



Quantifying landscape spatial patterns: a collaborative forest management framework for tribal and federal lands

Spus Wilder¹, Ernesto Alvarado¹, Susan Hummel², Phil Rigdon³

¹ School of Environmental and Forest Sciences, University of Washington, Box 352100 Seattle, WA 98195-2100, 509-634-1612

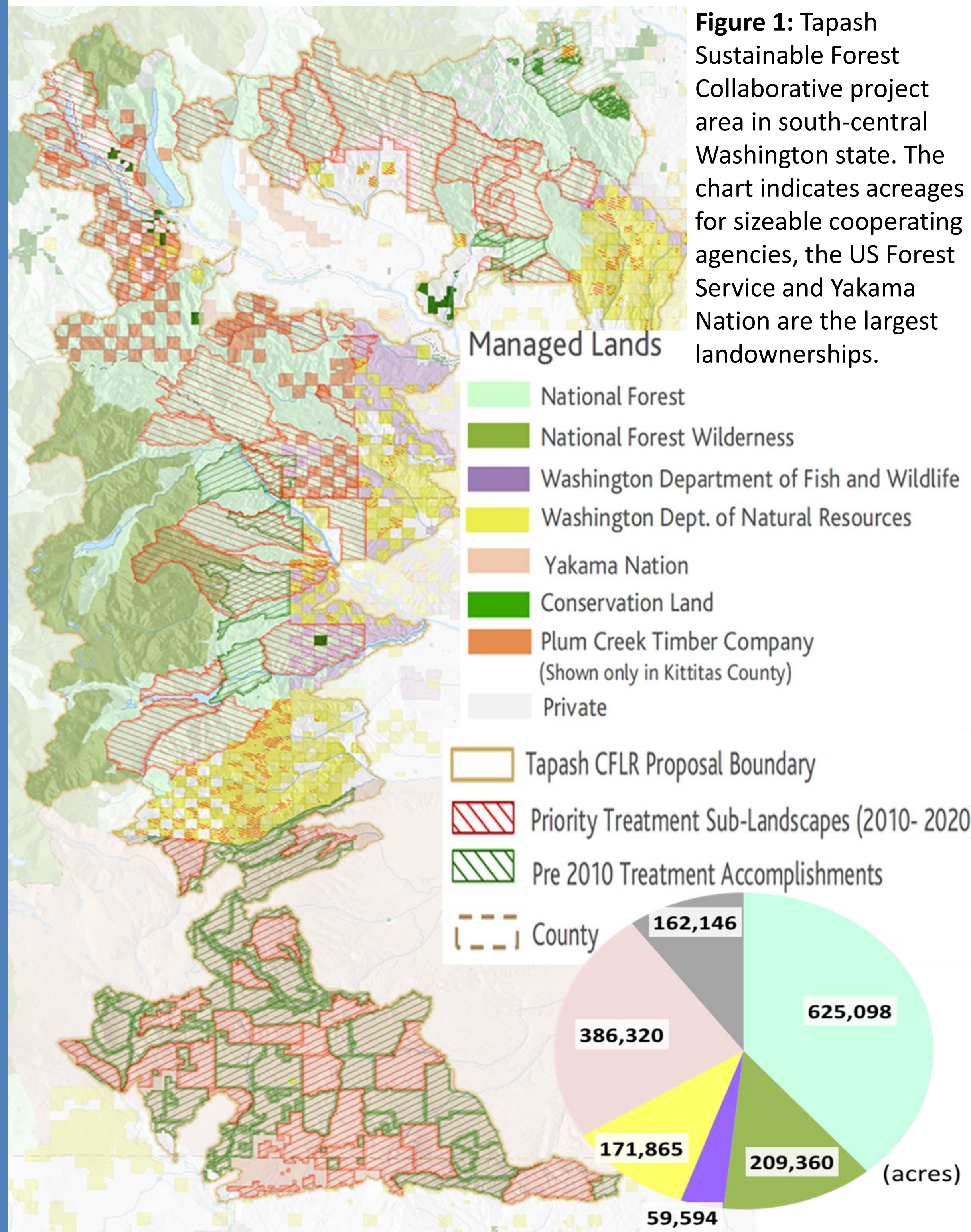
² Pacific Northwest Research Station, 1220 SW 3rd Avenue, Suite 1400 Portland, OR 97204

³ Yakama Indian Nation Department of Natural Resources, 401 Fort Road PO BOX 151 Toppenish, WA 98948



Introduction

Presently, ecological conditions of landscapes are the result of ownerships, spatial pattern and dynamics of ownerships, and ecological interactions among individual ownerships. Ownerships are distinct jurisdictional units, however, forest spatial patterns, processes, functions, and health conditions exceed current legal boundaries. To address issues related to forest health and multiple ownership landscapes, many tribes and neighboring federal agencies have entered into cooperative agreements to achieve more significant and durable outcomes than by working individually. This case study quantified Okanogan-Wenatchee National Forest, Naches Ranger District (NRD) and Yakama Nation Tribal Forest (YTF) spatial patterns and environmental and ownership effects to evaluate differences and potential forest health effects.



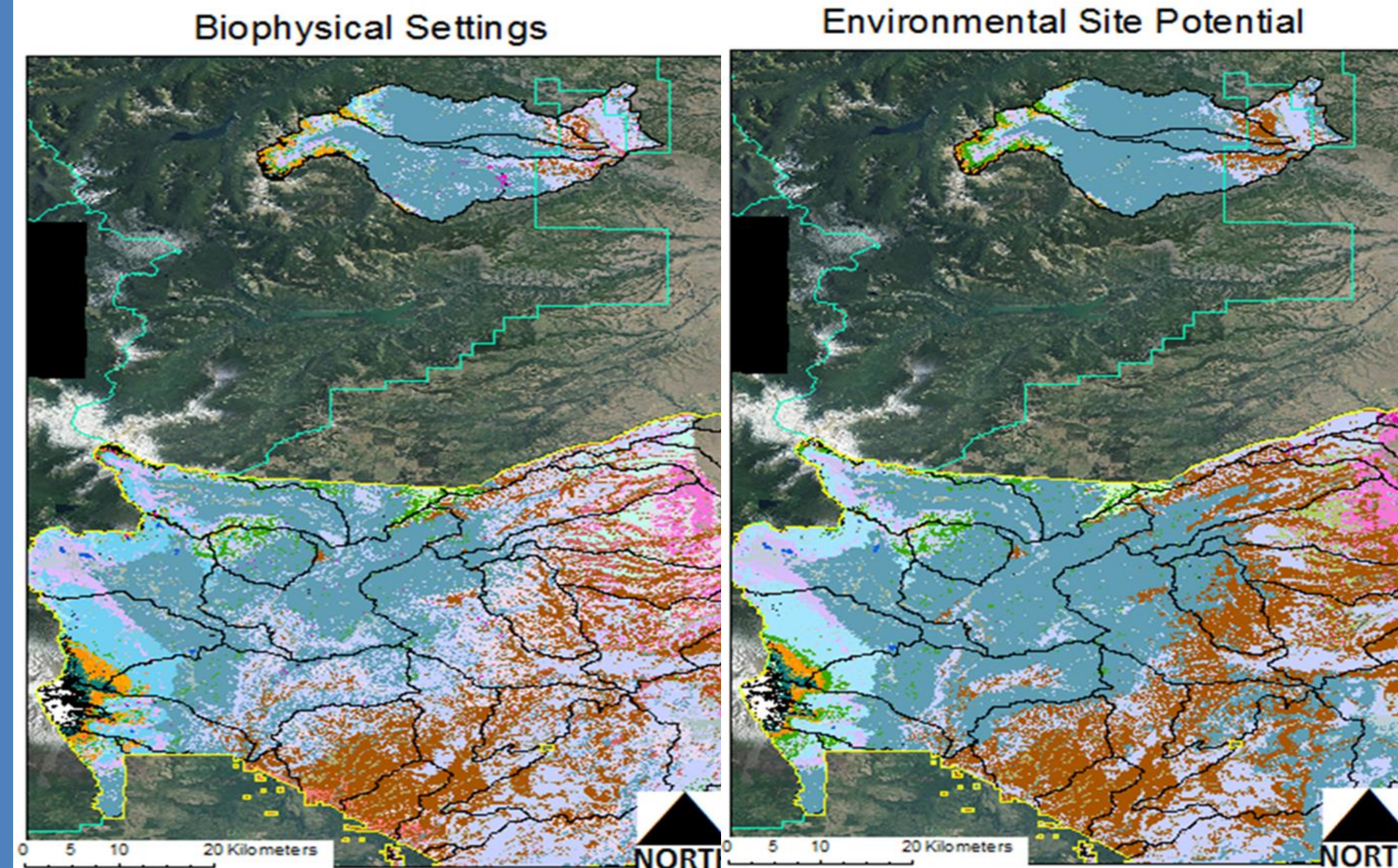
Objectives

- To identify similar federal and tribal watersheds (landscapes).
- To collect/develop comparable data for federal and tribal ownerships.
- To determine if existing landscape spatial patterns are similar for federal and tribal ownerships.
- To quantify factors explaining significant amounts of variance in existing vegetation data.
- To enhance collaborative forest management through presentations, publications, and data contributions.

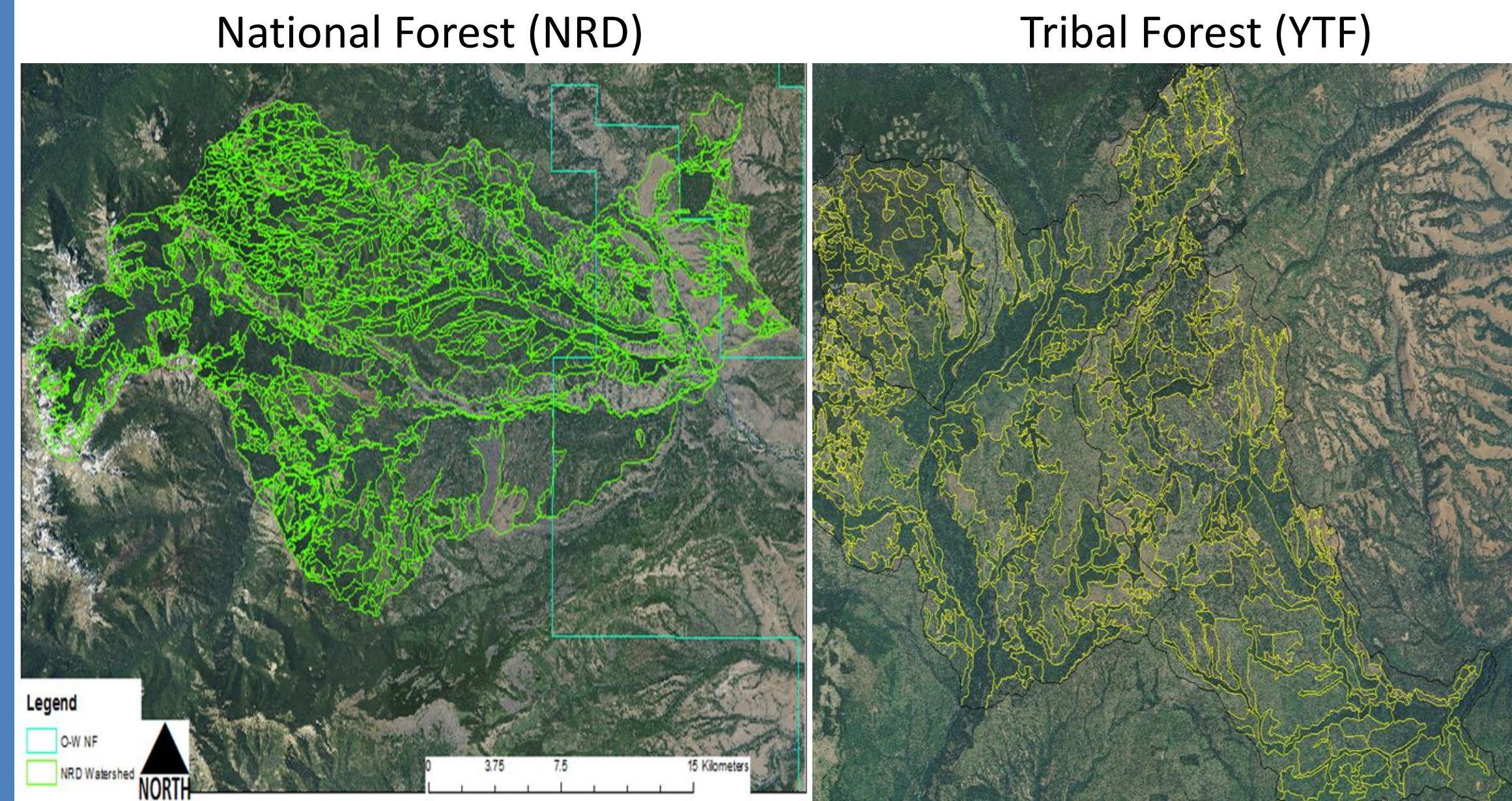
Methods

- Identified similar landscapes on tribal and federal ownerships using LANDFIRE potential vegetation layers, Environmental Site Potential (ESP) and Biophysical Settings (BPS).

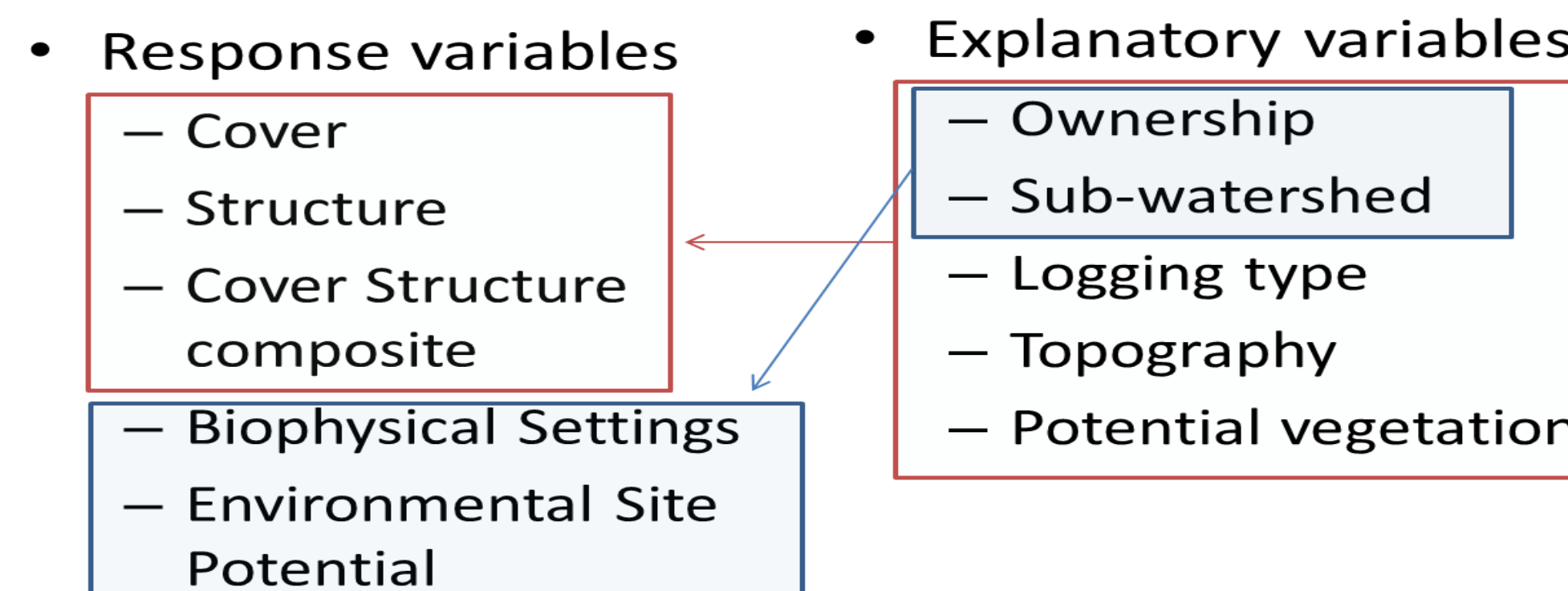
- ArcGIS
- FRAGSTATS
- Permutational Multivariate Analysis of Variance (PERMANOVA)



- Vegetation mapping units (VMUs) were delineated for selected watersheds from the National Agriculture Imagery Program 2009 aerial photographs using ArcGIS.

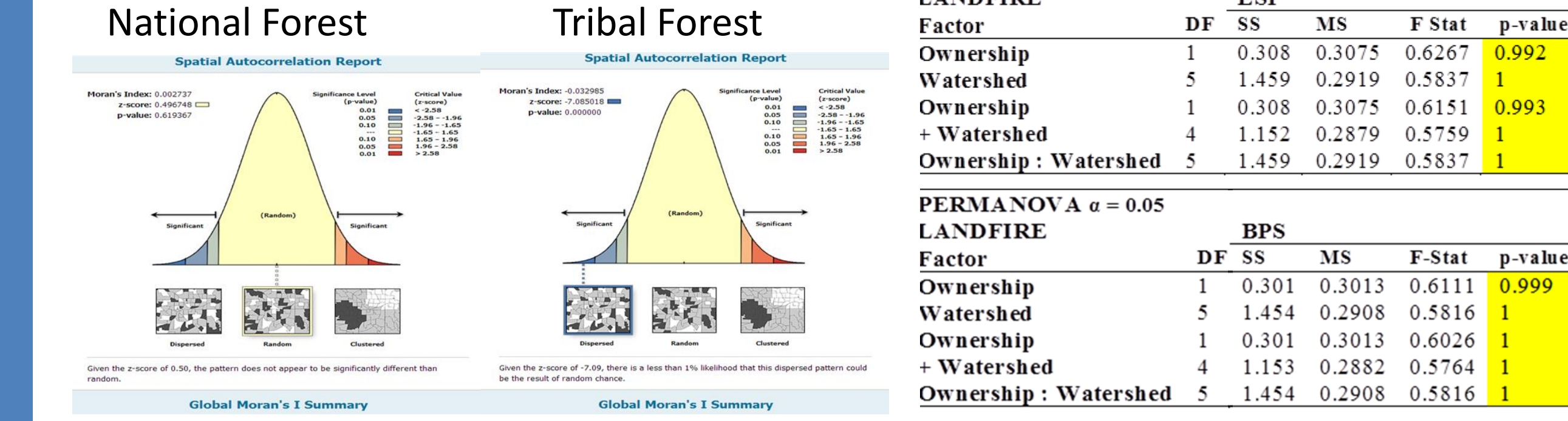


- Spatial patterns of VMUs from tribal and federal landscapes were calculated using ArcGIS and FRAGSTATS
- Factors explaining significant amounts of variance in VMUs data were quantified using PERMANOVA



Results

Spatial patterns of LANDFIRE potential vegetation layers varied by ownership and feature type (NRD), but PERMANOVA found no significant difference between ownerships or sub-watersheds.

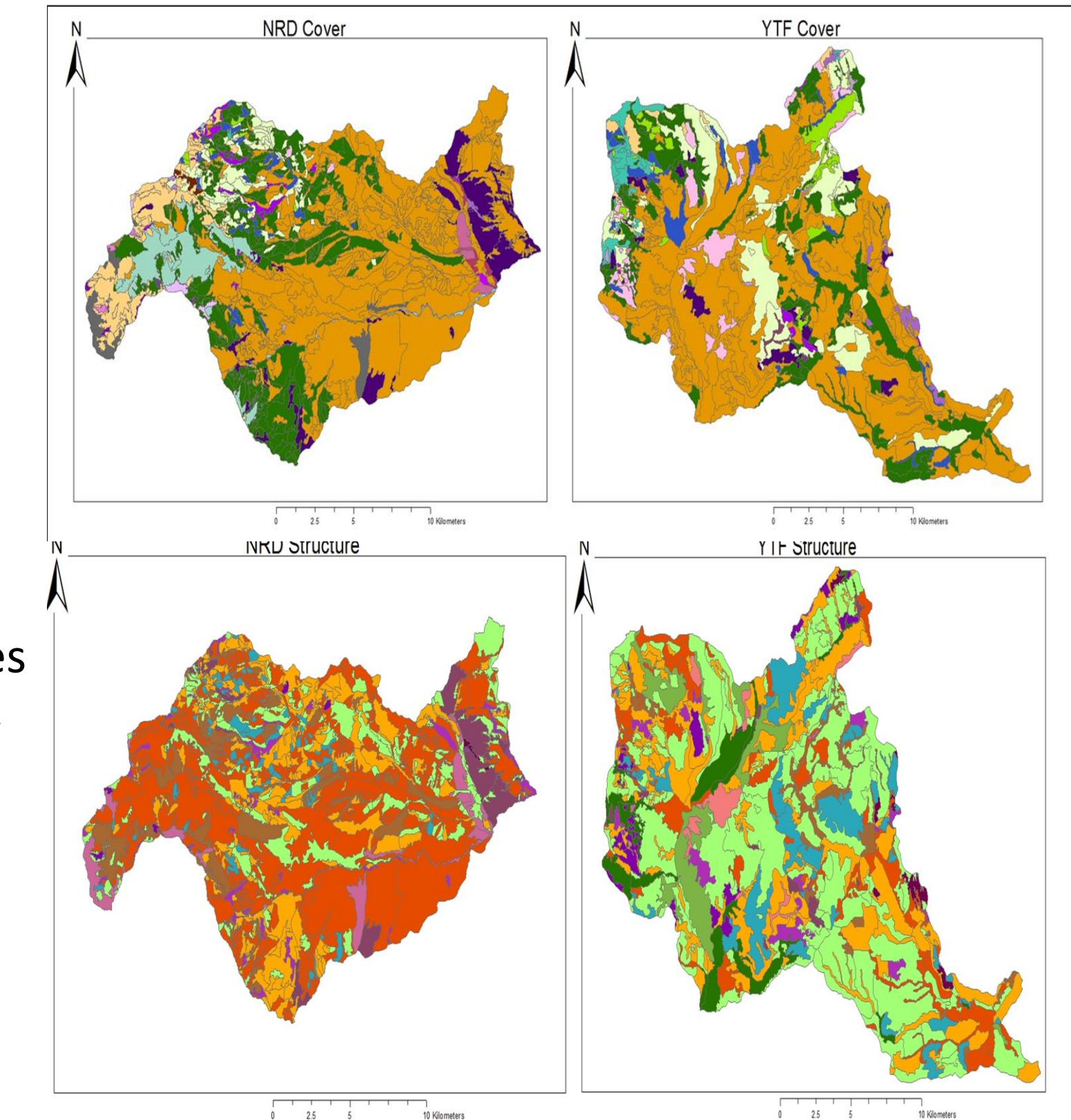


Tribal Forest (YTF)

- More early seral species
- More open and old forest structures
- Larger patches
- Greater interspersion
- Greater diversity

National Forest (NRD)

- More shade-tolerant species
- More dense, closed canopy forest structures
- Higher patch density
- Lower interspersion
- Greater richness



PERMANOVA $\alpha = 0.05$

Total Structure					
Factor	DF	SS	MS	F Stat	p-value
Ownership	1	9.39	9.3861	23.329	0.01
+ Logging type	4	9.77	2.4426	6.071	0.01
+ Watershed	4	8.21	2.0518	5.099	0.01
+ BPS class	18	13.87	0.7705	1.915	0.01
+ Elevation	29	14.27	0.4922	1.223	0.02
+ Ownership : Logging type	4	6.11	1.5283	3.799	0.01
+ Logging type : Watershed	12	9.45	0.7872	1.957	0.01
+ Logging type : Watershed : BPS class	61	26.89	0.4408	1.096	0.05

Conclusion

Ecological Implications

- Tribal Forest (YTF)**
 - Old forest habitat
 - Greater diversity
 - < vulnerable, > resilient to severe fire, insect, disease, climate change
- National Forest (NRD)**
 - No old forest habitat
 - Lower diversity, but greater richness
 - VMUs spatial patterns similar to ESP
 - > vulnerable, < resilient to severe fire, insect, disease, climate change

Applied Implications

- Stewardship Contracts (TFPA 2004)
 - To enhance ecosystem restoration
 - To sustain & develop local industries & economies
- Incorporate Yakama operational framework
 - Scientific support for the Anchor Forest Pilot Project
- Additional research
 - More watersheds, case-studies
 - Comparative fire, insect, disease, climate change vulnerability assessment
 - Decision support tools

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