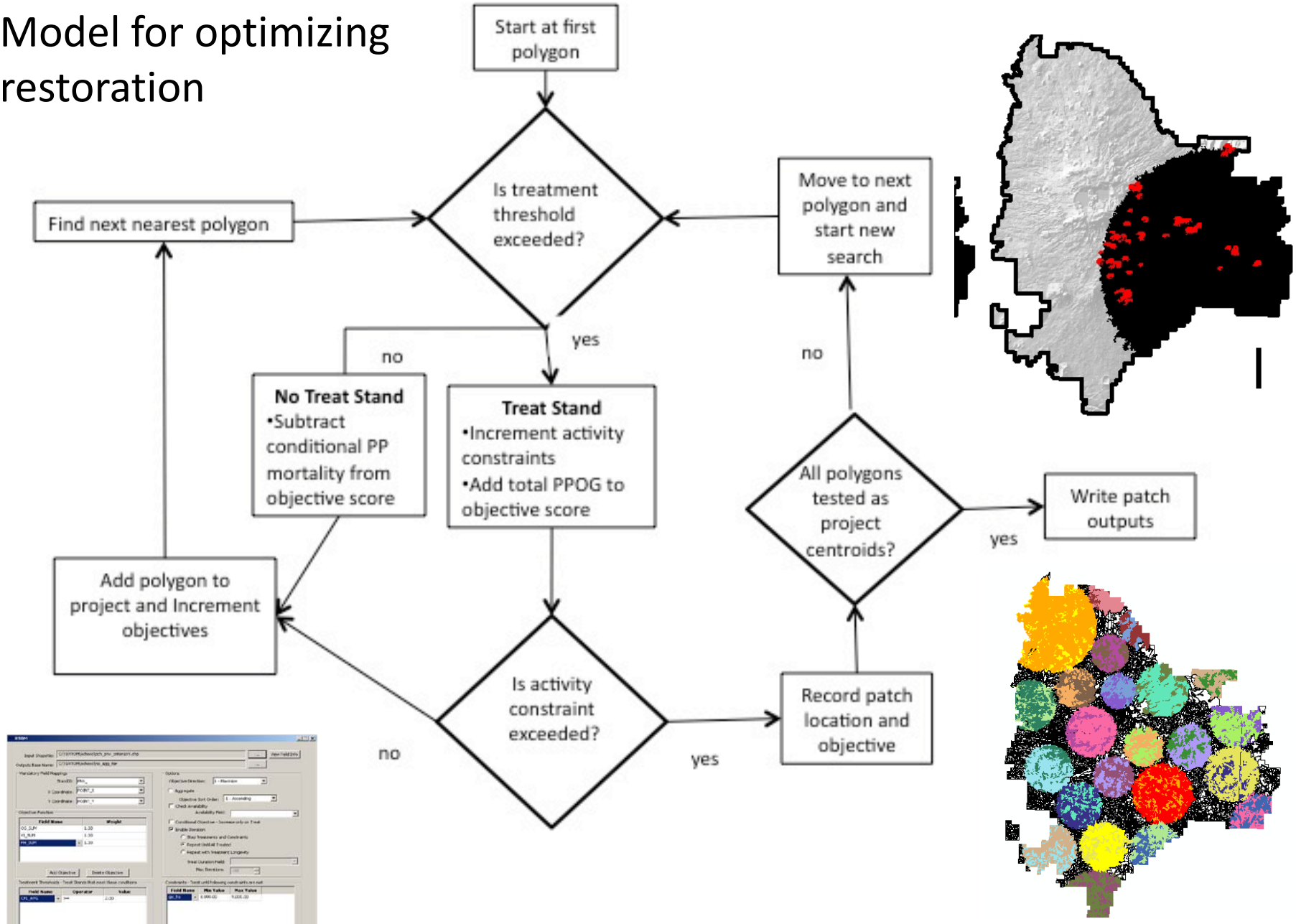


- Landscape goals for restoration –create and maintain fire resilient structure (late-old ponderosa pine) in large patches where fire can be used to sustain it.

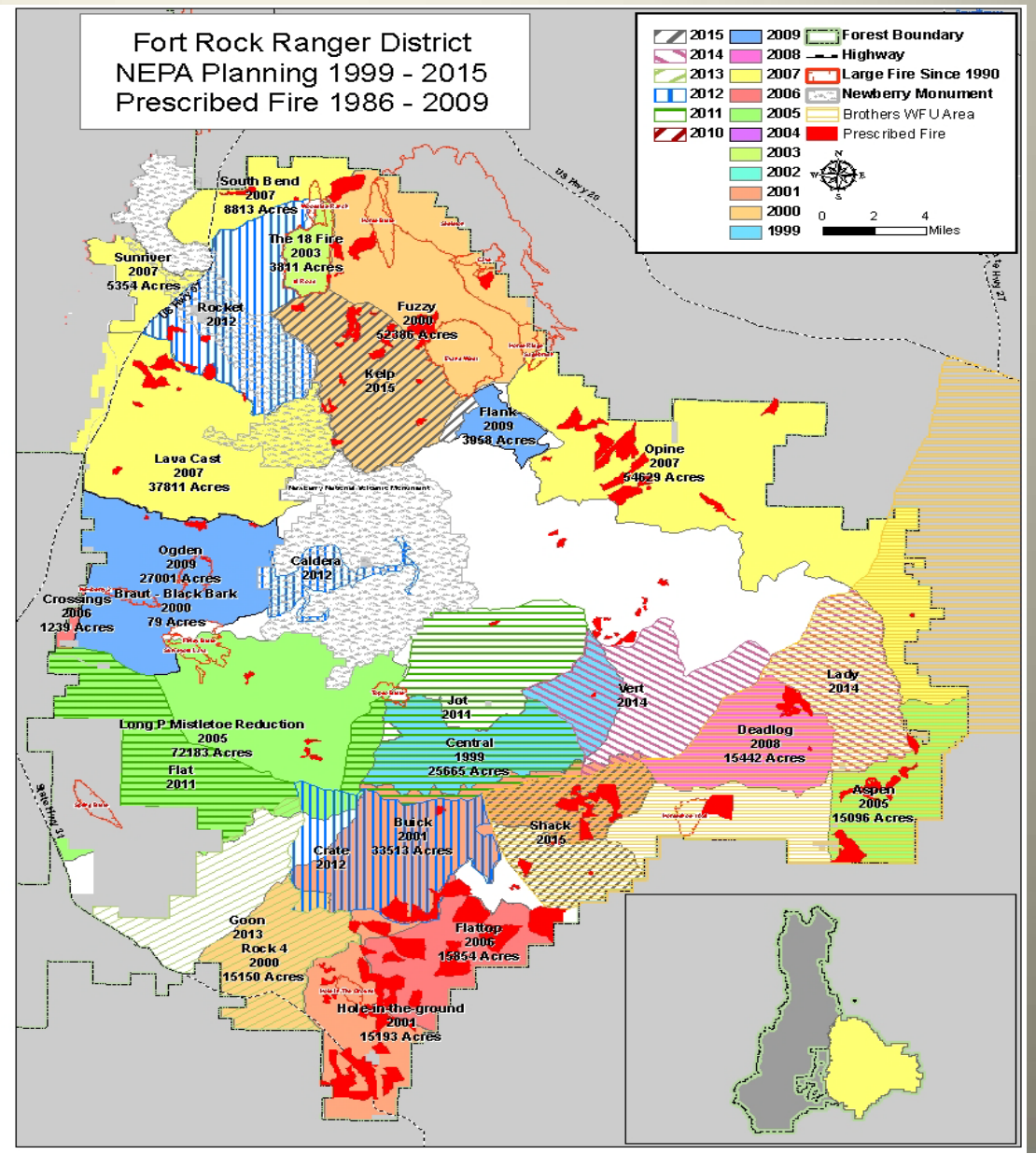
Can we identify optimal landscape strategies and locations for restoration projects? i.e. TOM for restoration?



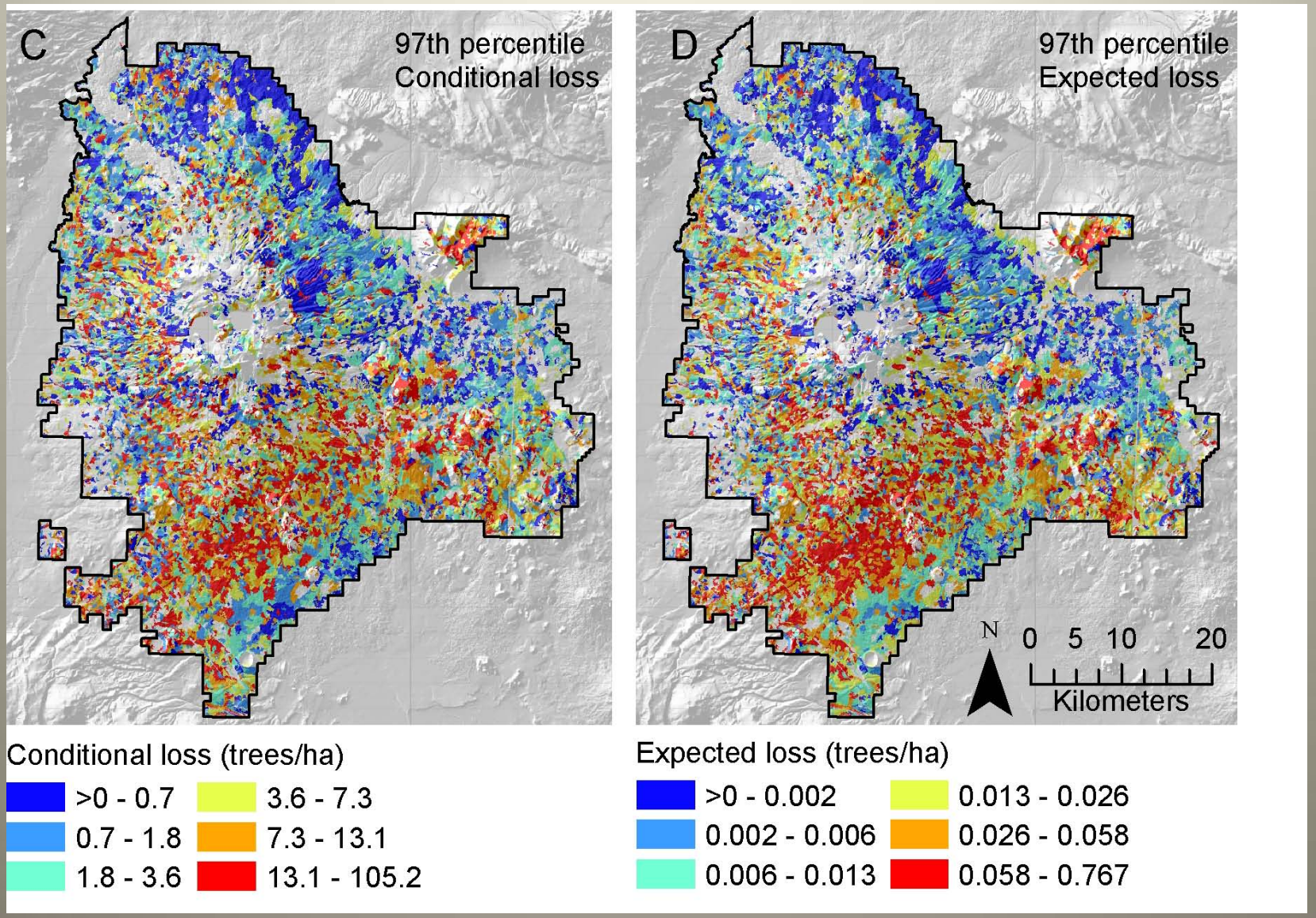
Model for optimizing restoration



Study site - Fort Rock Ranger District



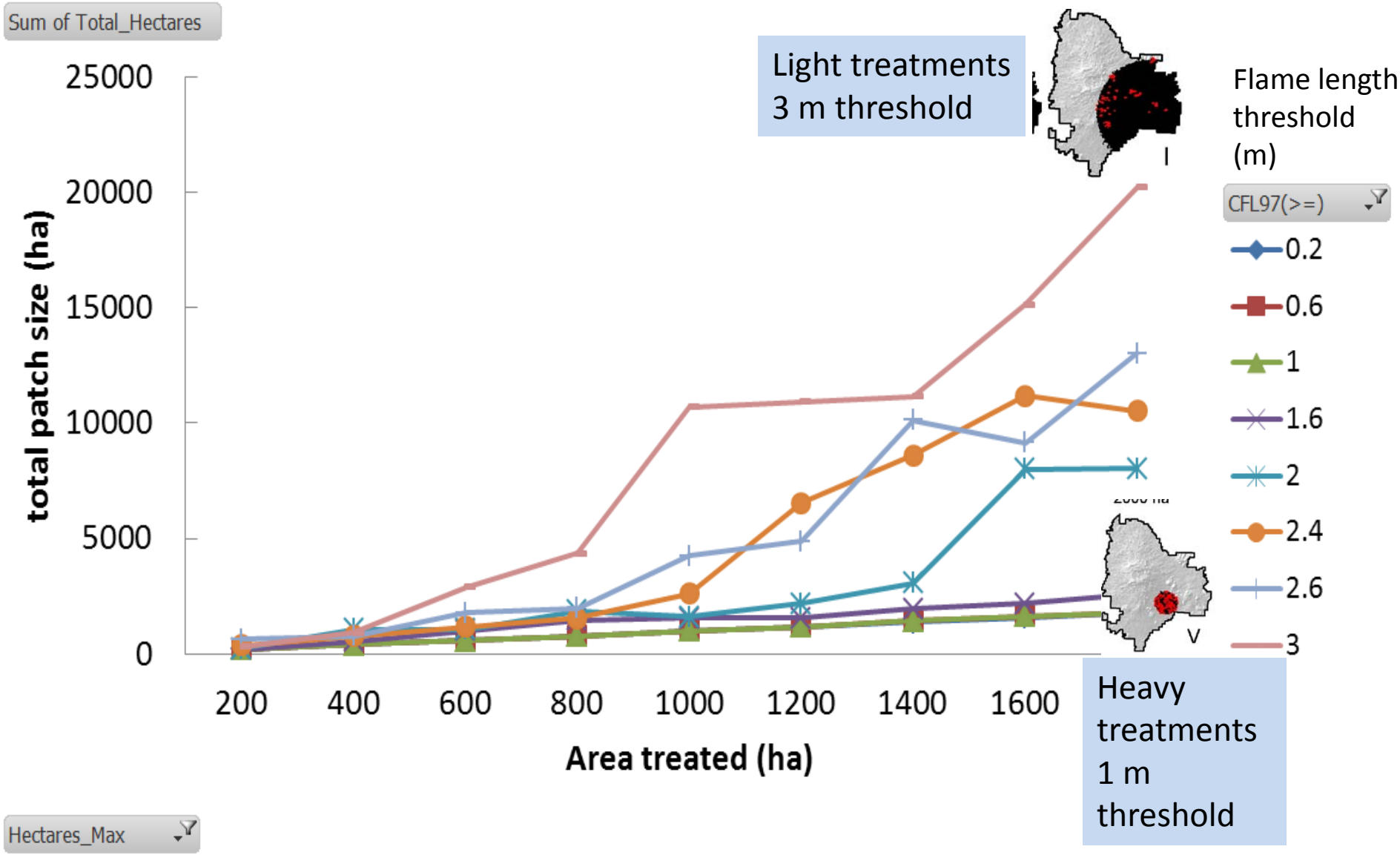
Current hazard and risk to large ponderosa pine trees -



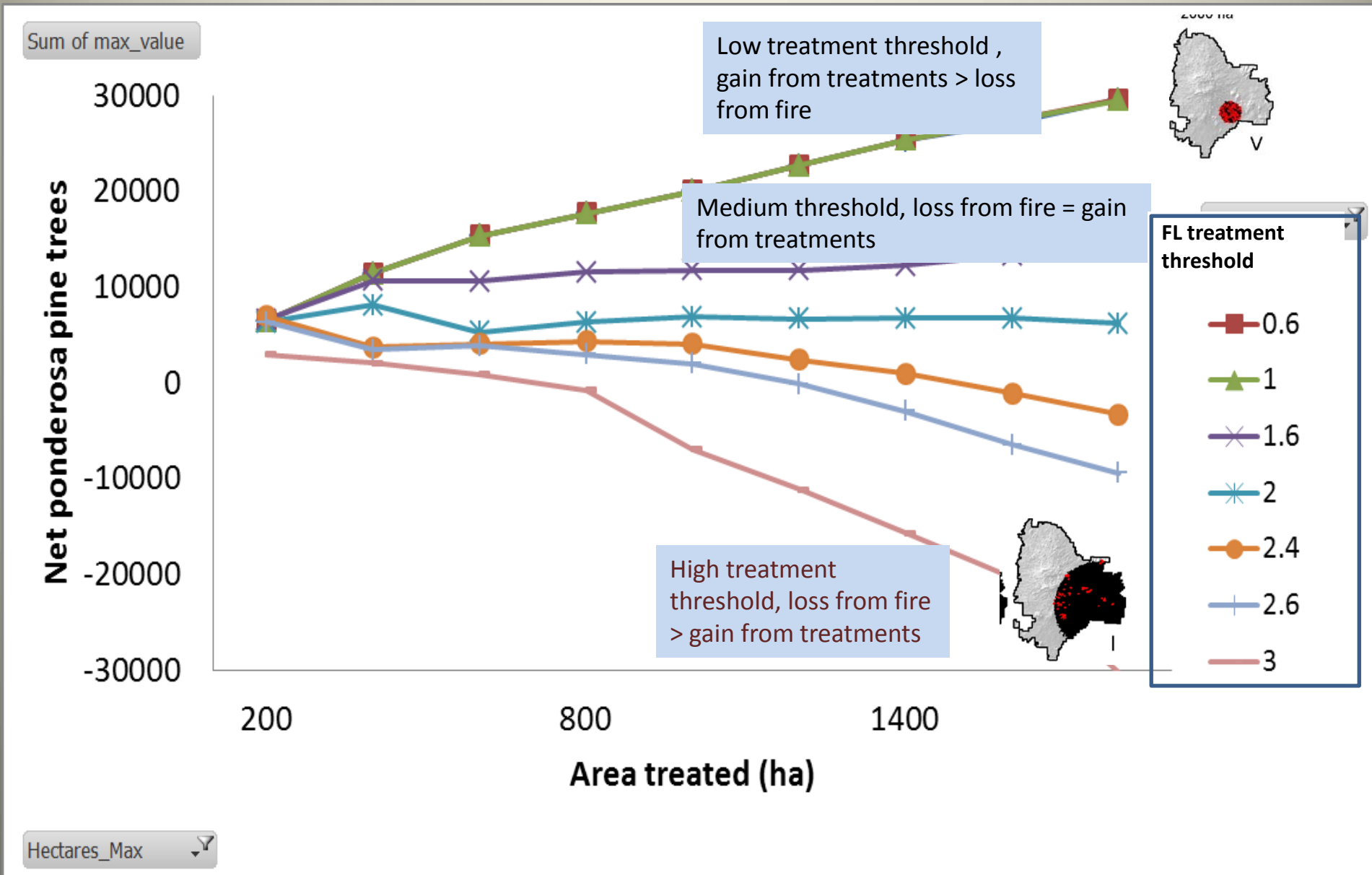
Assumptions

- Treatments save ponderosa pine from potential wildfire loss
- Untreated stands lose ponderosa pine according to the current level of hazard
- Finite budget and treatment area
- Objective: identify the patch location and fuel treatments to save the most ponderosa pine trees

Restored patch size by treated area and flame length threshold

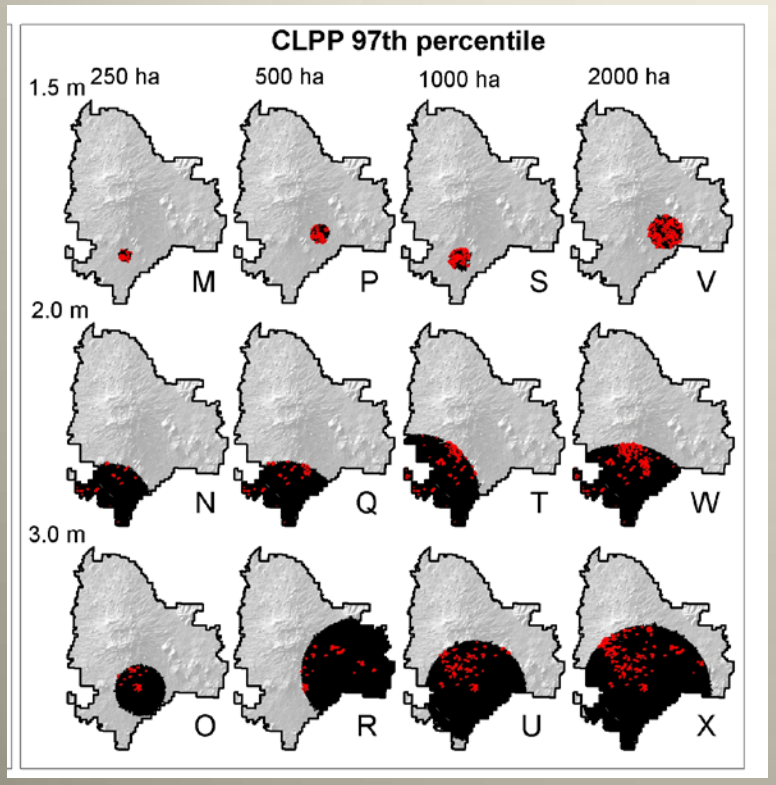


Effect of treatment area and flame length threshold on ponderosa pine after wildfire

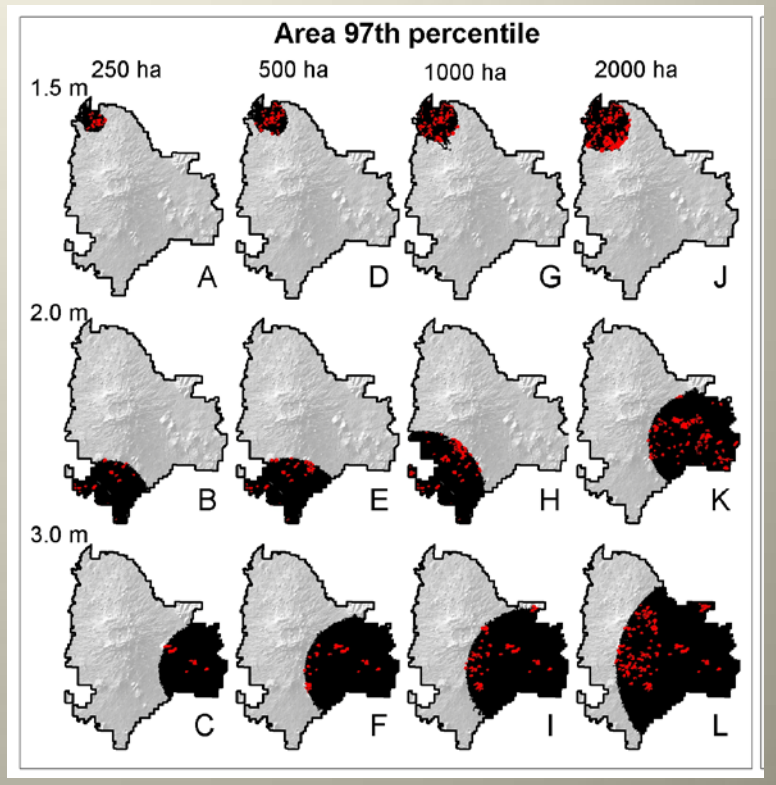


Optimal patch locations to reduce loss of old growth ponderosa pine

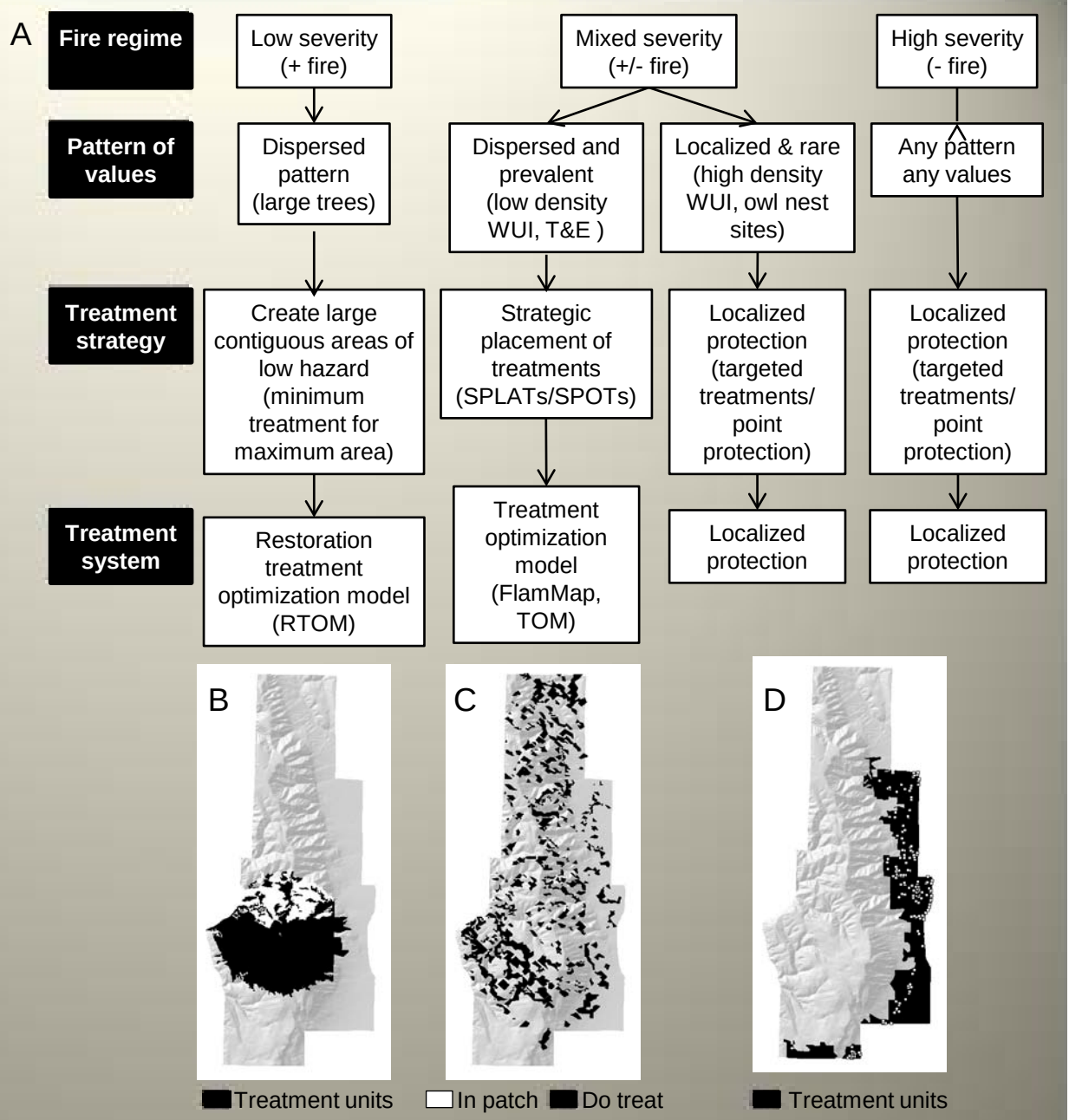
hazard



area



Ecological taxonomy for fuel management strategies



A multicriteria optimization tool for fuel treatment planning

- Home
- What is LTD?
- Download
- Case Studies & Presentations
- Publications
- Training & Workshops
- Related Links
- People
- WWETAC

Welcome to Landscape Treatment Designer

Fuel treatment planning can be difficult on large landscapes with multiple objectives. The LTD (Landscape Treatment Designer) program automates the process and allows for combining several objectives in weighted combinations so that treatment alternatives can be quickly generated and mapped. LTD can be used to create aggregated (contiguous patches) or non-aggregated (fragmented pattern) fuel treatment pattern(s).

www.arcfuels.org/ltd