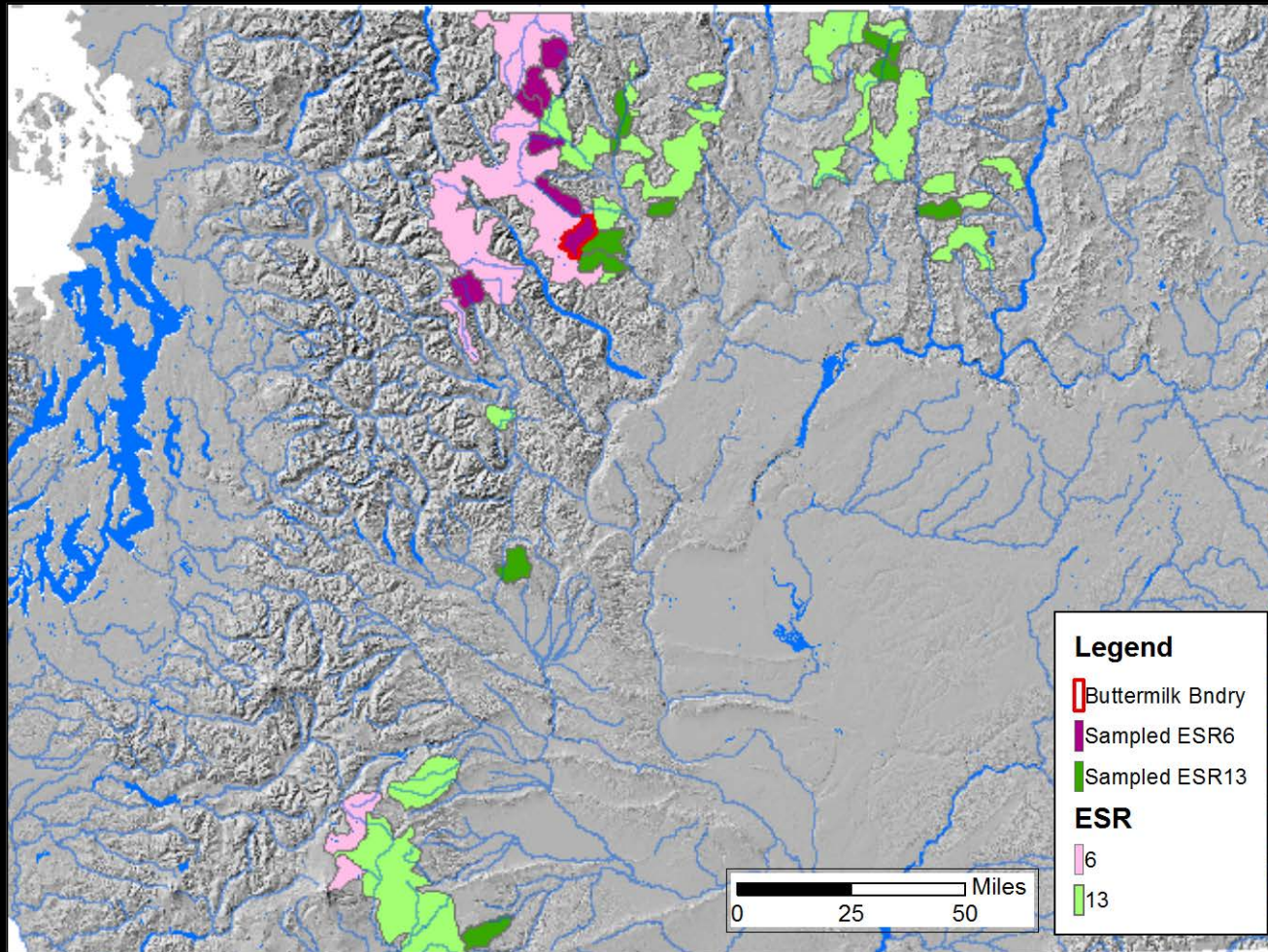


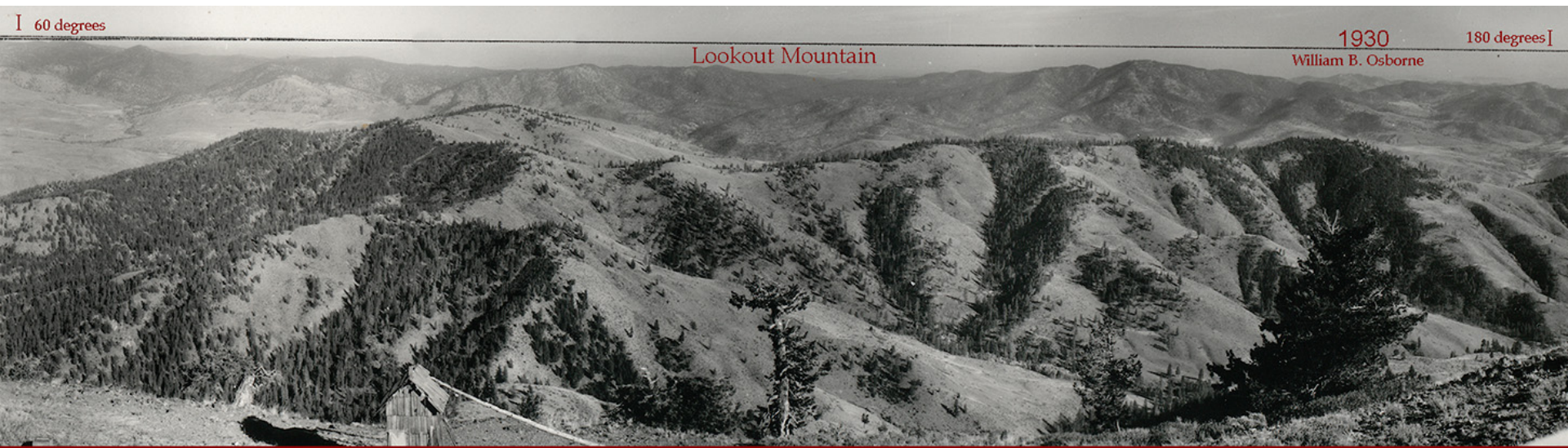
An aerial photograph of a mountainous landscape. The foreground shows a steep, rocky slope with sparse vegetation. The middle ground is dominated by a large, forested mountain range with a prominent valley. A river or stream flows through the valley, surrounded by dense evergreen forests. In the background, more mountain ranges are visible under a blue sky with scattered white clouds.

Landscape Evaluation & Prescription Mission Project Area Okanagan-Wenatchee National Forest

Derek Churchill
University of Washington
Stewardship Forestry & Science

Mission Project Area





I 60 degrees

Lookout Mountain

1930
William B. Osborne

180 degrees I



2011
John F Marshall

Historic image from National Archives and Records Administration
Seattle, WA.

2011 Image by John F Marshall.
Okanogan-Wenatchee National Forest
Wenatchee Forestry Sciences Lab

10/13/1930 by. William Osborne from the National Archives and Records Administration - Seattle, WA

I 180 degrees

300 degrees I

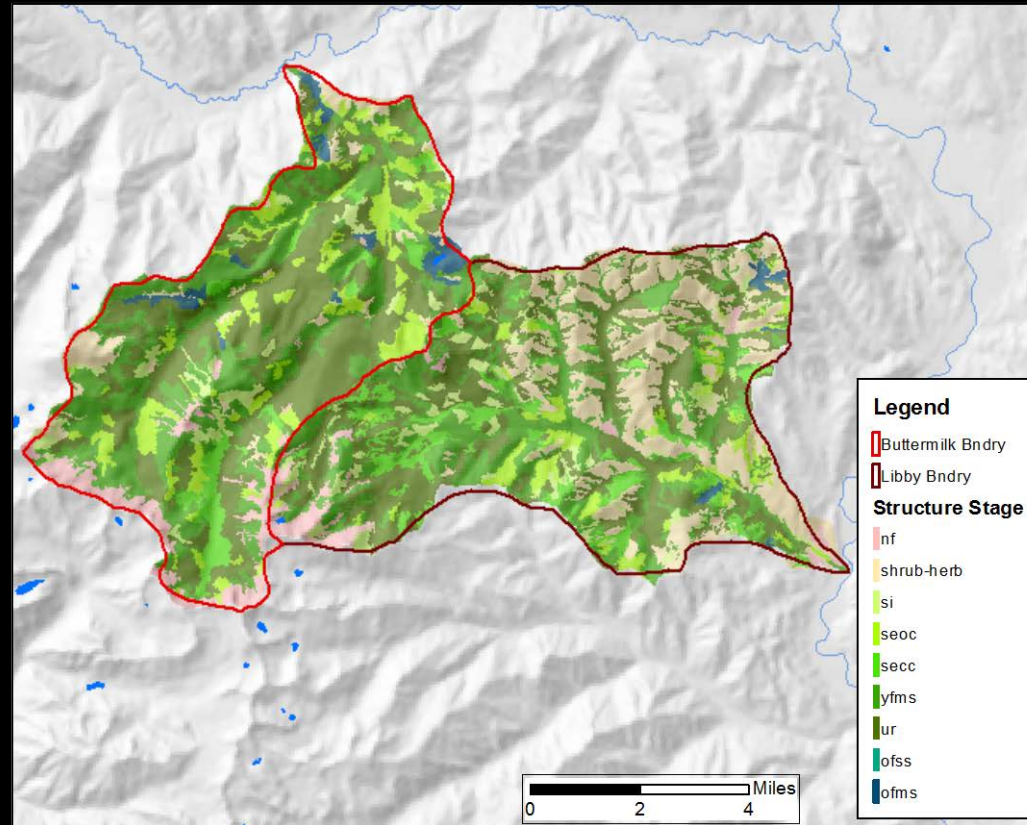


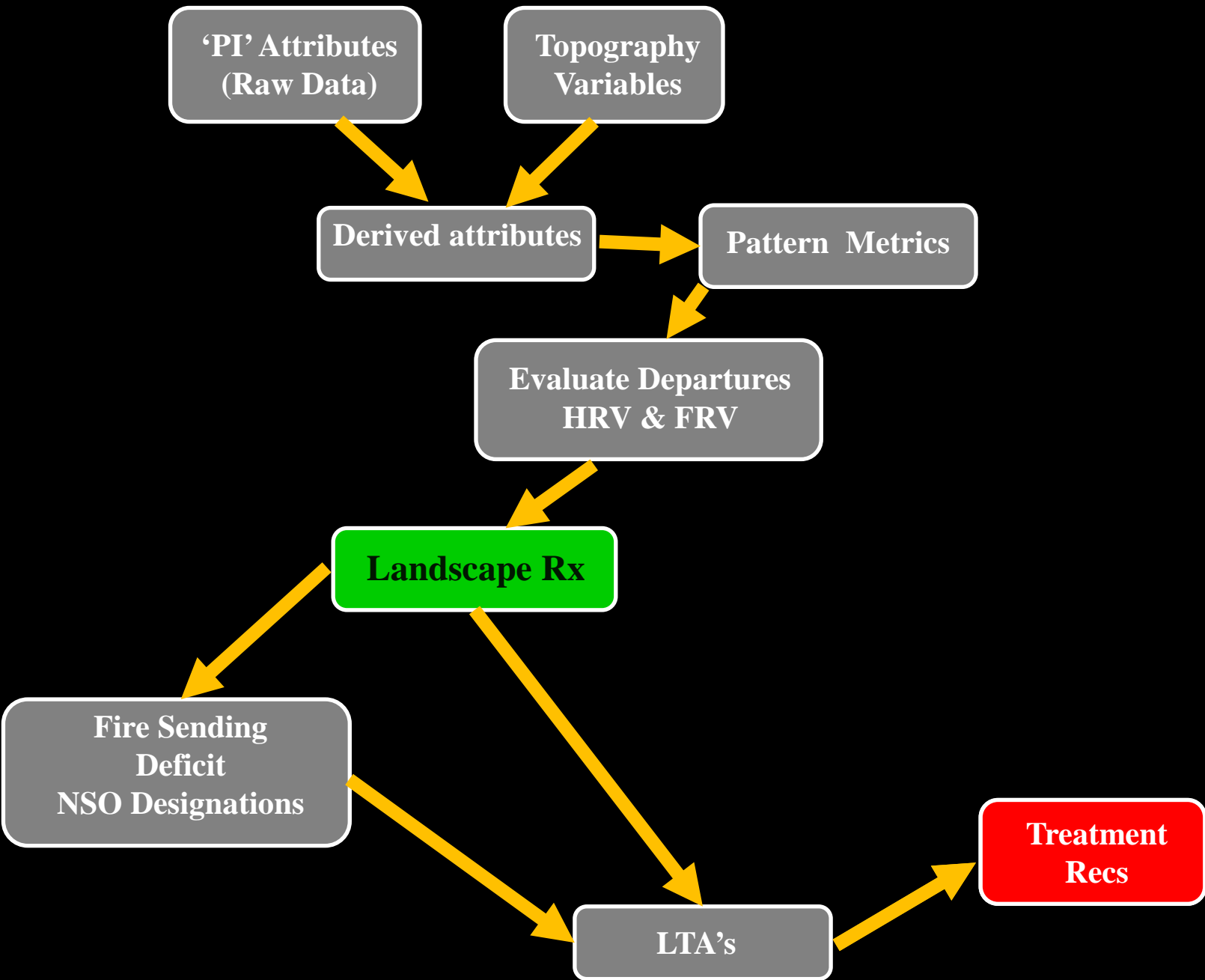
1930 image from National Archives and Records Administration
Seattle, WA

07/29/2011 by John F Marshall for USFS
Okanogan-Wenatchee National Forest
Wenatchee Forestry Sciences Lab

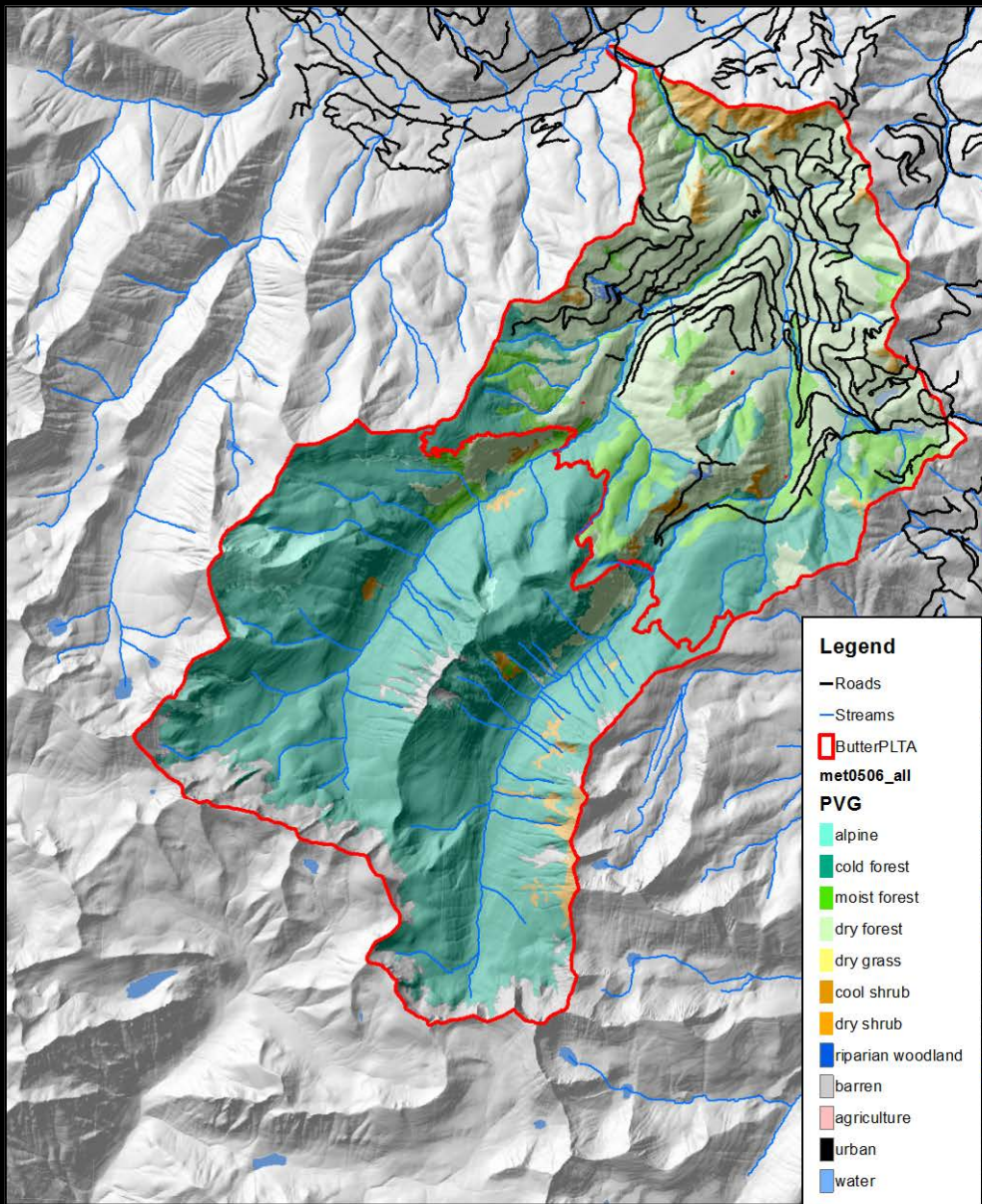
Landscape Evaluation Goals

1. Assess current condition & diagnose departure of structure, composition, & pattern of watershed
 - Habitat for focal species
 - Fire, insects
 - Incorporate roads, aquatics, & other user defined functions
 - HRV & FRV
2. Landscape Prescription
 - Targets for addressing departure in percent land & pattern
 - Guidance for whole watershed
 - Priority treatment areas





Potential Vegetation Group (PVG)



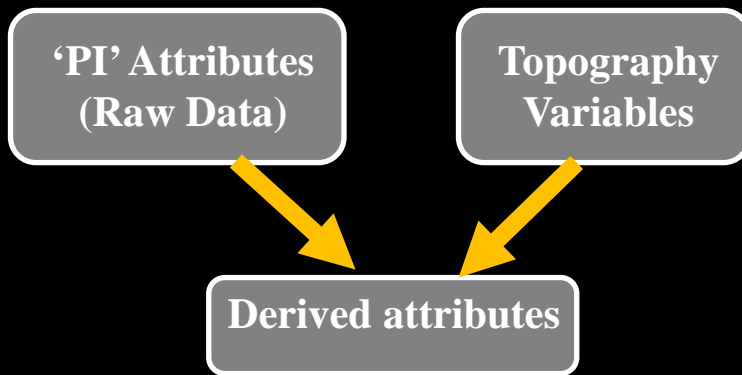
'PI' Attributes
(Raw Data)

Topography
Variables

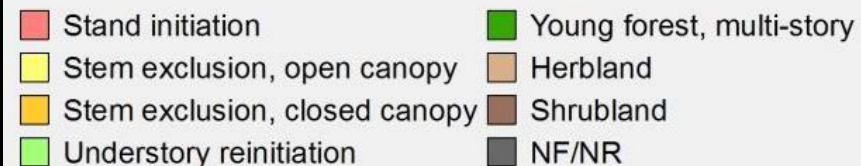
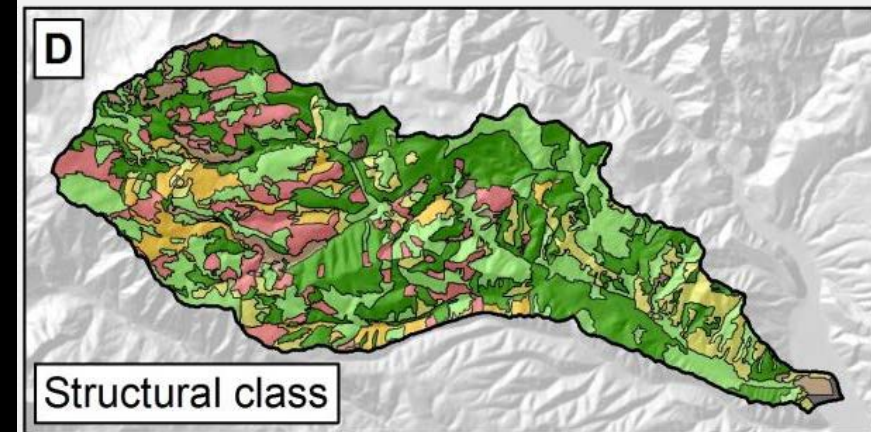
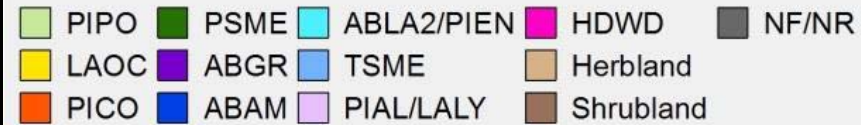
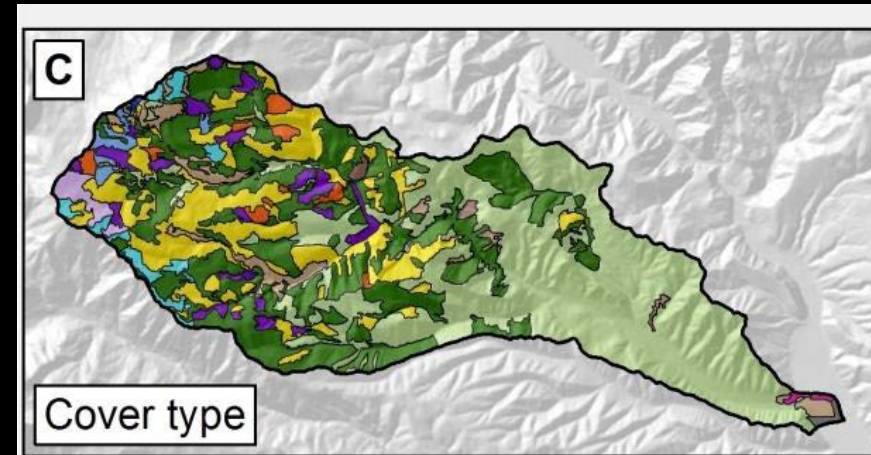
Delineate polygons and collect Photo Interpreted attributes:

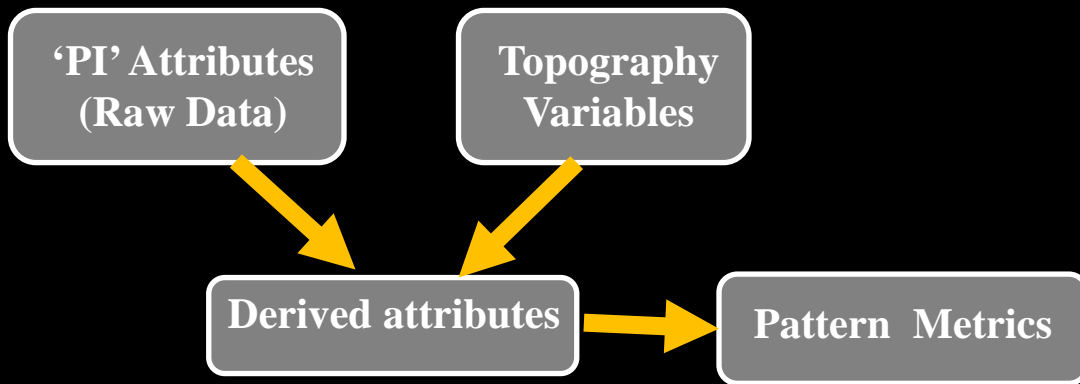


- % Canopy cover
- # Canopy layers
- Size class of trees
- Species composition
- Snag abundance
- Clumpiness of trees
- Others ...

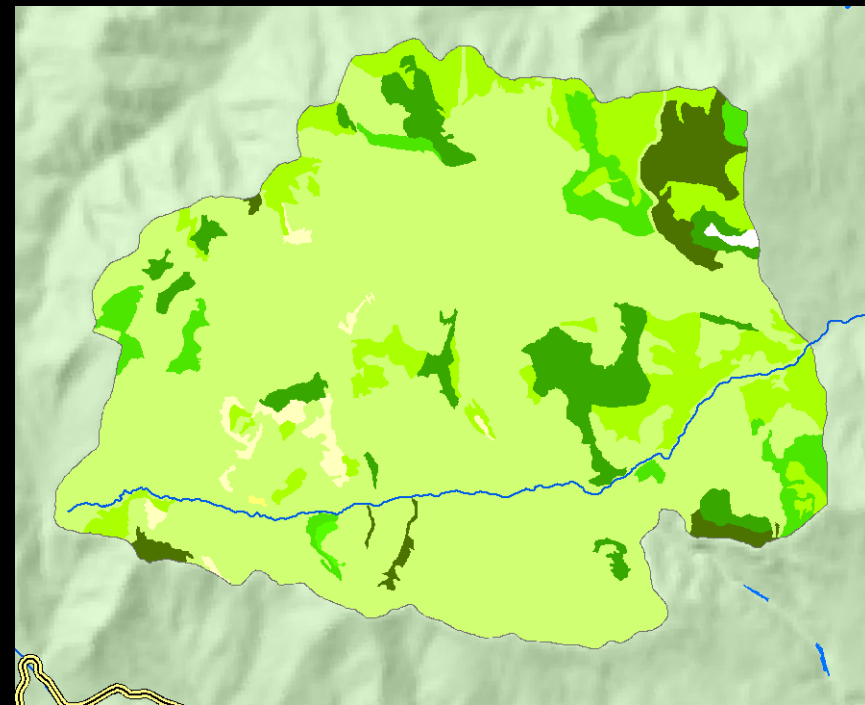
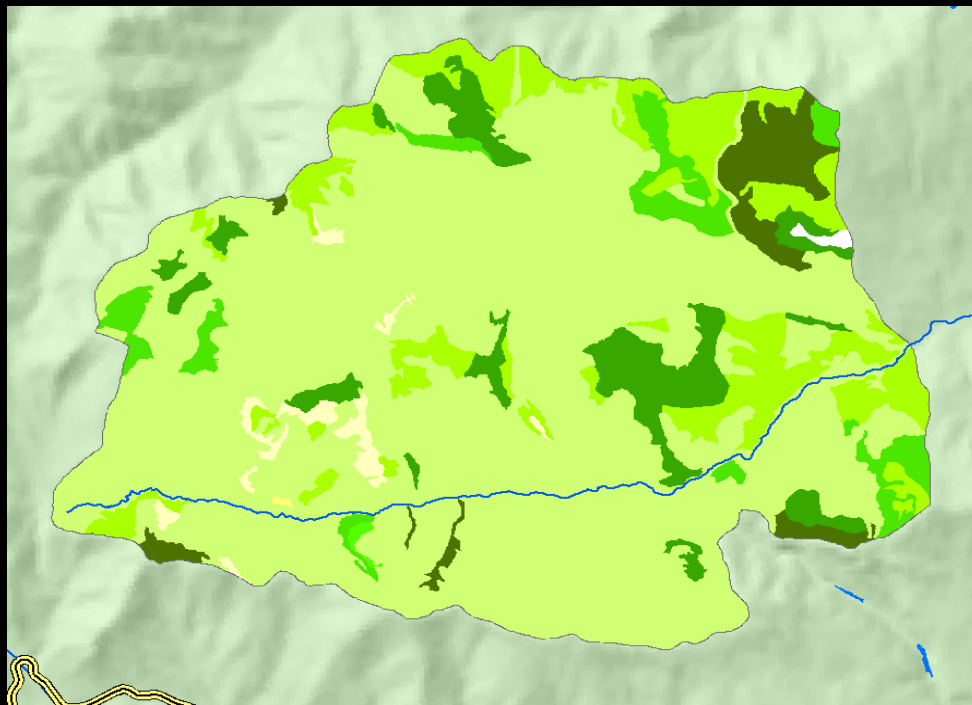


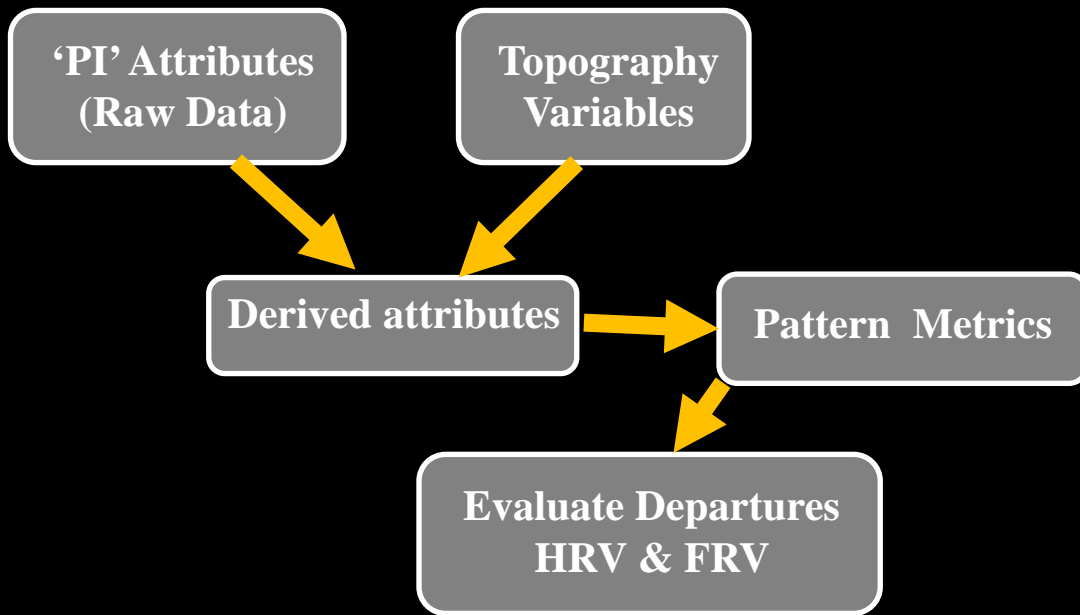
- Structure Class
- Cover Type
- Canopy Cover
- Large tree cover
- Habitat Indices
- Fire ratings
- Insect & disease ratings





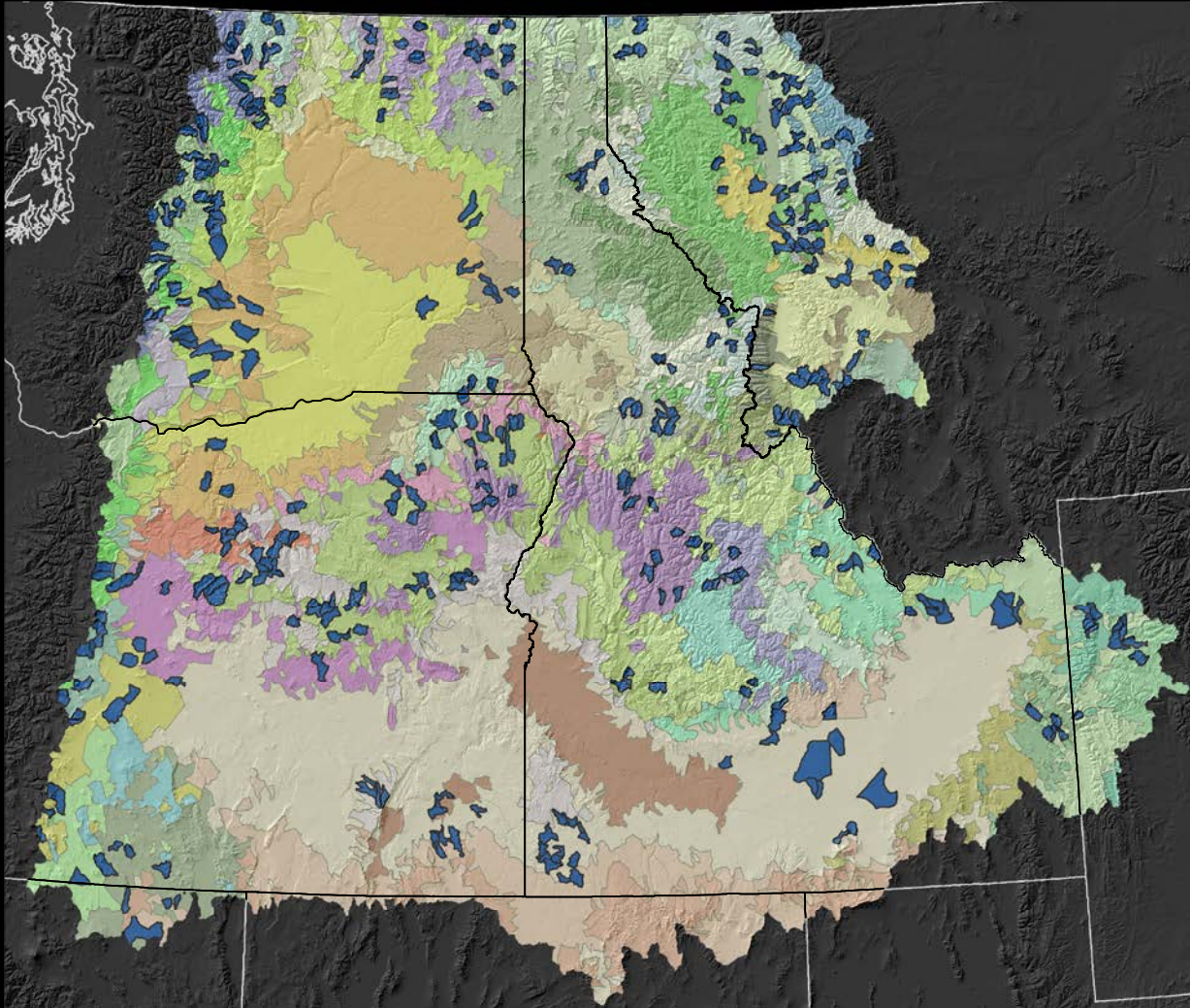
- Percent Area
- Mean patch size
- Largest patch
- Nearest neighbor
- IJI vs Contagion





Evaluating Departure

Historical Watersheds

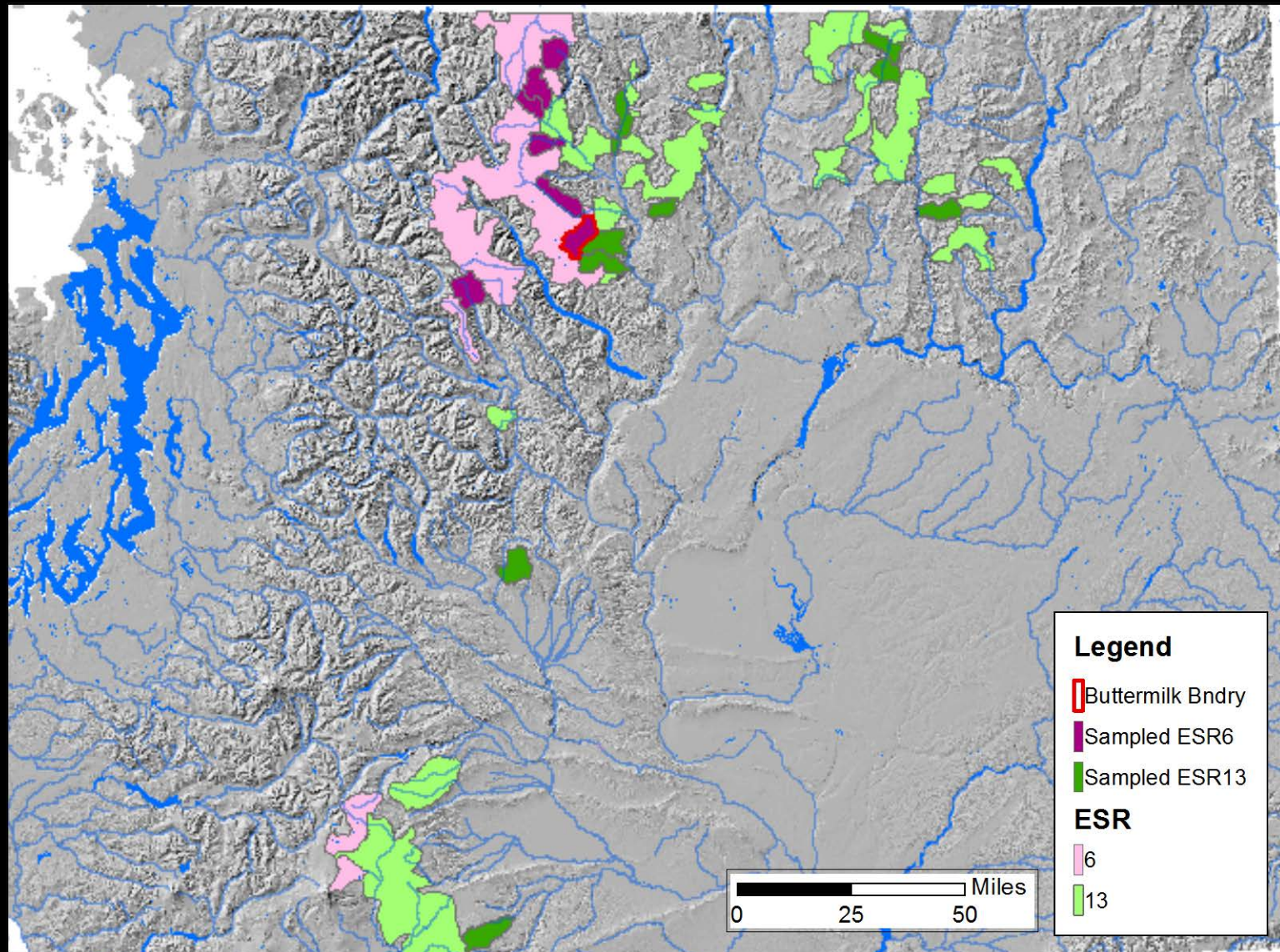


Interior Columbia
Basin Ecosystem
Management
Project (ICBEMP)
Hessburg et al. 2000

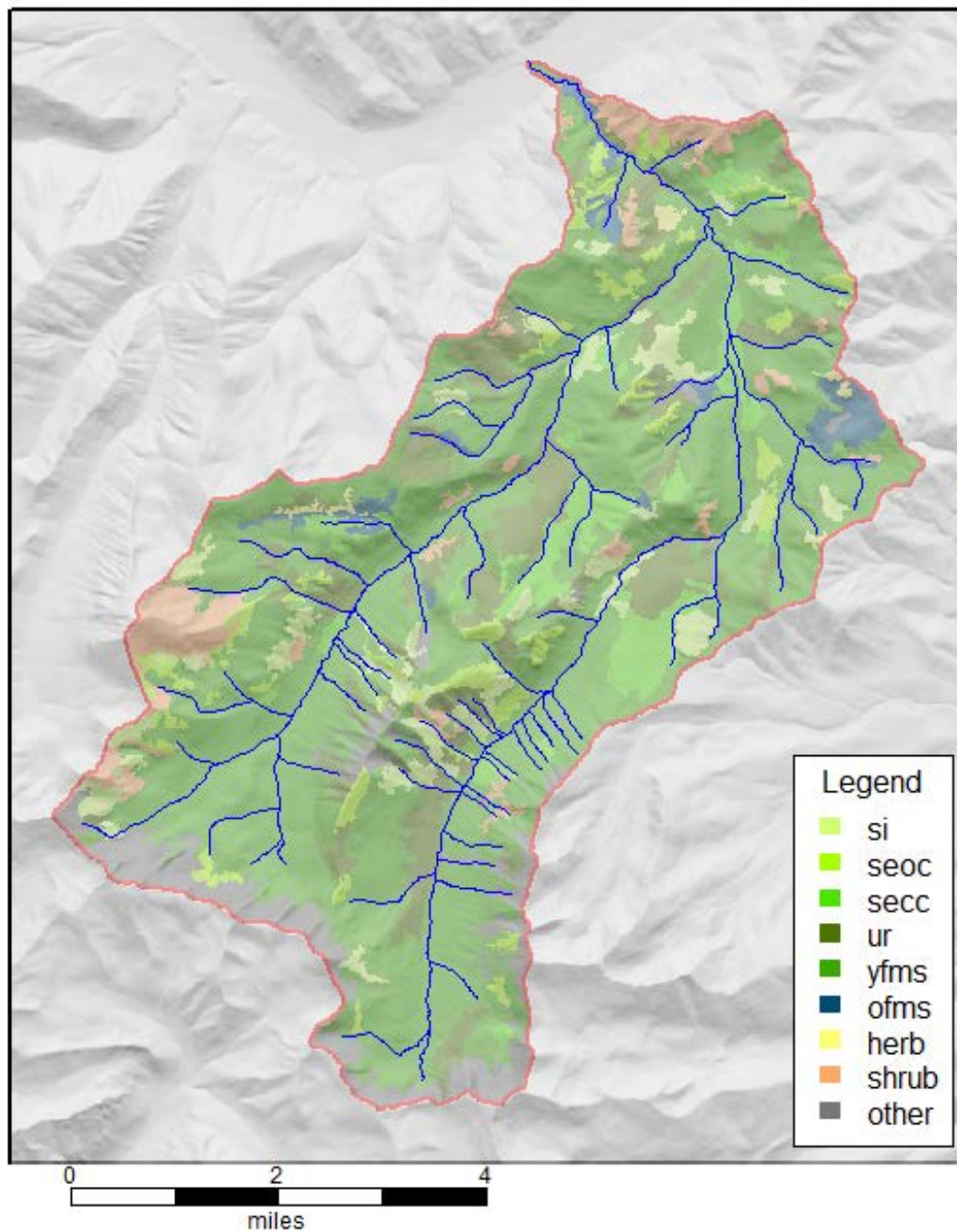
- PI work: 1930-50's photos
- Derived attributes
- Pattern metrics

HRV & FRV Buttermilk

HRV: ESR 6
FRV: ESR 13



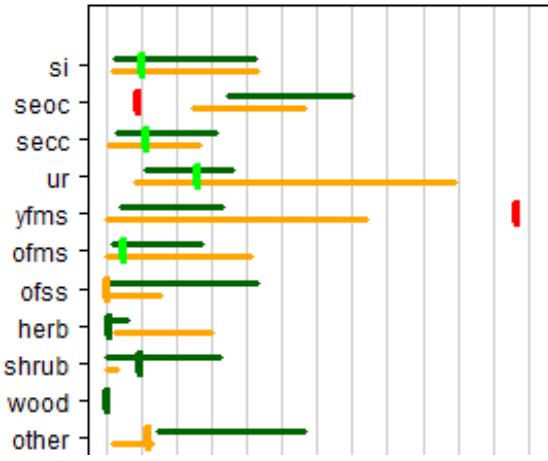
Struct. Class



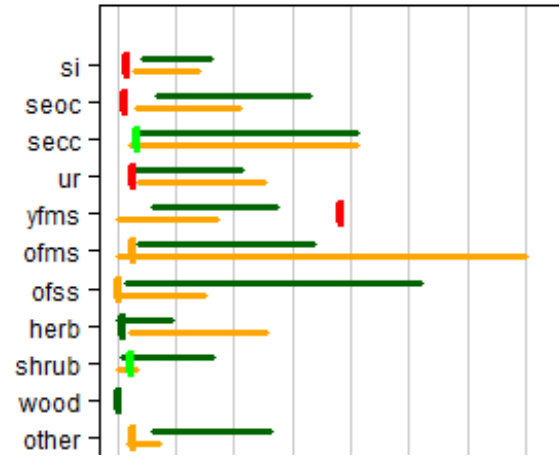


Structure Class

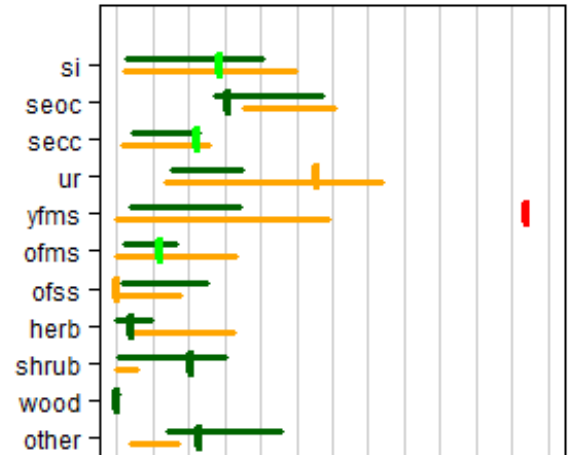
Percent Land



Mean Patch Size



Patch Density



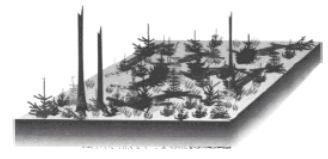
Young Forest
Multistory



Stem Exclusion
Open Canopy



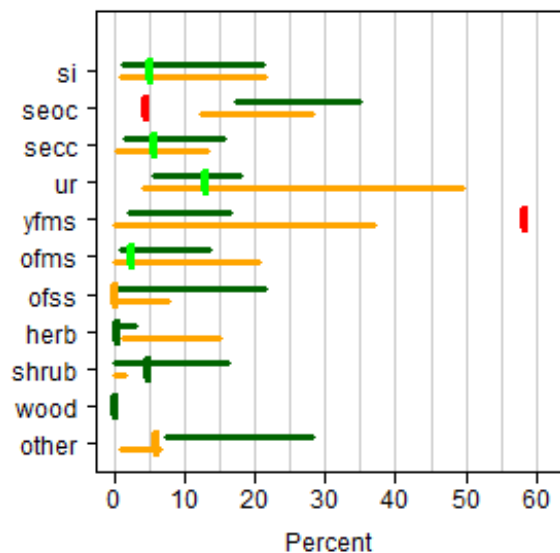
Old Forest Single
Story



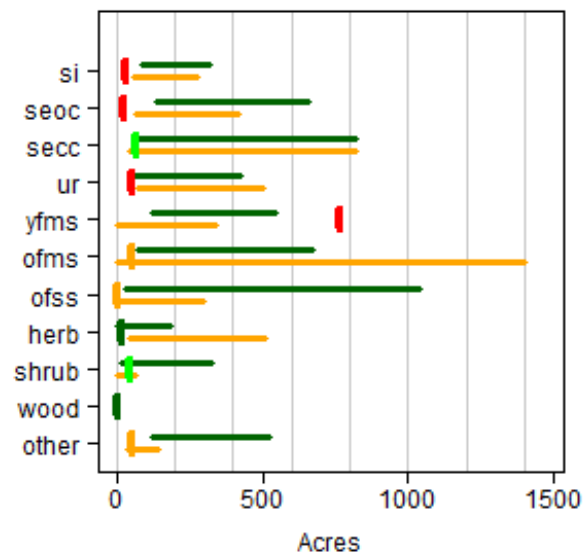
Stand Initiation

Structure Class

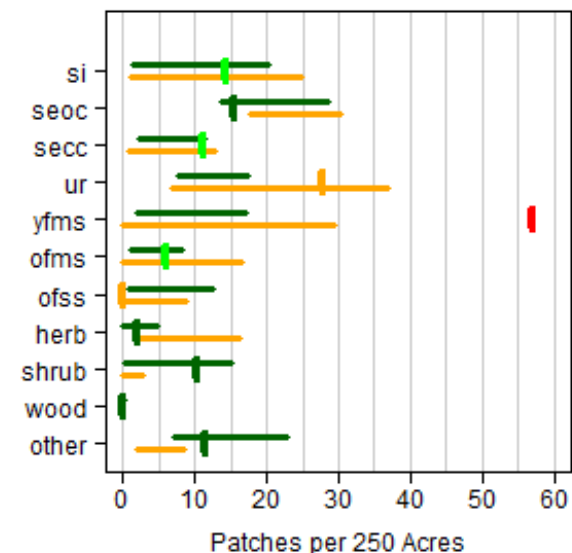
Percent Land



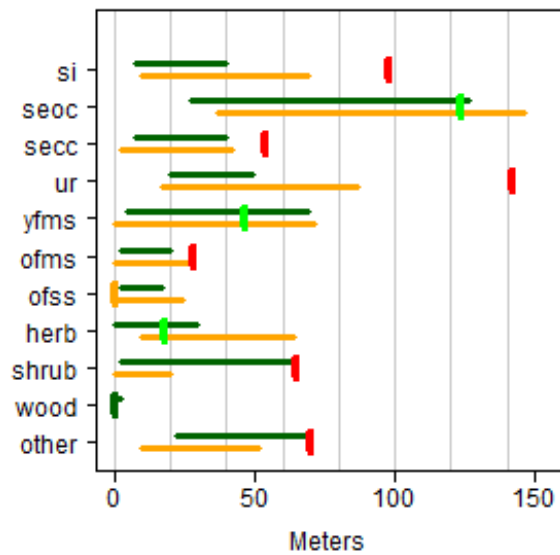
Mean Patch Size



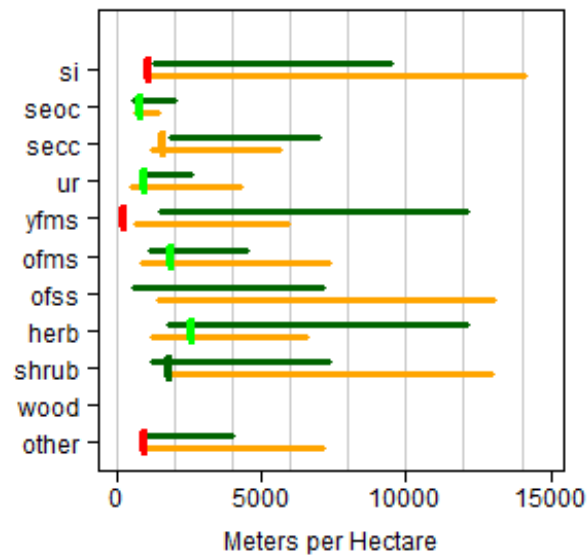
Patch Density



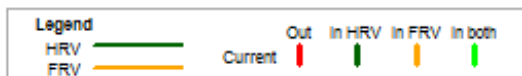
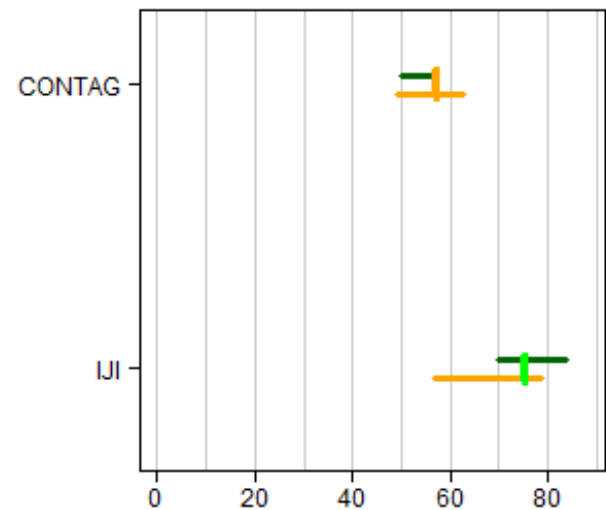
Mean Nearest Neighbor



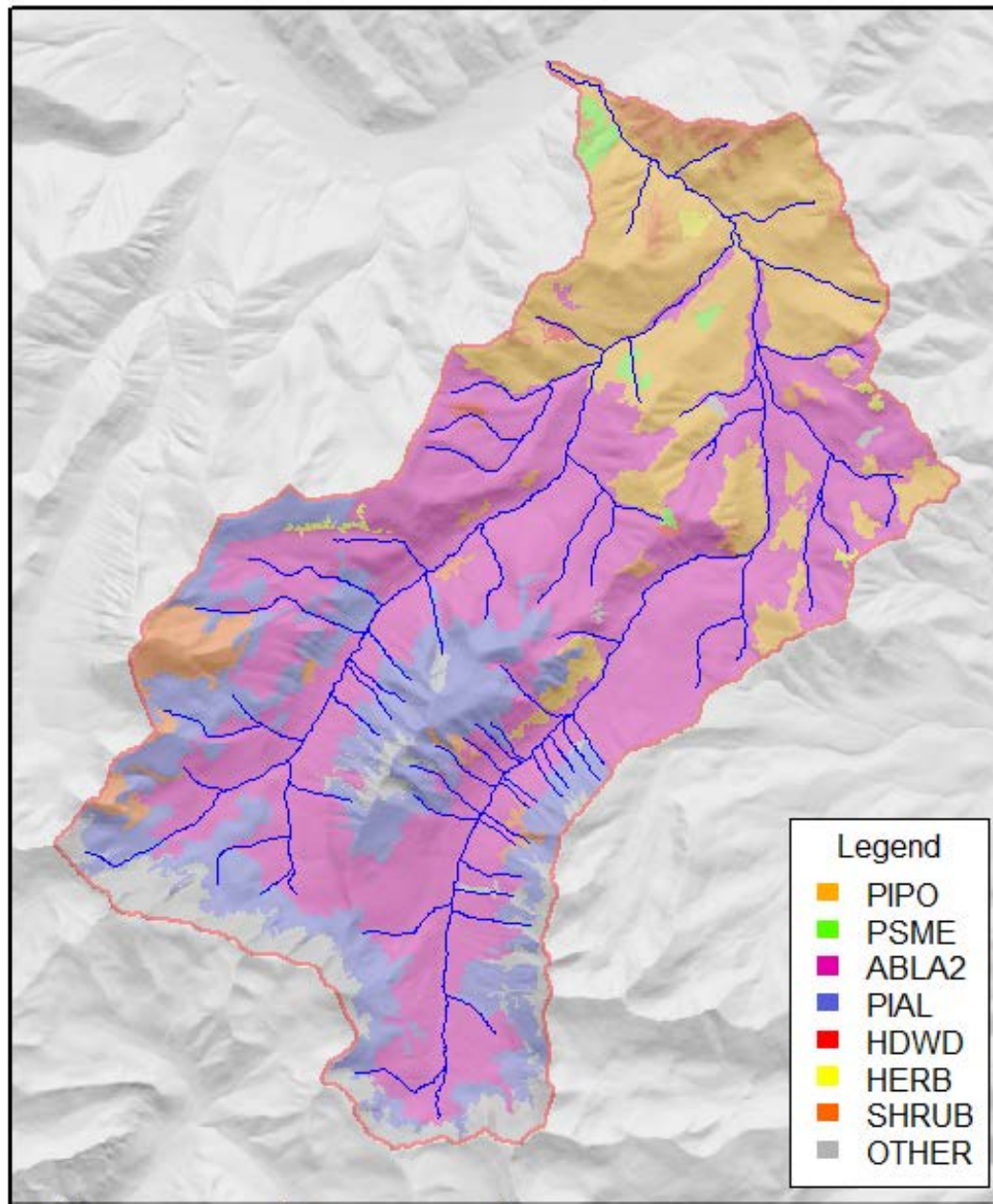
Edge Density



Landscape Metrics



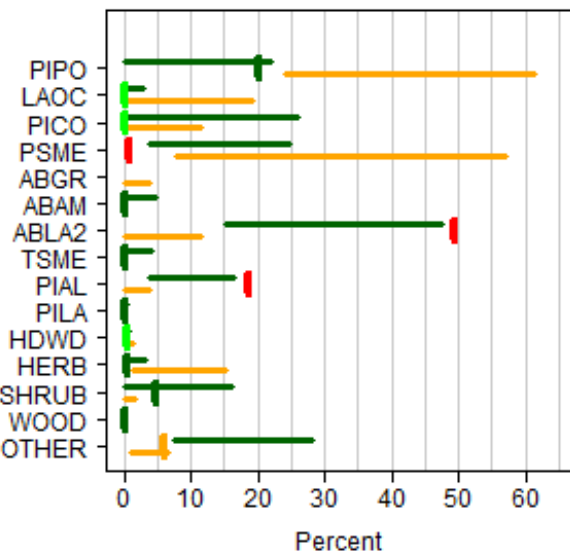
Cover Type



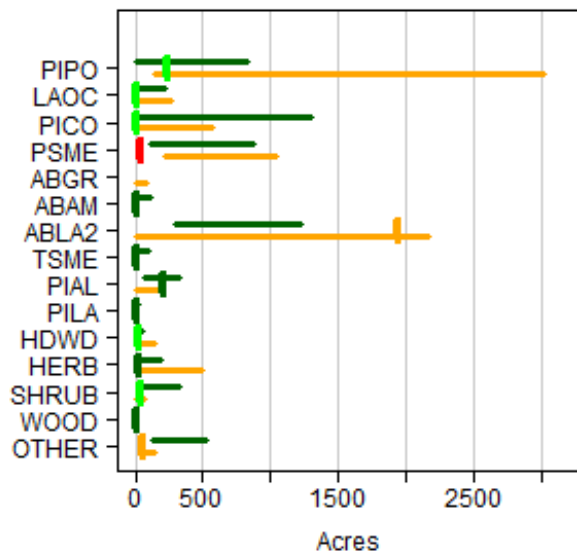
0 2 4
miles

Cover Type

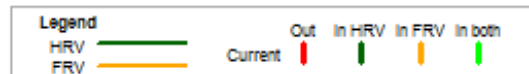
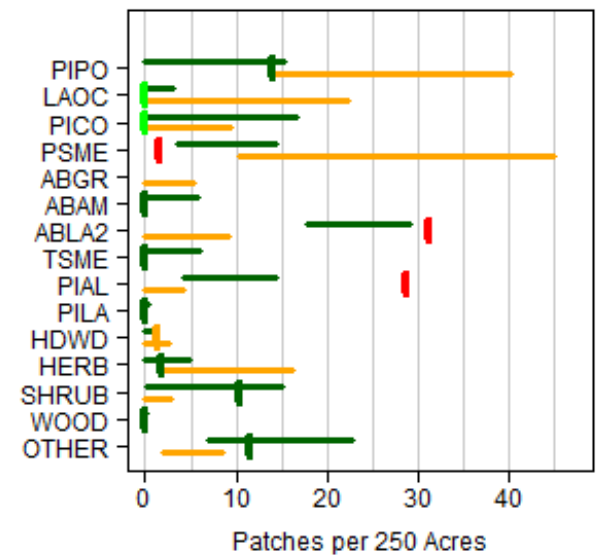
Percent Land



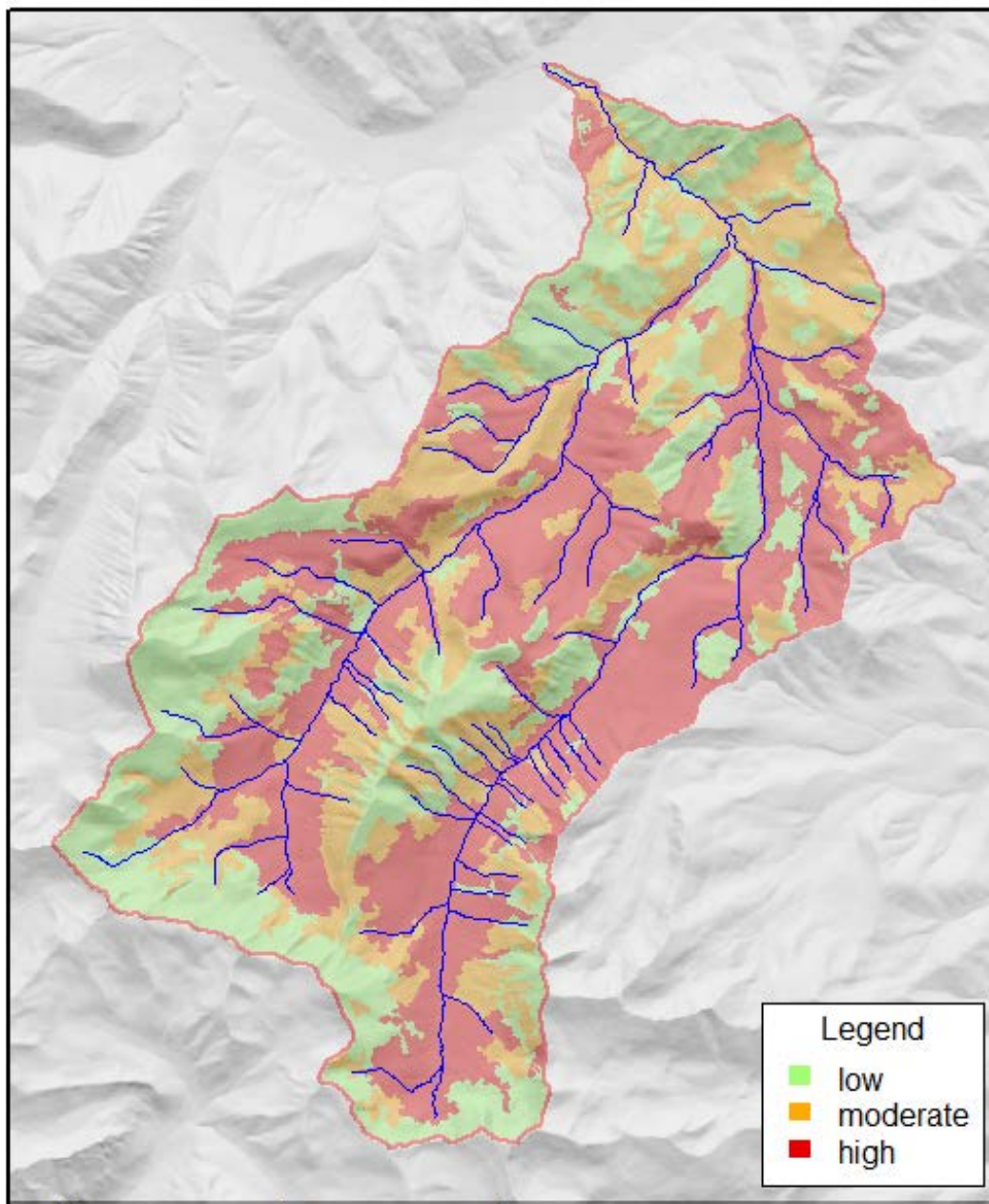
Mean Patch Size



Patch Density



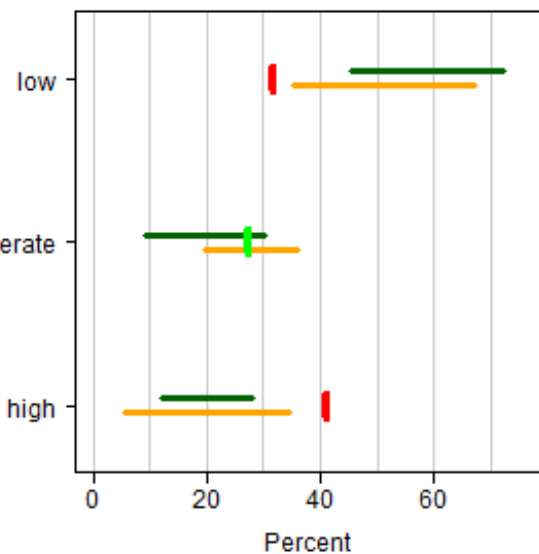
Crown Fire Potential



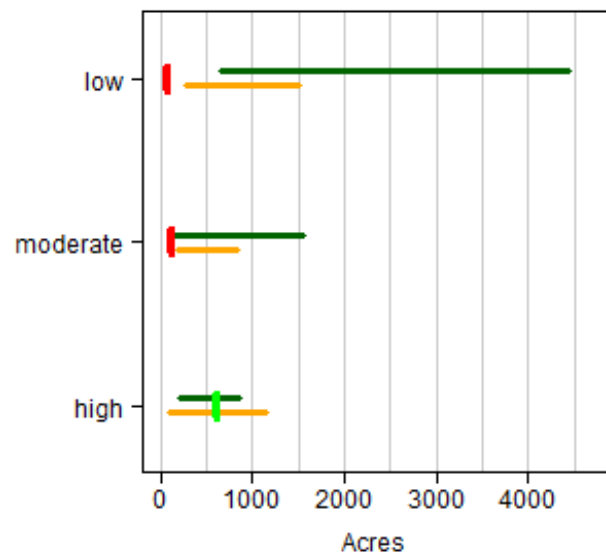
0 2 4
miles

Crown Fire Potential

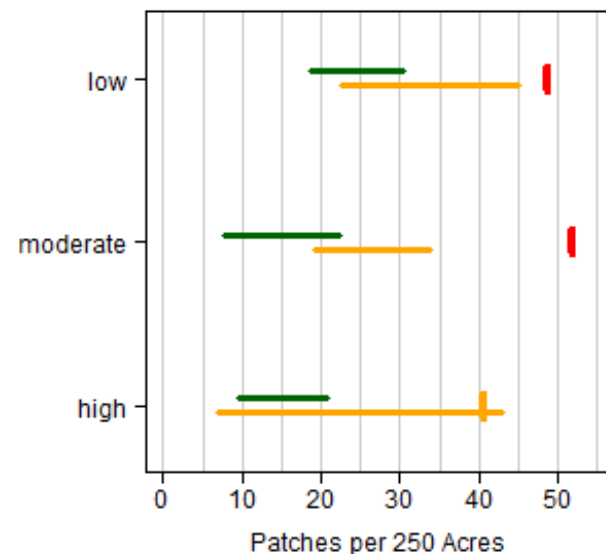
Percent Land



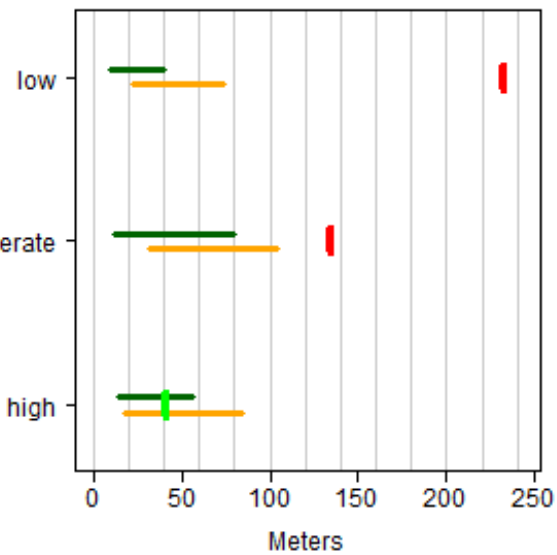
Mean Patch Size



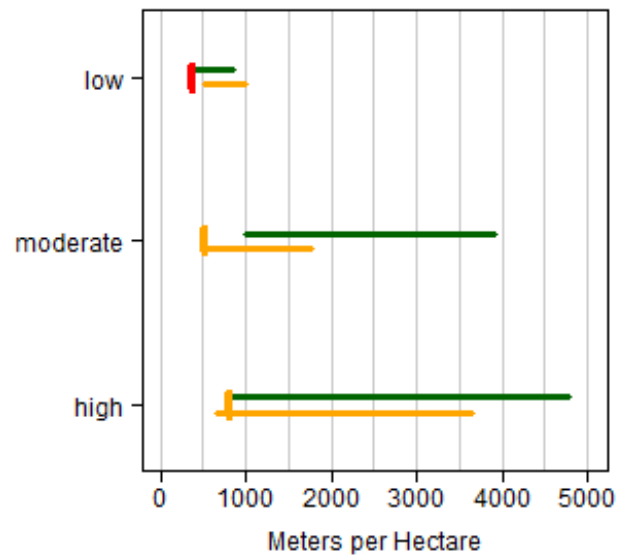
Patch Density



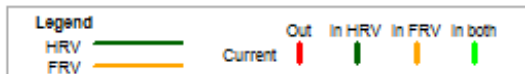
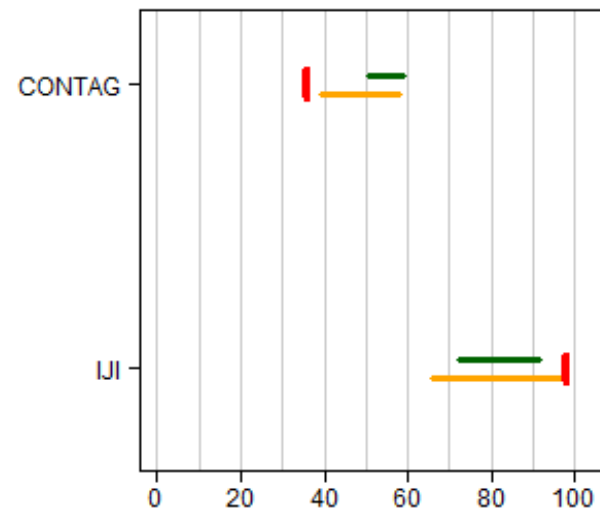
Mean Nearest Neighbor



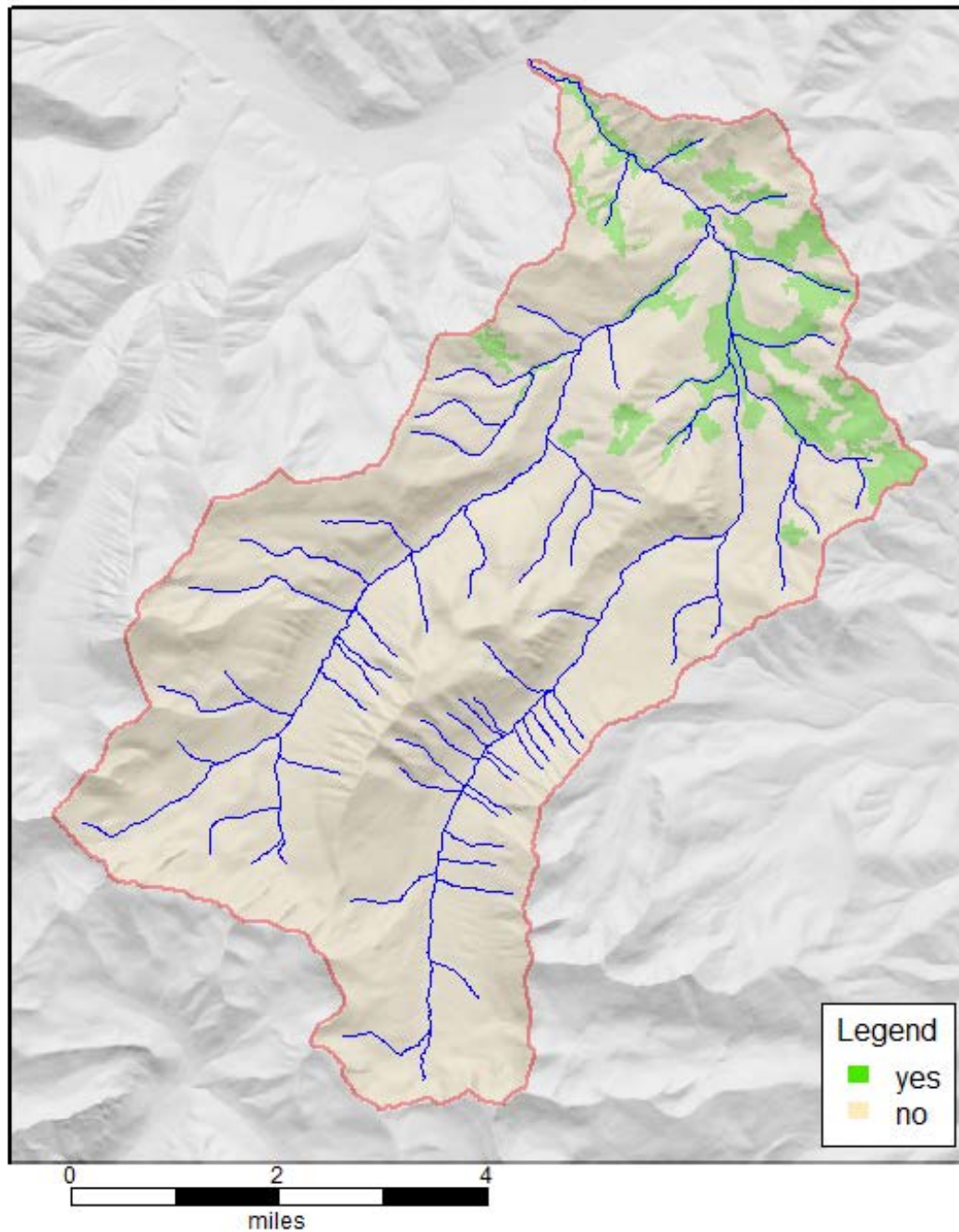
Edge Density



Landscape Metrics

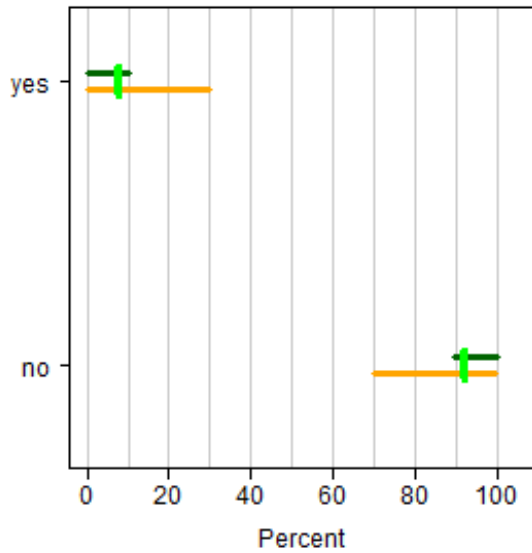


Northern Spotted Owl

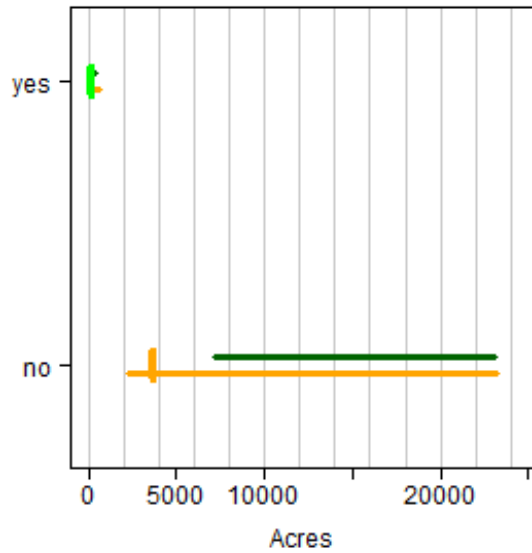


Northern Spotted Owl

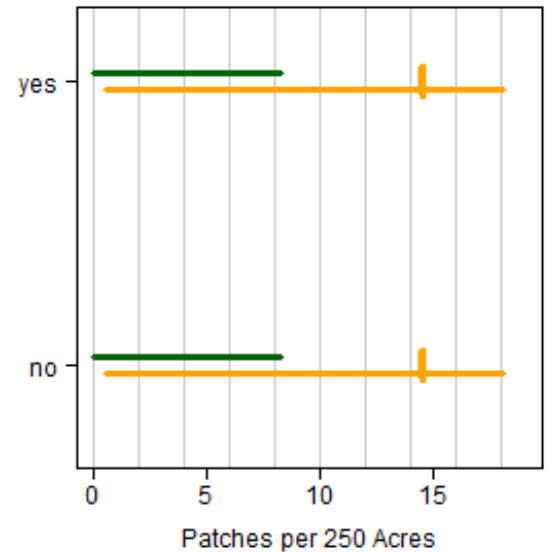
Percent Land



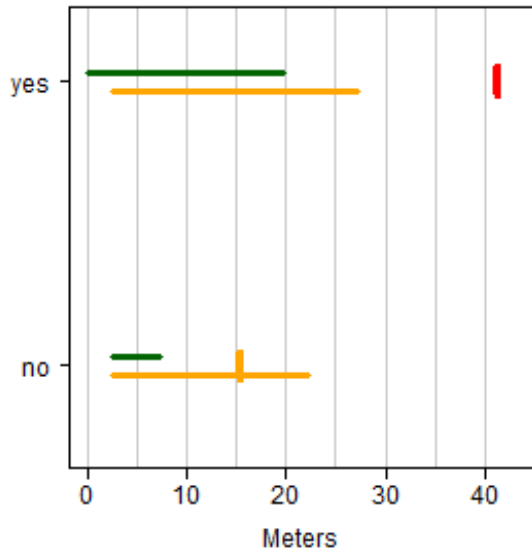
Mean Patch Size



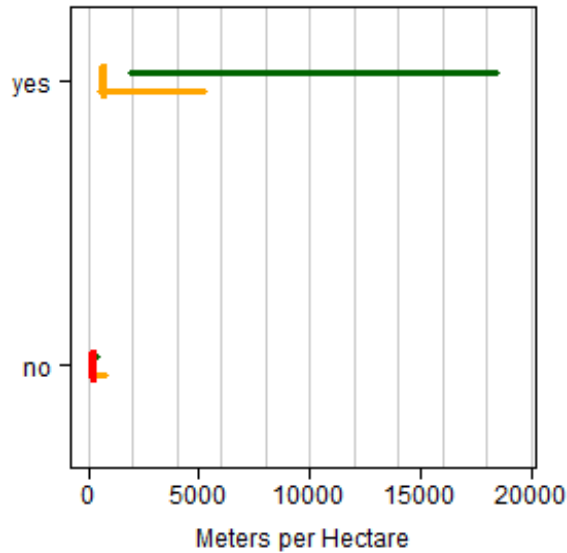
Patch Density



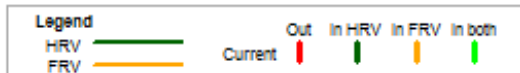
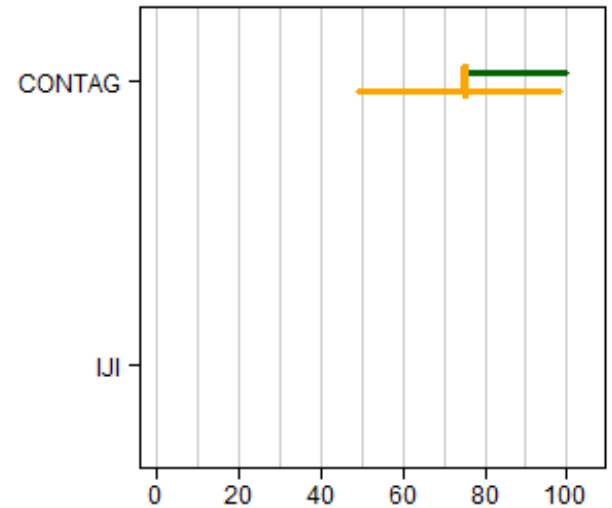
Mean Nearest Neighbor



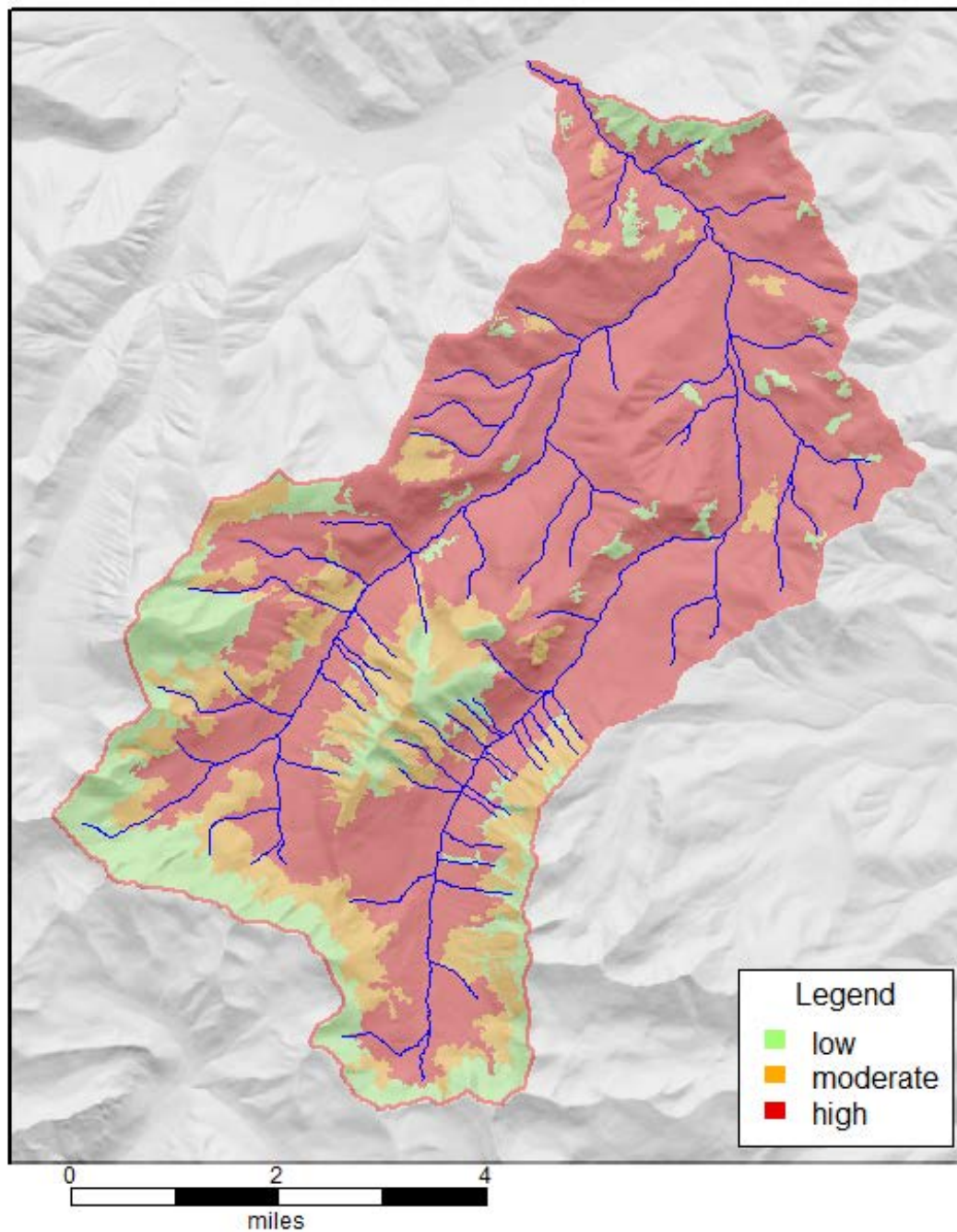
Edge Density



Landscape Metrics

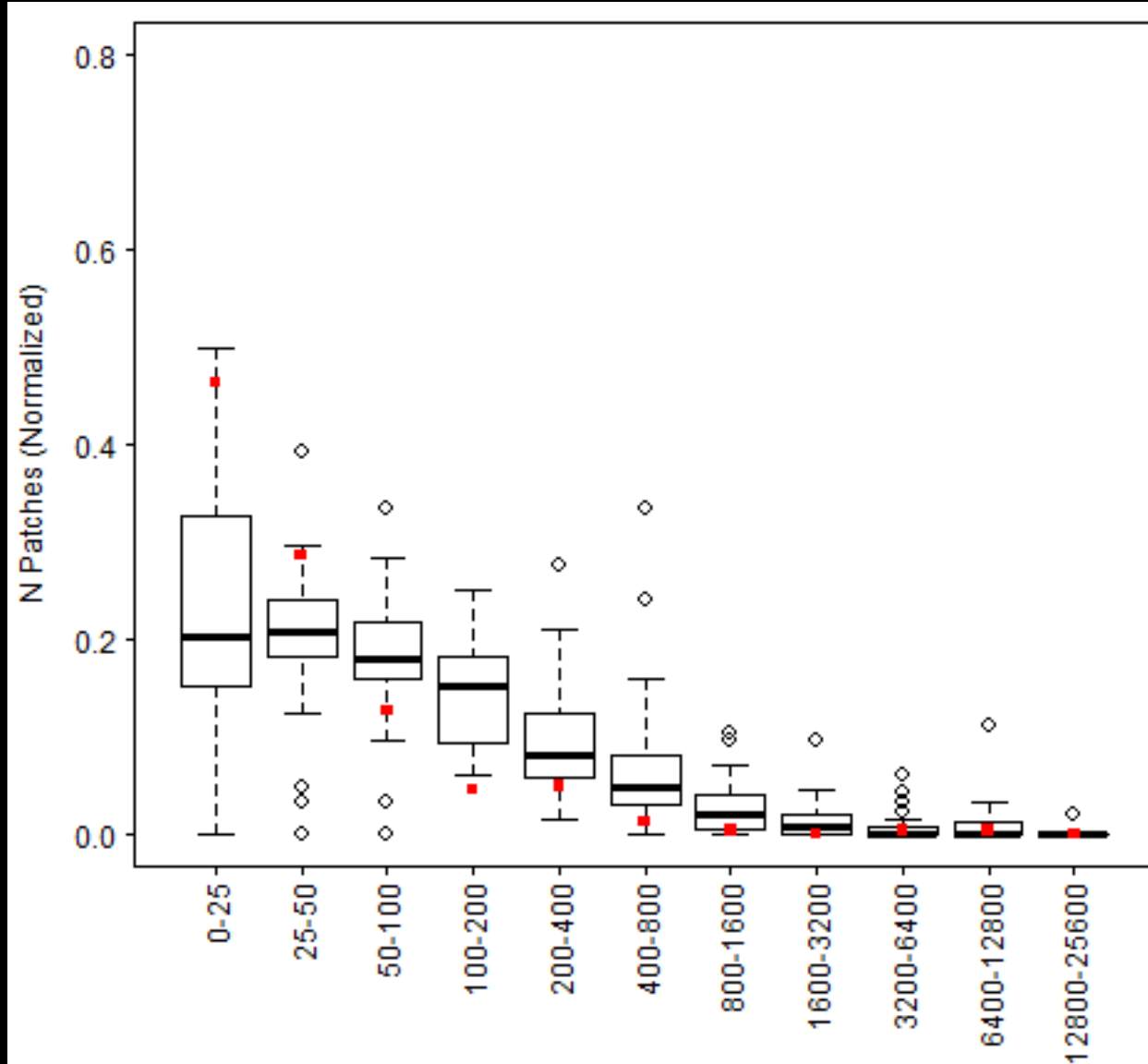


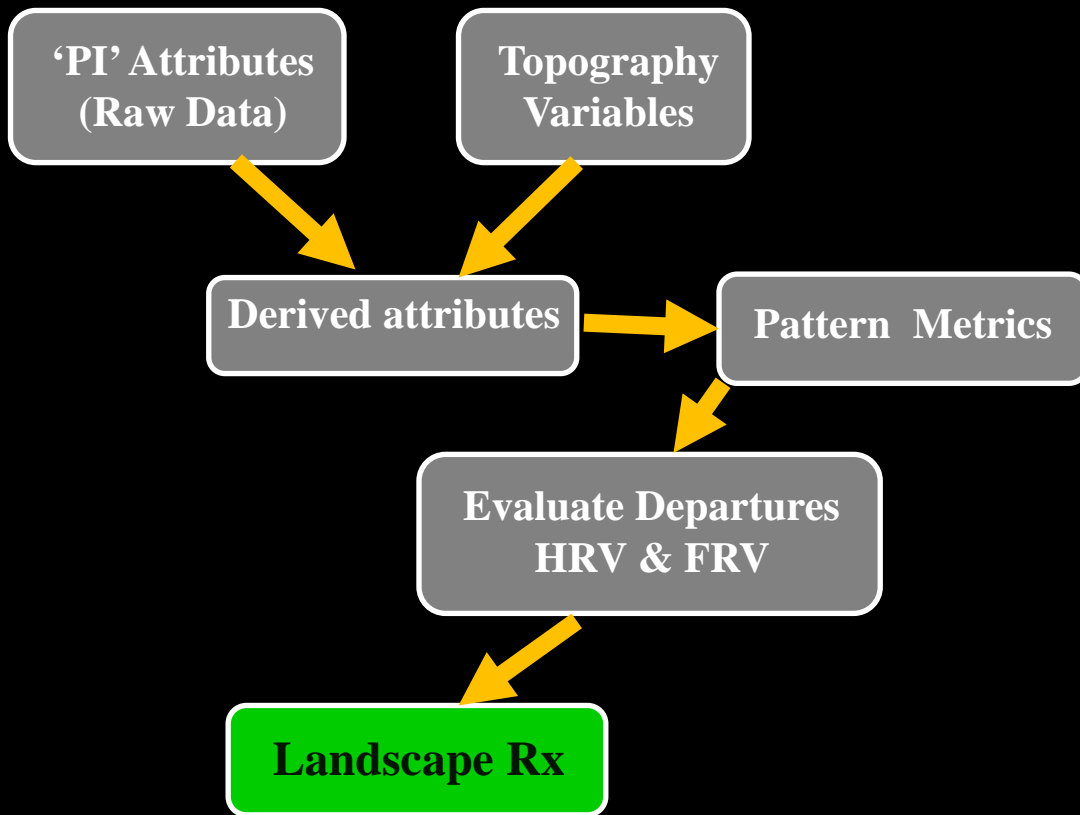
W. Spruce Budworm



Landscape Rx

Patch Size Distribution: Structure Class





Landscape Rx

- *Too much Young Forest Multi-story → High crown fire*
- *Not enough open canopy forest. Patch size too small & fragmented*
- *Too much ABLA, need more PSME, LAOC, & PICO*
- *NSO, Large trees → Area ok, pattern out of whack*

Landscape Rx

- *Too much Young Forest Multi-story → High crown fire*
 - *Not enough open canopy forest. Patch size too small & fragmented*
 - *Too much ABLA, need more PSME, LAOC, & PICO*
 - *NSO, Large trees → Area ok, pattern out of whack*
-
- *More area & larger patch size of open canopy, large tree forest*
 - *Reduce young, multi-story forest*
 - *Consolidate: large tree, closed, multi-story into larger patches*

Landscape Rx

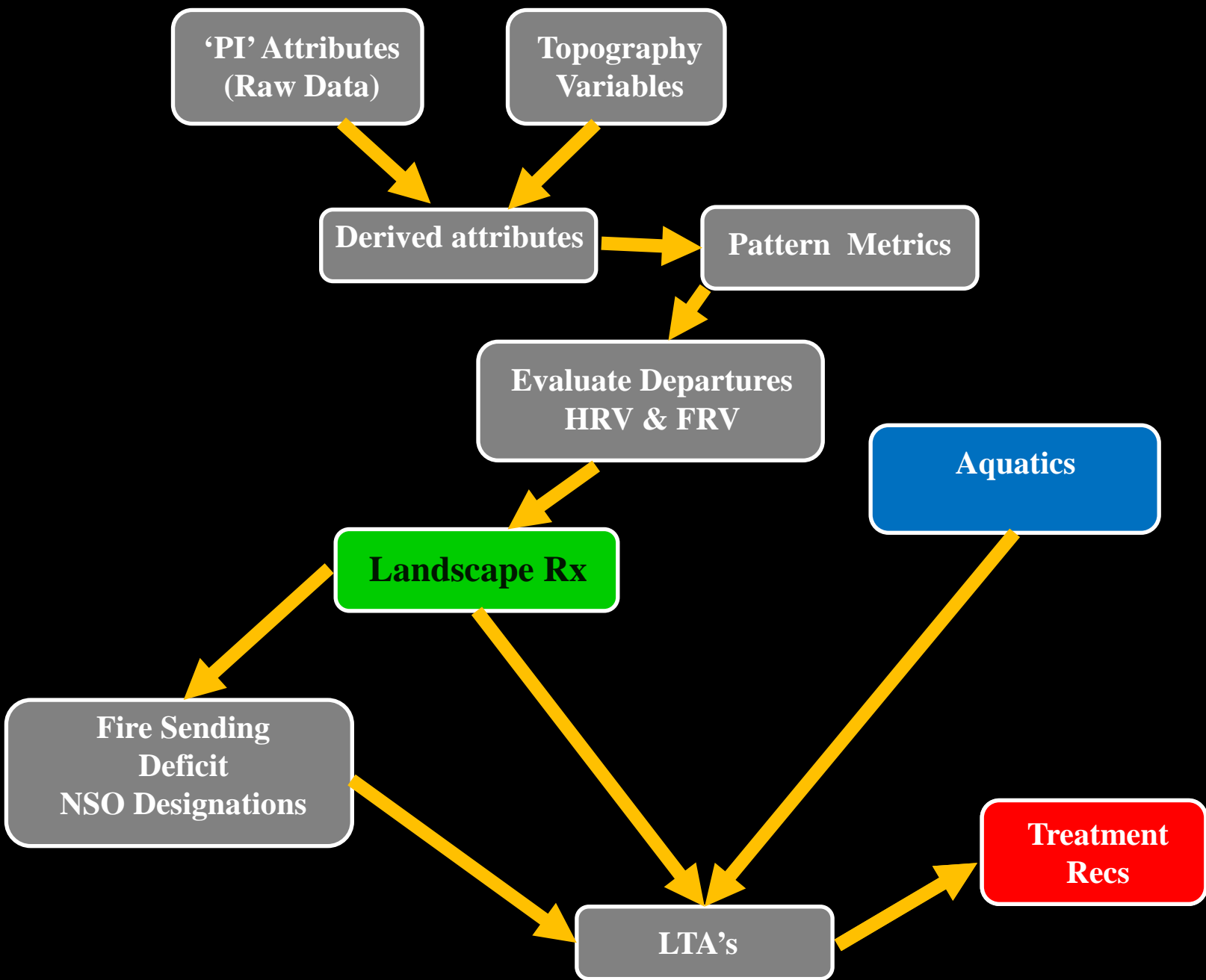
Dry Forest Areas:

1. Reduce area in YMFS (4740ac → 0-435ac), SECC (348ac → 0-85ac), UR (800ac → 0-600ac), and SI (350ac → 0-140ac) by converting into fewer, more compact patches with more separation. Reduce size of largest patch of YFMS and SECC.
2. Increase area and patch size of OFSS
3. Increase area (540ac → 900-1700ac) and patch size of SEOC by expanding and consolidating into fewer, more compact patches with more separation.
4. Reduce area in ABLA (2340ac → ~0 ac) by reducing number of patches and size of largest patch. Reduce edge and patch separation. Increase PSME as needed.

Moist Forest Areas:

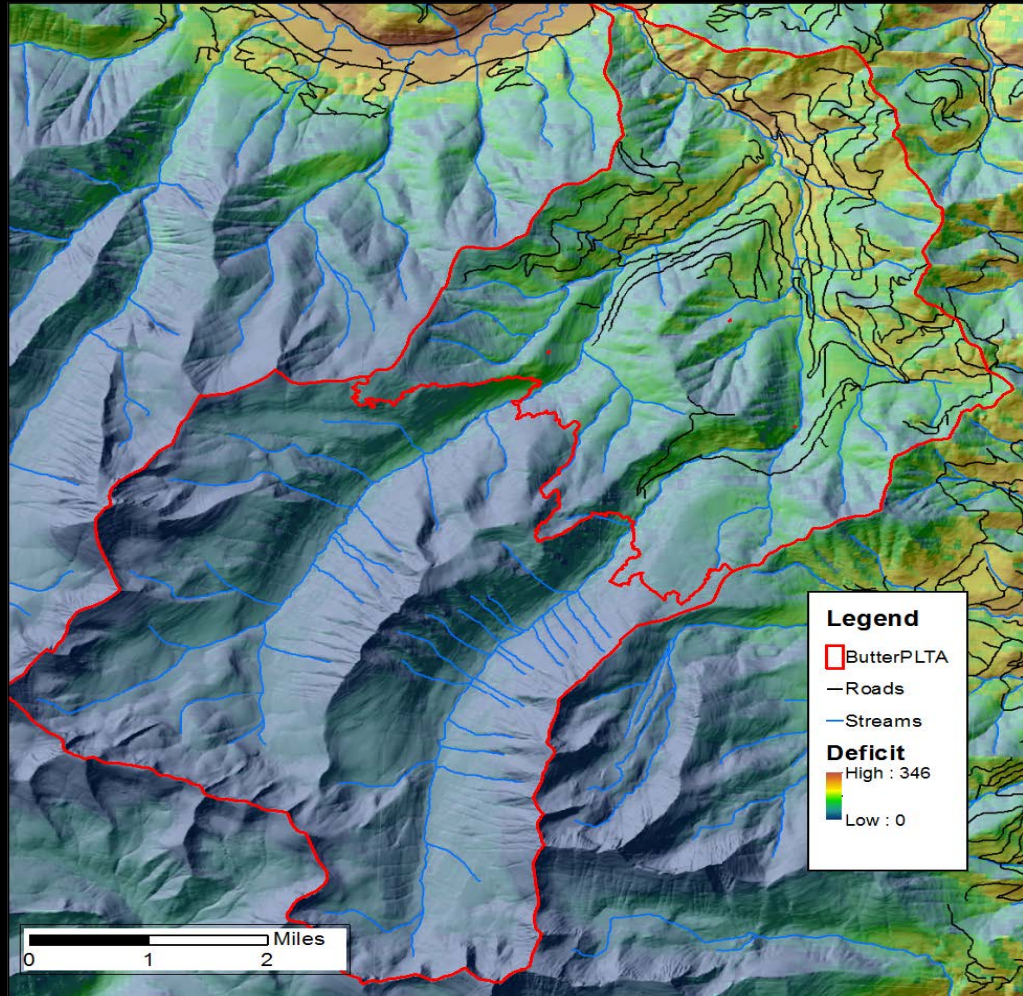
1. Increase area and patch size of OFMS and OFSS.
2. Reduce area in ABLA (1500ac → ~0 ac) by reducing number of patches and size of largest patch. Reduce edge and patch separation.
3. Increase PSME (11 → 1520 – 1980) & PIPO (440 → 2600-3300). Can also increase PICO.

Rx → Cold Forest, Wildlife, Fire, Insect & Disease



Landscape Rx → Treatment Recommendations

1. Rx → Landscape Treatment Areas



Landscape Rx → Treatment Recommendations

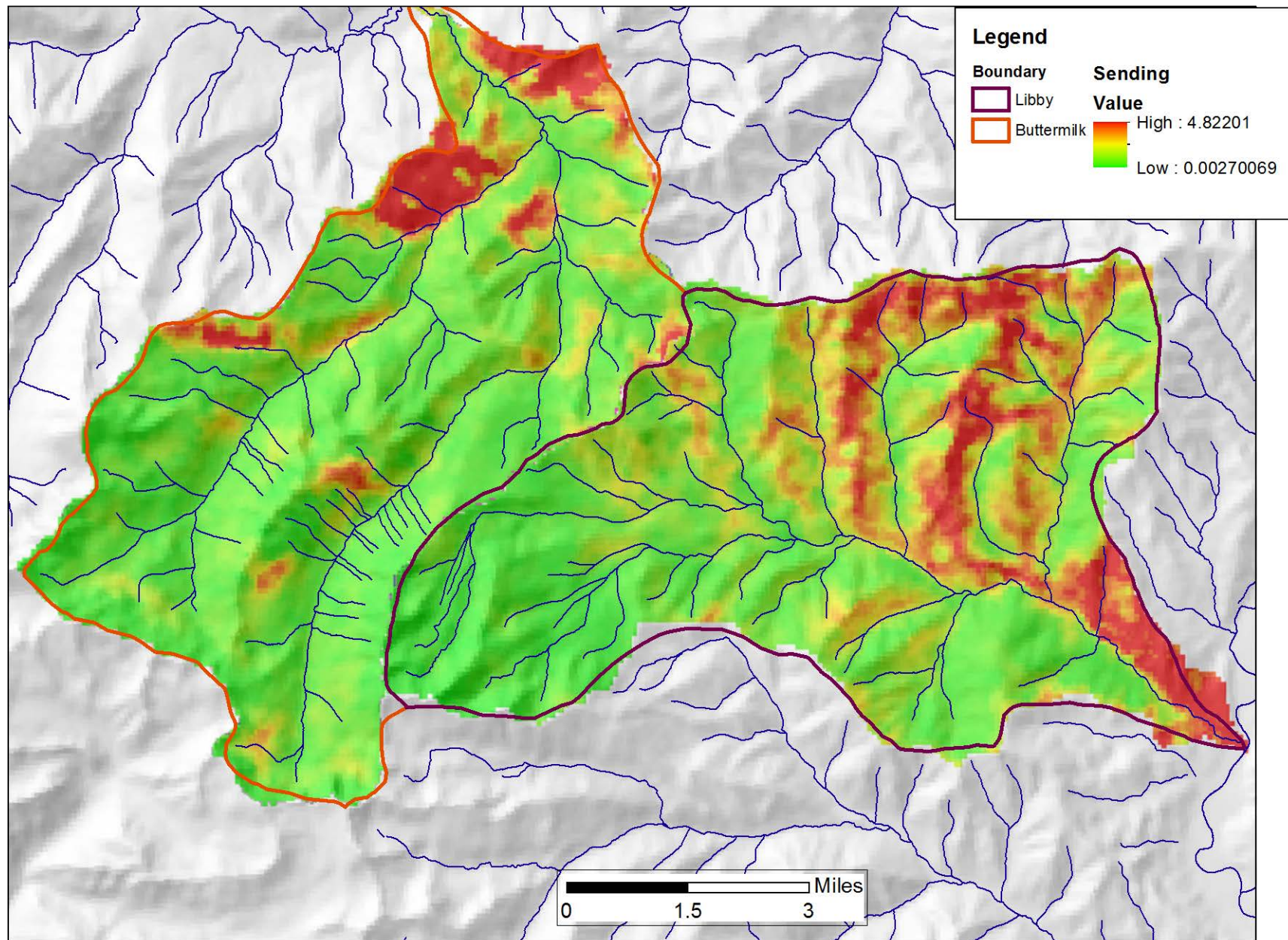
1. Rx → Landscape Treatment Areas

2. Identified Fire tolerant vs. NSO/complex forest parts of watersheds

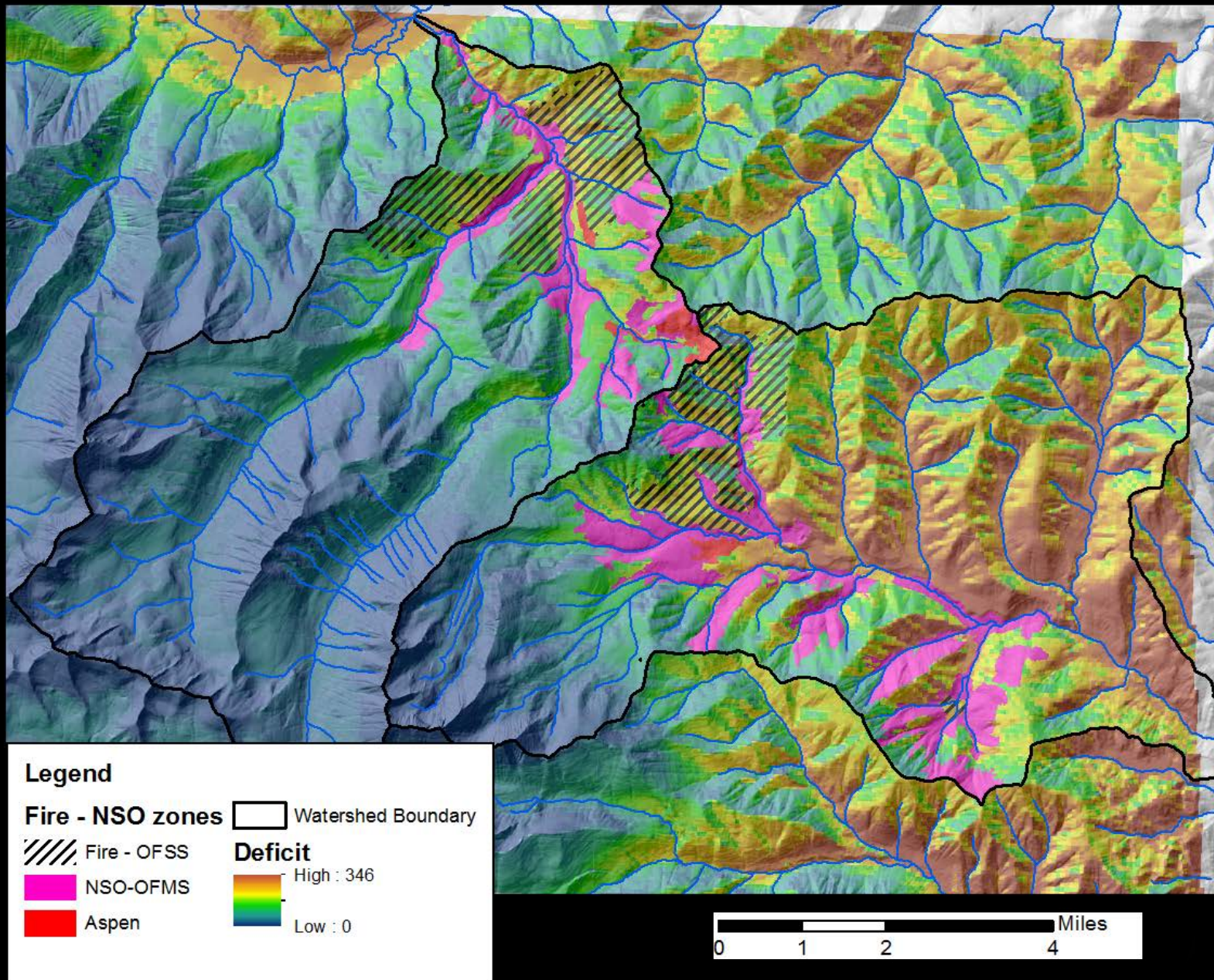
- Water Balance Deficit
- Fire Sending
- NSO habitat layers
- Fire ratings: crown fire, rate of spread etc.
- Existing vegetation

Better align vegetation with topography and biophysical conditions

Flammap: Sending



Landscape Prescription



Treatment Recommendations

3. Determined treatment for each polygon

- Landscape Rx
- No new roads. Some temp roads
- Veg & habitat conditions
- Recon information, PI metrics, Aerial photos
- Fire sending, Deficit, Riparian, etc.
- Road access & yarding systems

Treatment Types

Dry Forest Restoration Thin (ICO)

DF Restoration Thin + Dwarf Mistletoe Reduction

Aspen Release

Variable Retention Regen

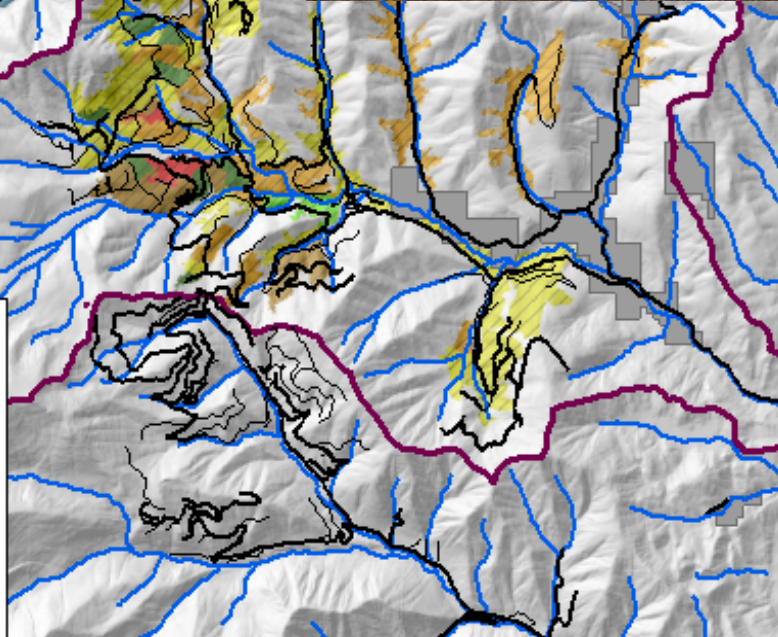
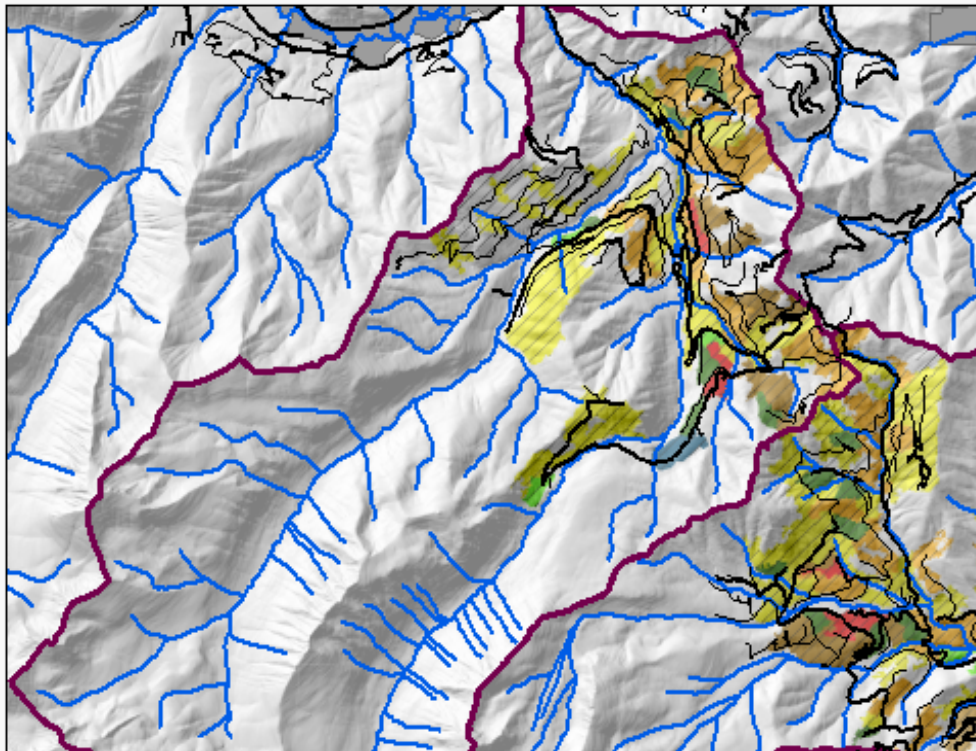
Moist Forest Thinning

Ladder fuel / Large Tree Release (small diameter)














Young plantation thin (small diameter)

Fire & Activity Fuel Treatments





Legend

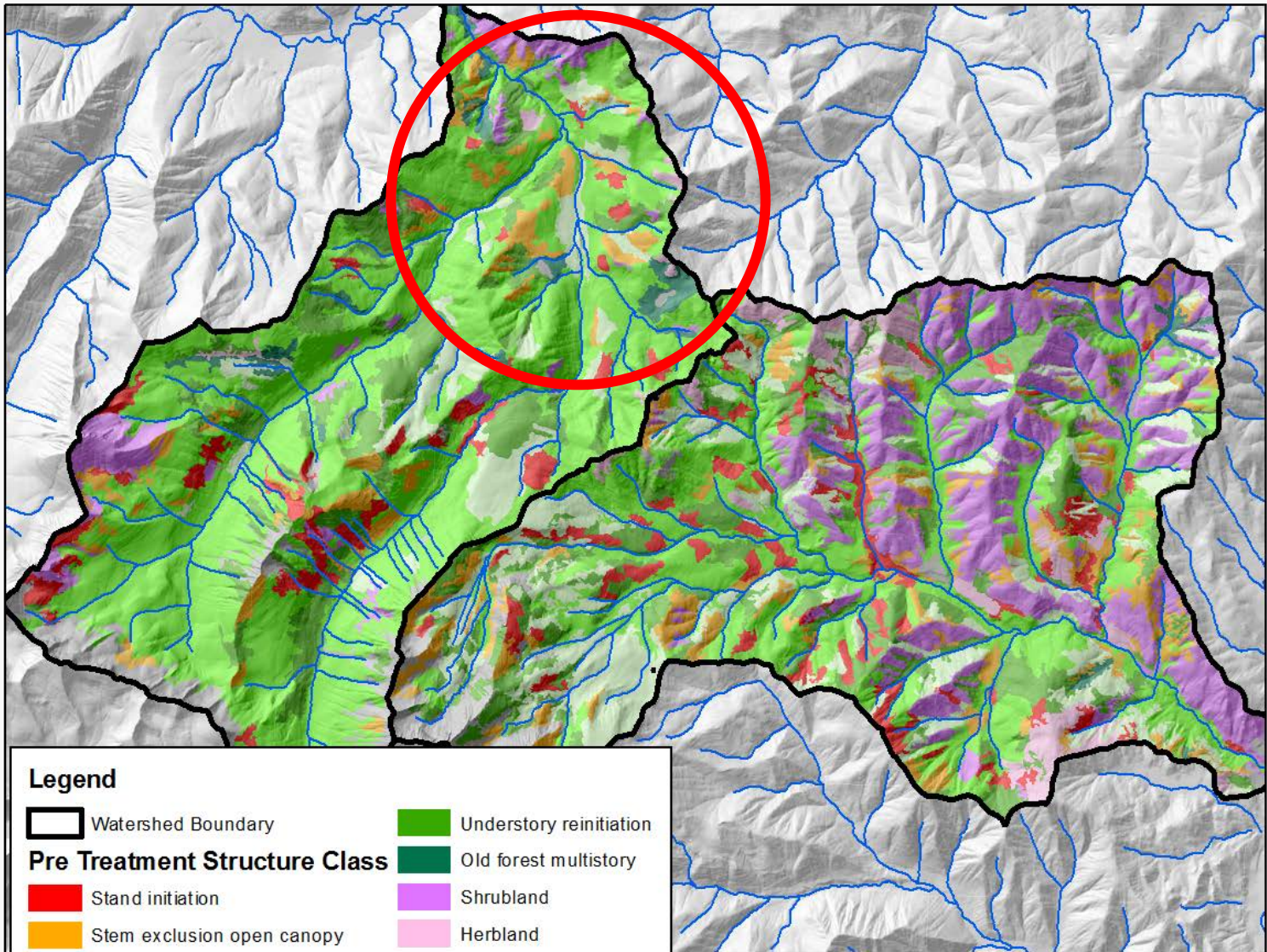
- | | |
|--|--|
|  Watershed Boundary | Treatment Type |
|  Private Land |  Aspen |
| Roads |  Dry forest restoration thin |
|  Open |  DF restoration thin + DMT |
|  Closed |  Moist Forest thin |
| |  Variable retention regen |
| |  Ladder fuel or DF restoration thin |
| |  Ladder fuel treatment |
| |  Young plantation thin |
| |  Prescribed fire |













Treatment Recommendations

4. Determined post treatment structure class, cover type, & canopy cover.

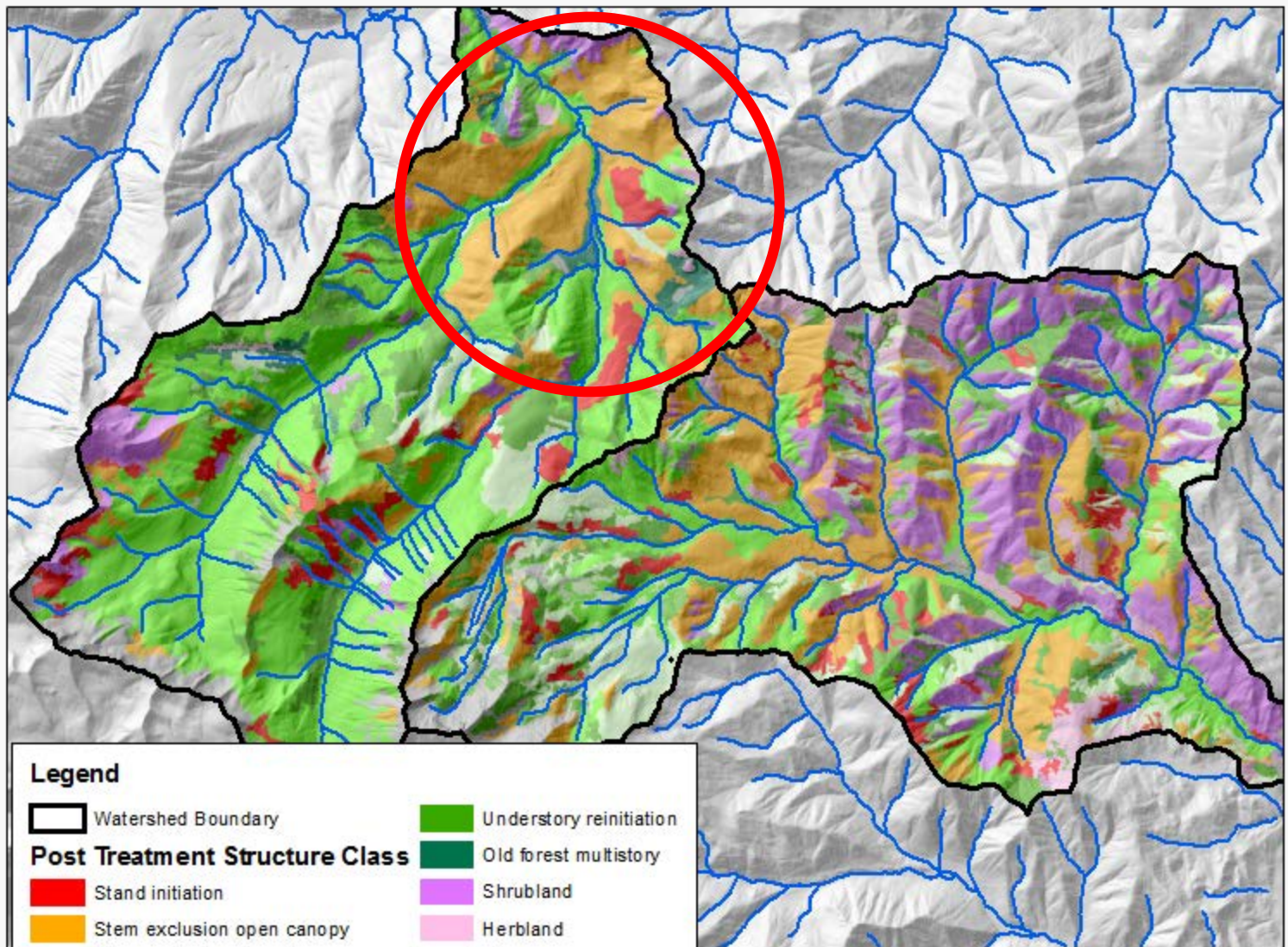
- Re-run departure analysis to determine how far we moved the landscape



Legend

- | | |
|--|---|
|  Watershed Boundary |  Understory reinitiation |
| Pre Treatment Structure Class |  Old forest multistory |
|  Stand initiation |  Shrubland |
|  Stem exclusion open canopy |  Herbland |
|  Stem exclusion closed canopy |  nf |
|  Young forest multistory | |



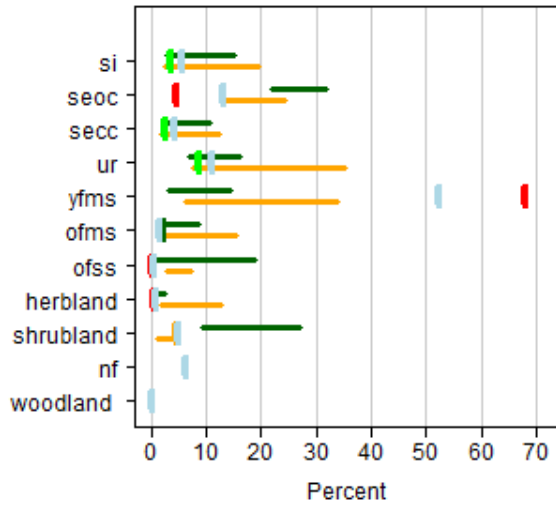


Buttermilk

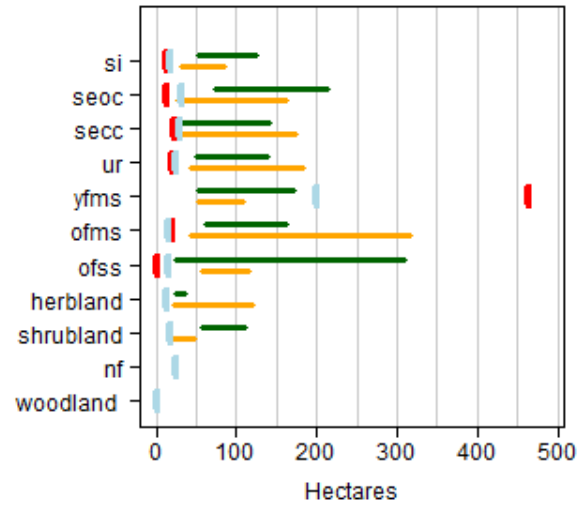


Structure Class

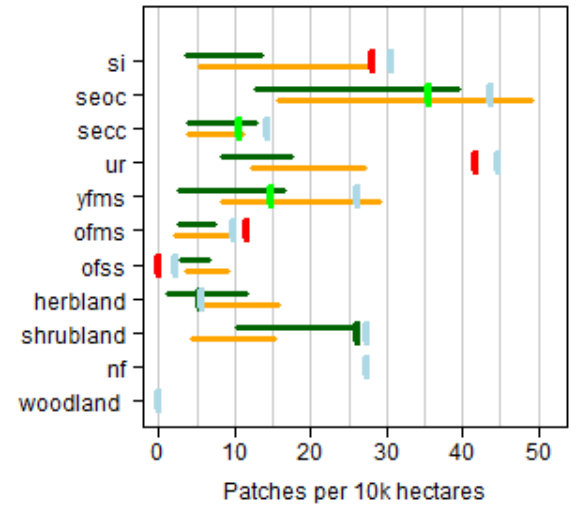
Percent Land



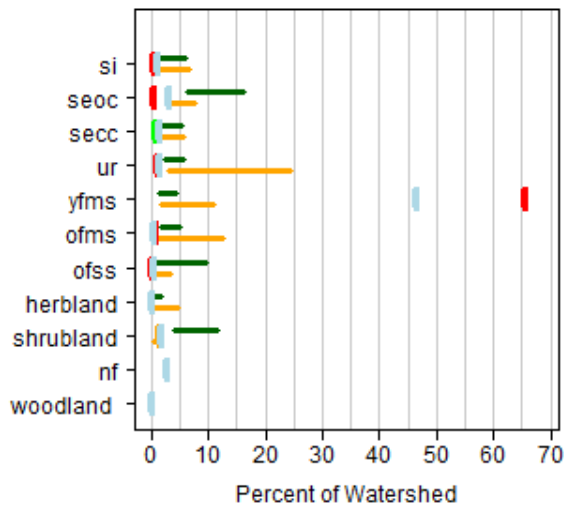
Mean Patch Size



Patch Density



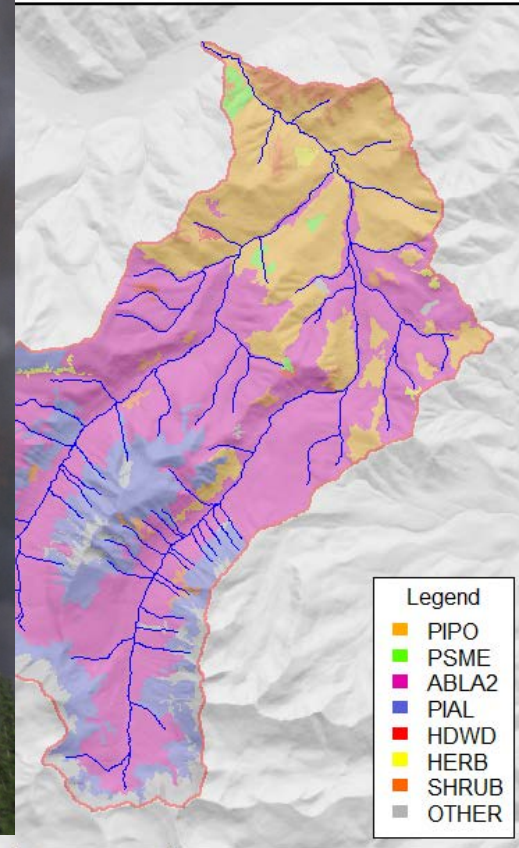
Largest Patch Index

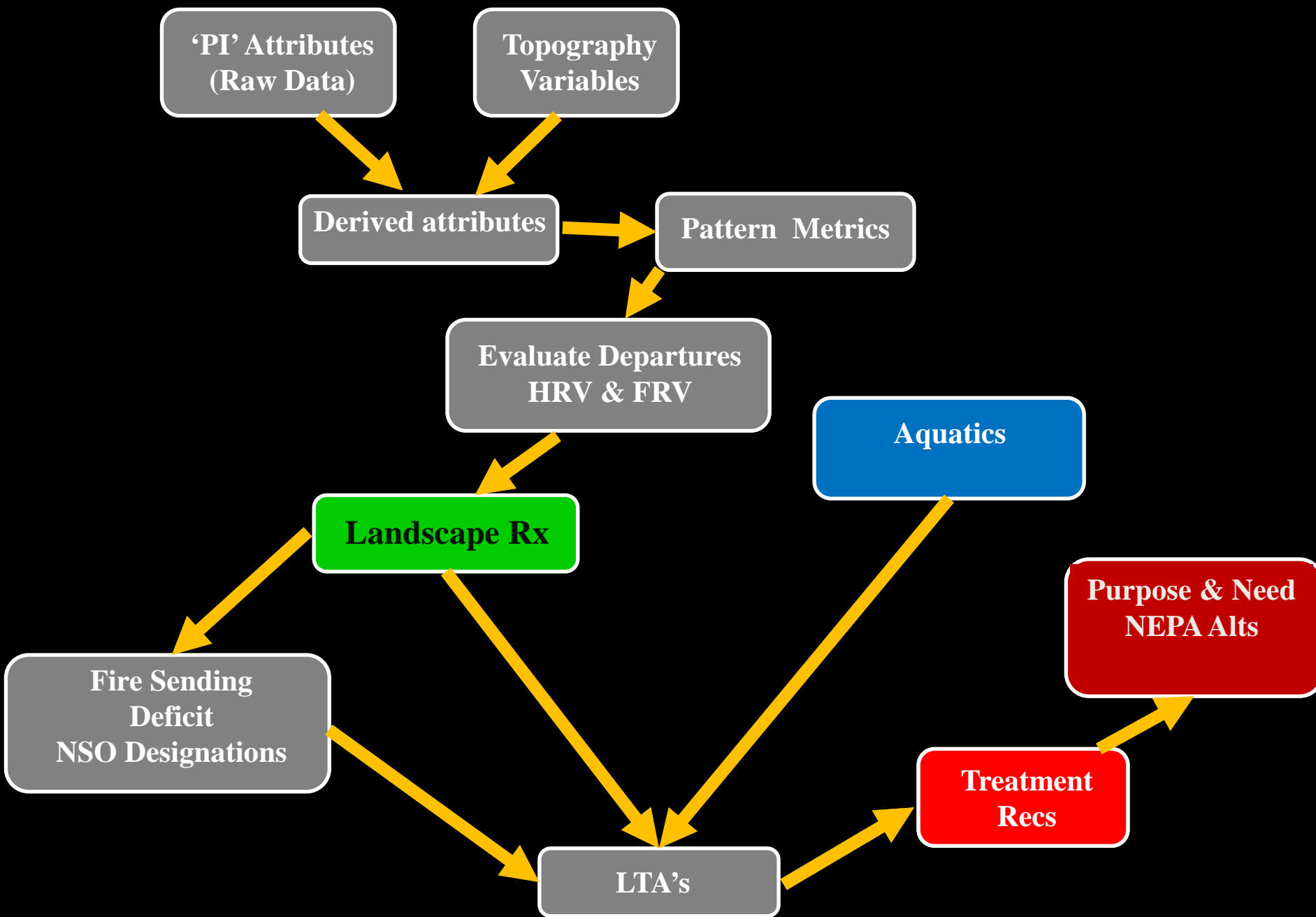


Landscape Rx → Treatment Recommendations



Cover Type



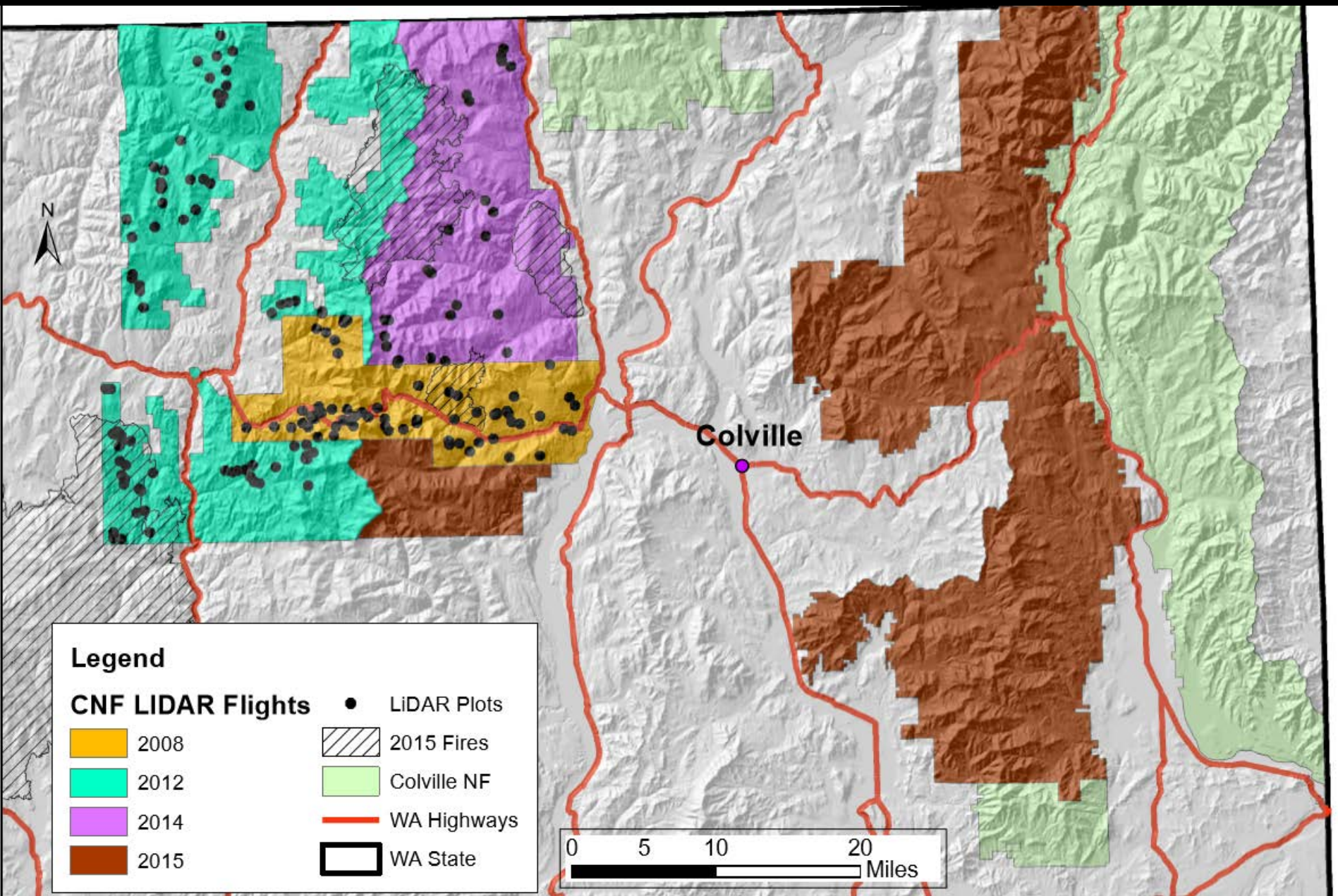


Summary

- Evaluate current conditions → HRV & FRV
 - Percent land & pattern
- Integrate fire flow, aquatics, social, economics

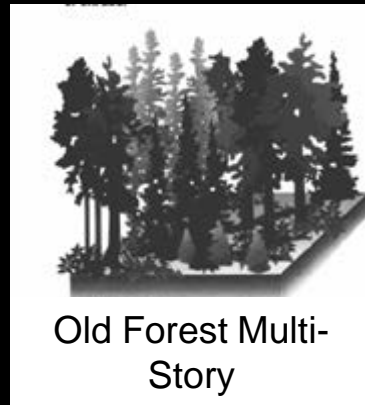
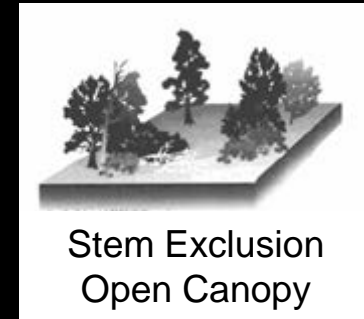
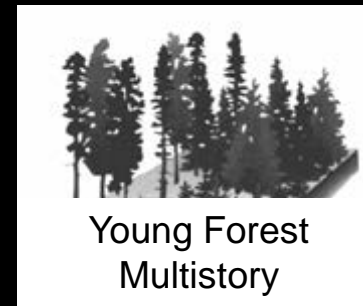
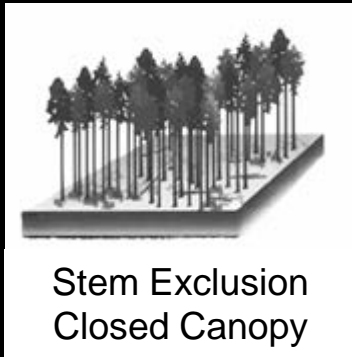
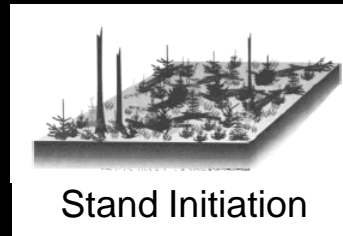
Summary

- Evaluate current conditions → HRV & FRV
 - Percent land & pattern
- Integrate fire flow, aquatics, social, economics
- **Landscape Rx**
 - Concrete targets for shifting amounts & pattern of vegetation
 - Quantitative, science basis
 - Whole watershed, not just treatable areas
 - More treatment: mechanical & fire
 - Social License



Structural Stages: Low & Mixed Severity Systems

O'Hara et al. 1996



Treatment Acres

Treatment	Buttermilk	Libby
Dry Forest Restoration Thin	923	1,835
DF Restoration Thin + Dwarf Mistletoe Reduction	351	405
Aspen Release	37	100
Variable Retention Regen	134	0
Moist Forest Thinning	80	0
Ladder Fuel or Dry Forest Thin	136	1,023
Ladder fuel / Large Tree Release (small diameter)	1,098	1,179
Young plantation thin (small diameter)	181	263
Commercial	1,525	2,341
Non Commercial	1,279	1,442
Either	136	1,023
Prescribed Fire	3,123	4,292

	Total Acres	Watershed % Treat	Dry & Moist % Treat
Libby	25,800	16%	
Buttermilk	23,700	13%	