Forests under a changing climate:

Using FIA to parameterize a spatially-explicit landscape model

Dr. Melissa Lucash
Research Assistant Professor
Geography Dept.

LANDIS-II

Portland State UNIVERSITY

Current Grants
(as of 10/17)

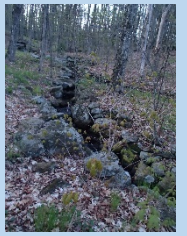
Increasing Fire Frequency and Climate Change on Carbon Dynamics and Species Composition in the Boreal Forest

Arctic Natural Systems (ANS)

Ecosystem Model Performance in the Eastern US

LANDIS-II

SORTIE-ND



Understanding the Potential for a Climate Change-Driven Critical Transition from Forest to Chaparral

KLAMATH

Division of Environmental Biology (DEB)

Visualizing Forest Futures under Climate Uncertainty

Virtual Reality of Forests under Climate Change

Coupled Human and Natural Systems (CHNS)

Current Research Questions

How do re-burns and climate change affect species composition and above-and belowground carbon cycling, including permafrost thawing?

How are landscape patterns of forest disturbances and ecosystem services (e.g., biodiversity and carbon storage) shaped by variability in future climate conditions?

How do changes in forest management influence future landscape structure and function?

What is the relative importance of fire regime (size, severity, and frequency) and forest recovery rate in determining the dominant state of forests or shrub-chaparral?
What is the role of climate in shaping alternative landscape states?
Could management actions delay or prevent critical transitions?

visualizing FOREST FUTURES

Dr. Melissa Lucash

Portland State UNIVERSITY

LANDIS-II

Home | Install | Extensions | Publications | Projects | Users | Tools | Meetings | Developers | Blog | About Us | Sitemap

Succession Extensions: You can install multiple succession extensions although only one operates during a simulation.

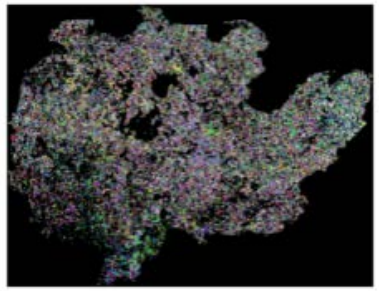
Name	Last Updated
Age-only Succession	June 2017
Biomass Succession	August 2017
Forest Carbon Succession	March 2017
Net Ecosystem Carbon & Nitrogen Succession	June 2017
PnET Succession	October 2017

Dr. Melissa Lucash

Portland State UNIVERSITY

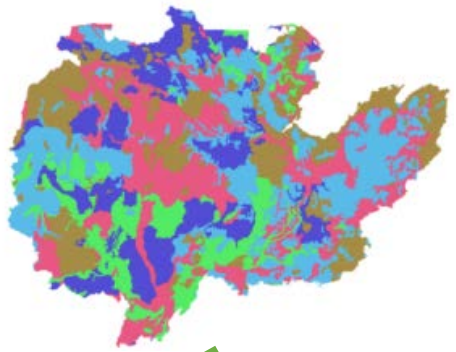
LANDIS-II

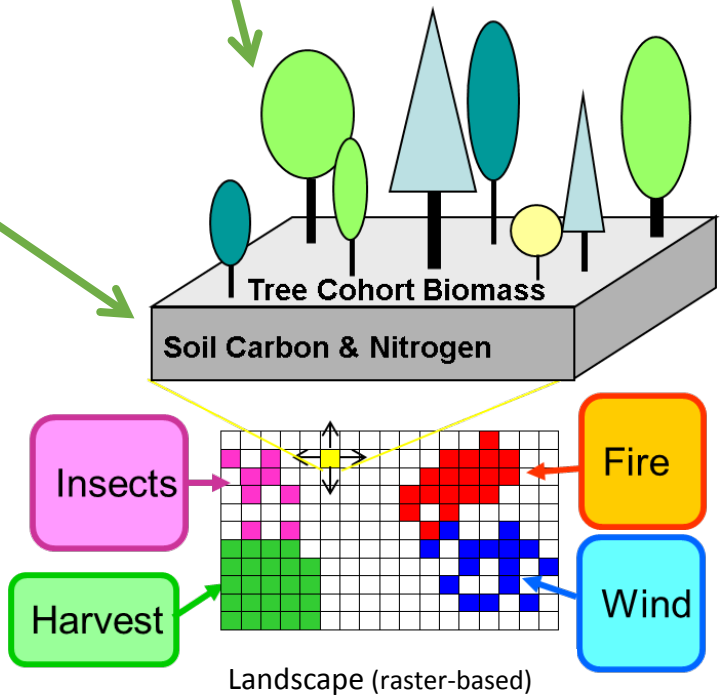
Species composition



Climate

Soils





NECN Extension

Dr. Melissa Lucash

Portland State UNIVERSITY

Current Forest Conditions

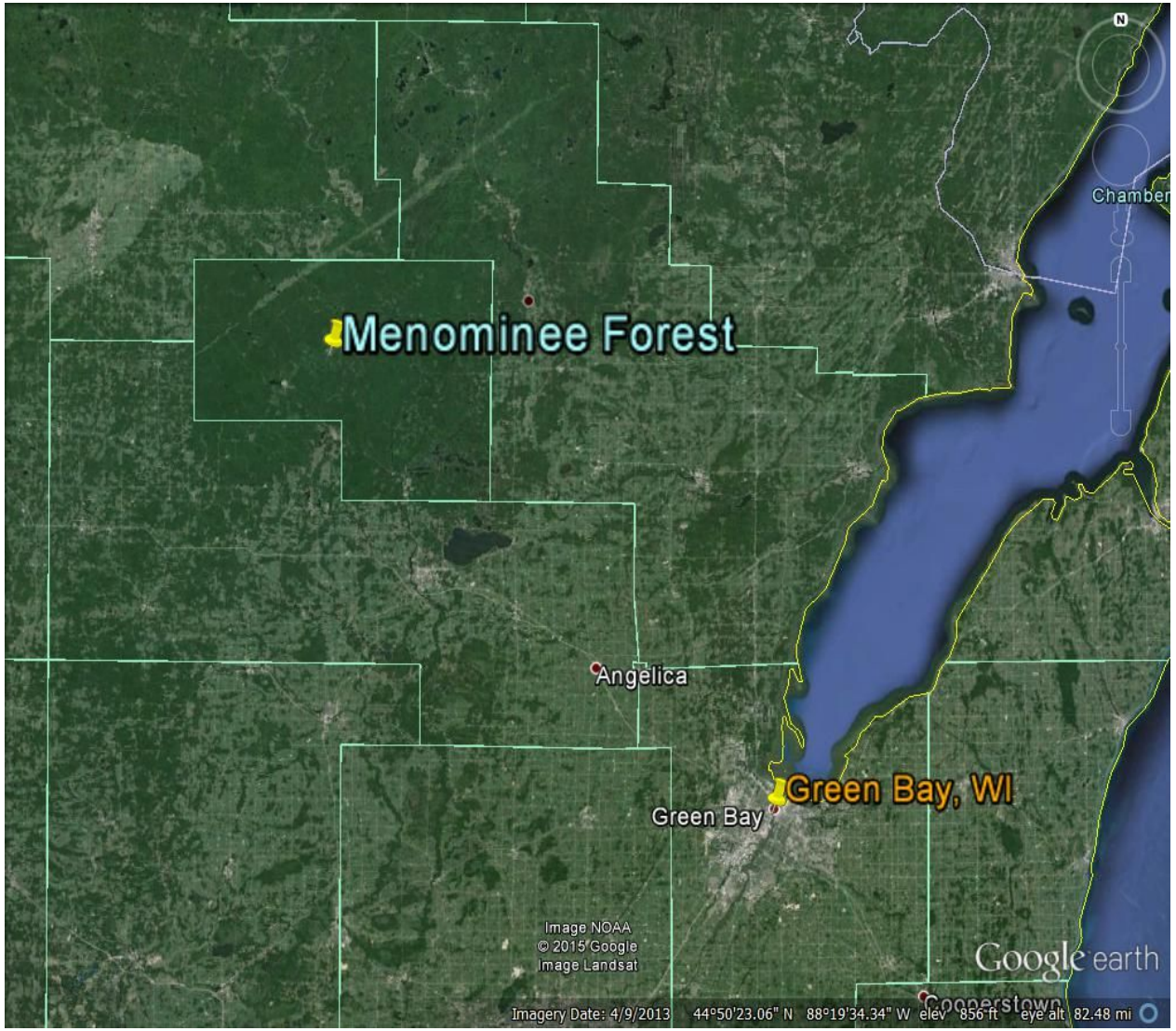
```
LandisData   "Initial Communities"

MapCode 0

MapCode    1 <<These were unmatched cells

MapCode  2
BitternutHickory 30 (79)
BlackCherry 30 (128) 40 (359)
Elms 30 (48) 40 (248)
GreenAsh 40 (702)
QuakingAspen 40 (327) 50 (881) 60 (408)
SugarMaple 40 (633)
WhitePine 40 (407)

MapCode  3
Basswood 40 (2074) 50 (345) 60 (646) 70 (534)
BurOak 50 (404) 70 (2491)
WhiteOaks 40 (788) 70 (2395)
WhitePine 50 (166) 60 (427) 70 (146)
```

Dr. Melissa Lucash

Portland State UNIVERSITY

Visualizing Forest Futures under Climate Uncertainty: Integrating Indigenous Knowledge into Decision Support tools for Collaborative Decision Making

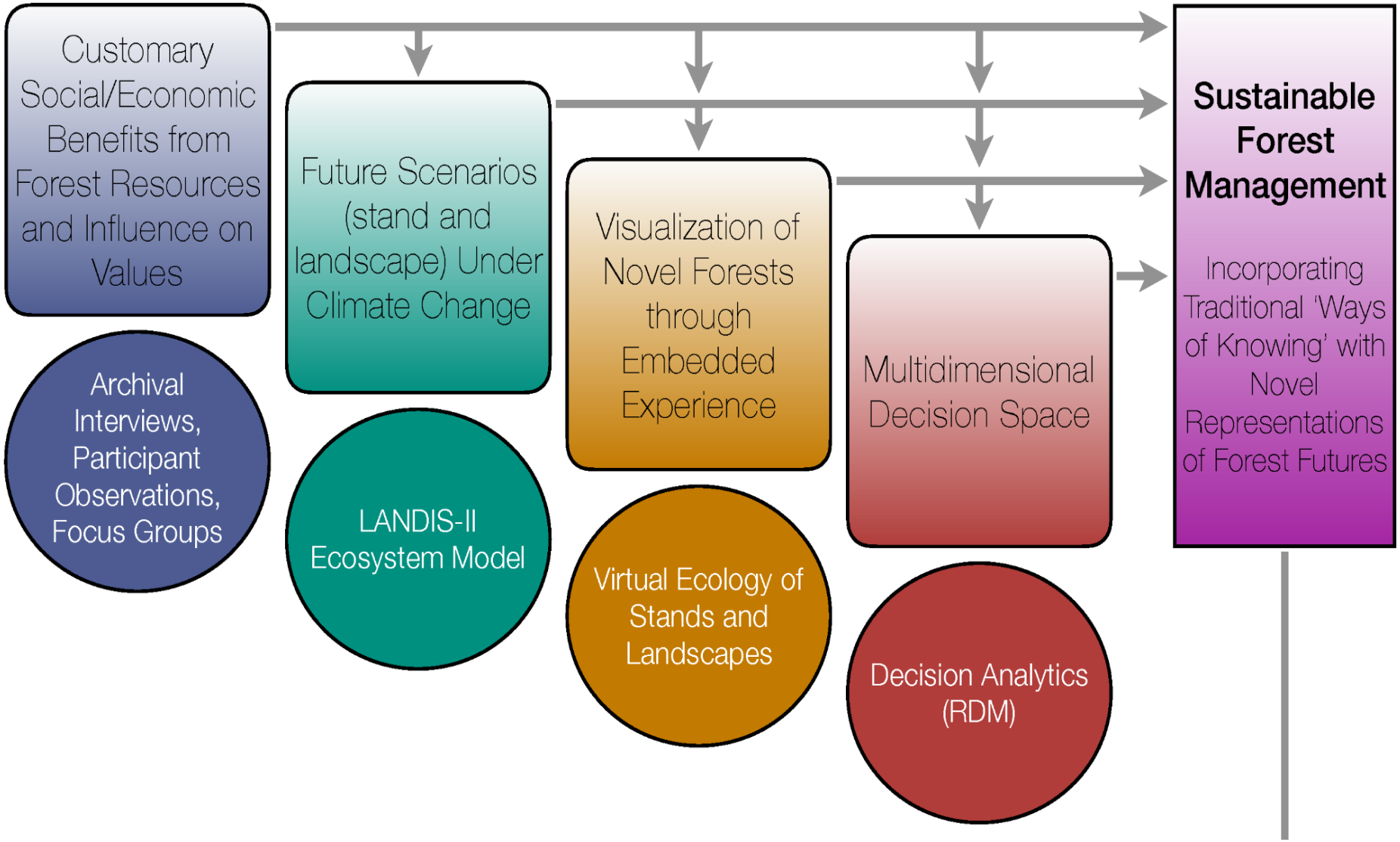
Erica A.H. Smithwick, Christopher Caldwell, Alexander Klippel, Robert Scheller, Nancy Tuana, Rebecca Bird, Klaus Keller, Melissa Lucash



visualizing FOREST FUTURES

Dr. Melissa Lucash

Portland State UNIVERSITY



visualizing FOREST FUTURES

Dr. Melissa Lucash

Portland State UNIVERSITY

Contents lists available at ScienceDirect

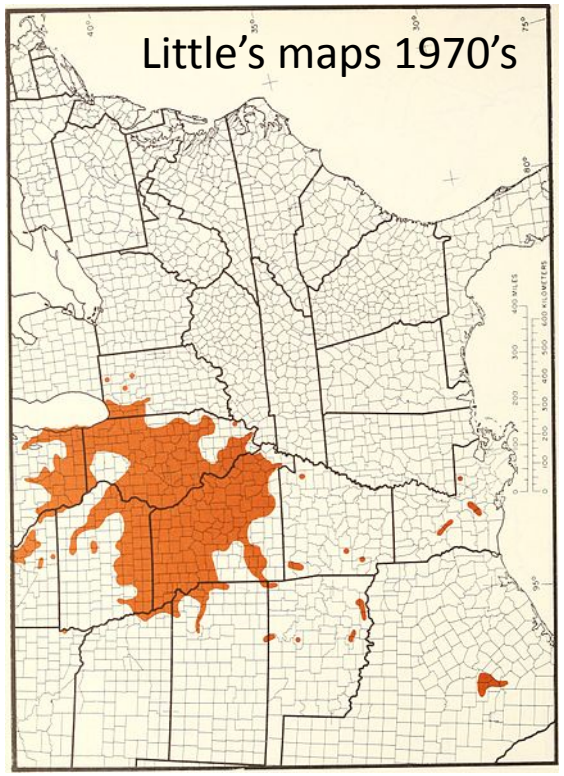
Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

An imputed forest composition map for New England screened by species range boundaries

Matthew J. Duveneck [a,*], Jonathan R. Thompson [a], B. Tyler Wilson [b]

[a] Harvard Forest, Harvard University, Petersham, MA, USA
[b] Forest Inventory and Analysis, Northern Research Station, USDA Forest Service, Saint Paul, MN, USA



For every forested pixel in New England landscape,

↓

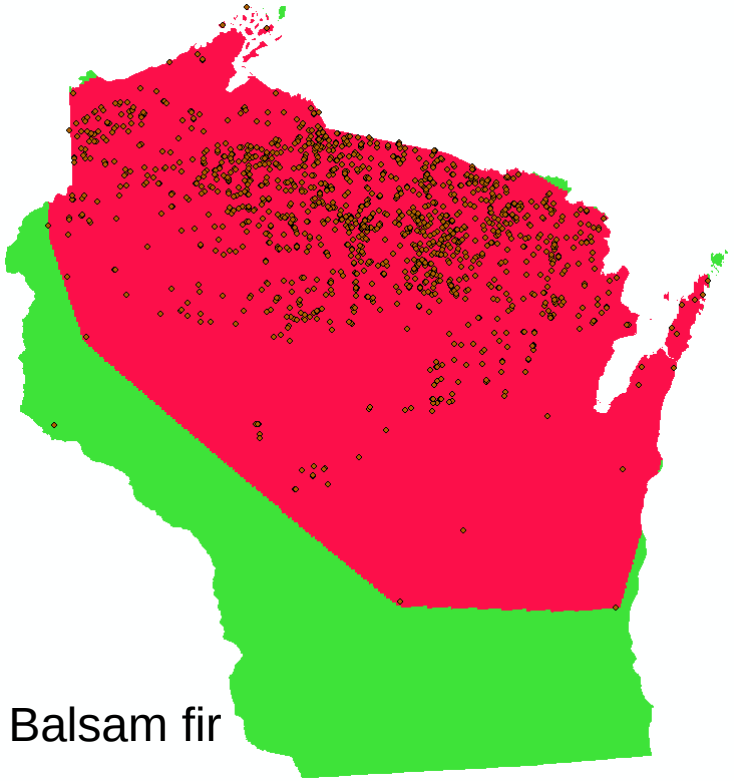
For each of five *k*NN neighbors,

↓

Trees present?

NO YES

(Exclude) All tree species matching home range?



visualizing FOREST FUTURES

Dr. Melissa Lucash

Portland State UNIVERSITY

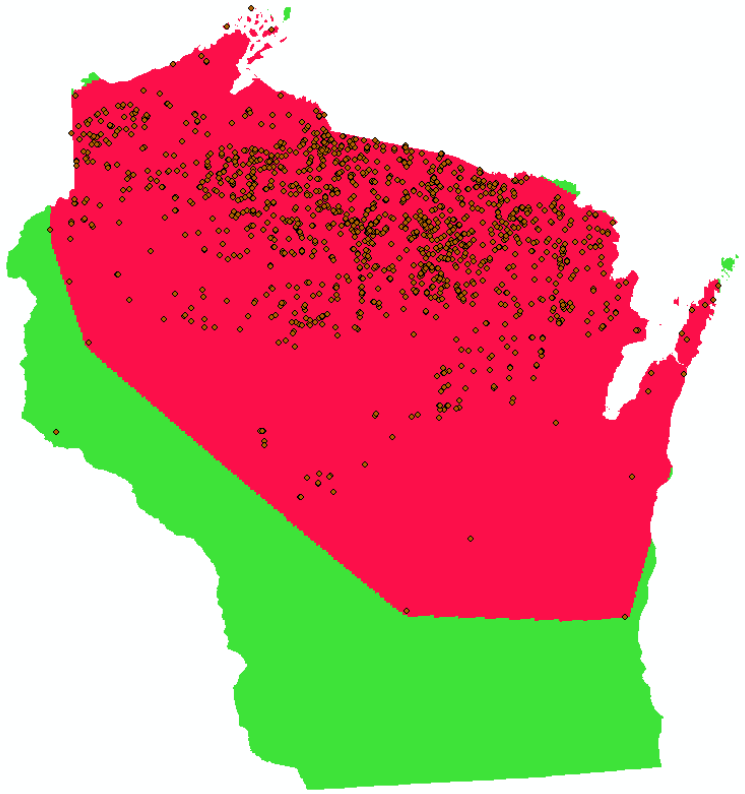
Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

An imputed forest composition map for New England screened by species range boundaries

Matthew J. Duveneck [a,*], Jonathan R. Thompson [a], B. Tyler Wilson [b]

[a] Harvard Forest, Harvard University, Petersham, MA, USA
[b] Forest Inventory and Analysis, Northern Research Station, USDA Forest Service, Saint Paul, MN, USA



For every forested pixel in New England landscape,

↓ ve *k*NN neighbors,

↓ present?

YES ↘

All tree species matching current range according to FIA?

~~All tree species matching home range?~~

NO ↙ ↘ YES

(Exclude)

Any *k*NN candidates remaining?

NO ↙ ↘ YES

Replace with geographically closest correctly matched pixel.

Select closest geographic source plot from pixel.

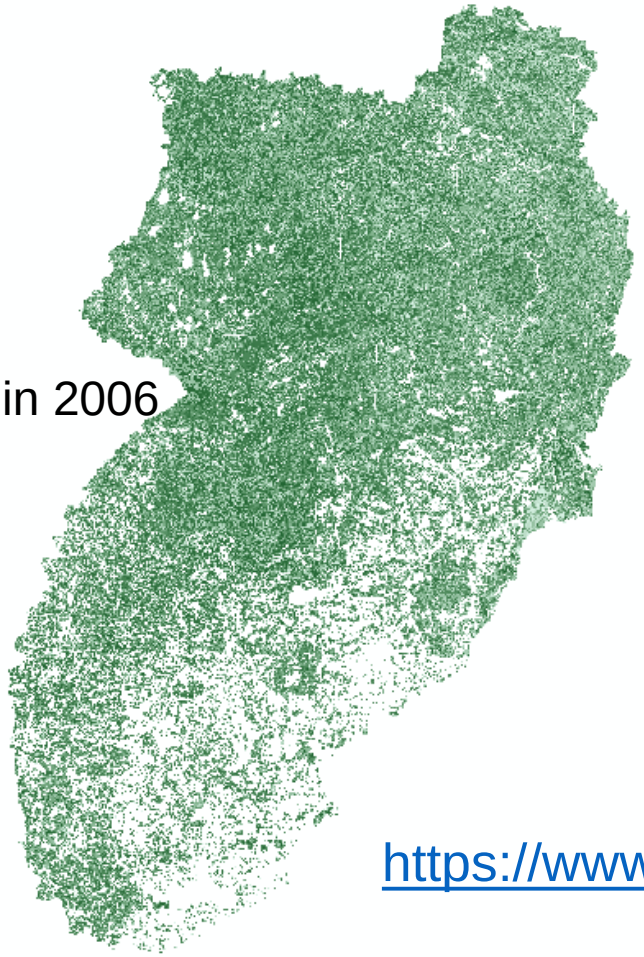
visualizing FOREST FUTURES

Dr. Melissa Lucash

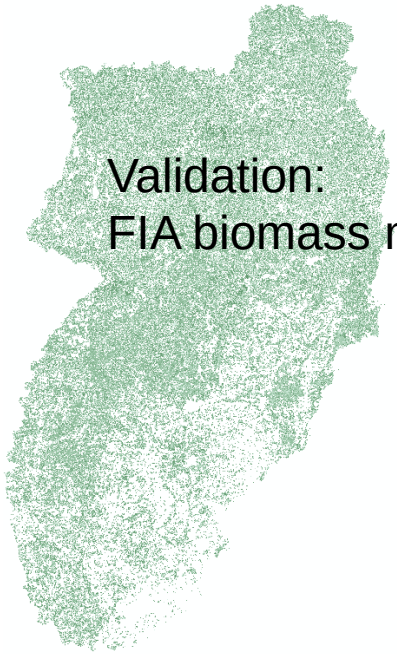
Portland State UNIVERSITY

How are landscape patterns of forest disturbances and ecosystem services shaped by variability in future climate?

Total biomass in 2006

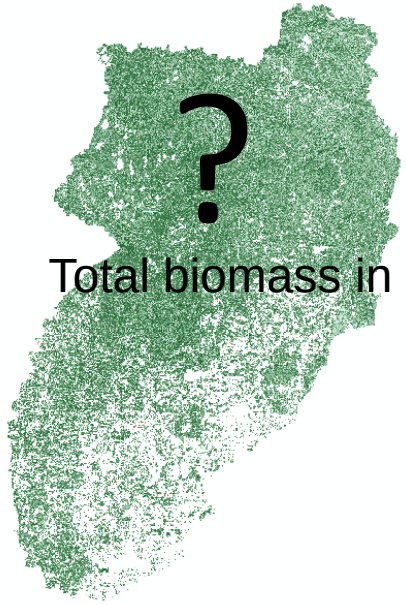


Validation:
FIA biomass maps



?

Total biomass in 2100



https://www.youtube.com/watch?v=KuRYGTdrwXM&feature=youtu.be&t=4s

visualizing FOREST FUTURES

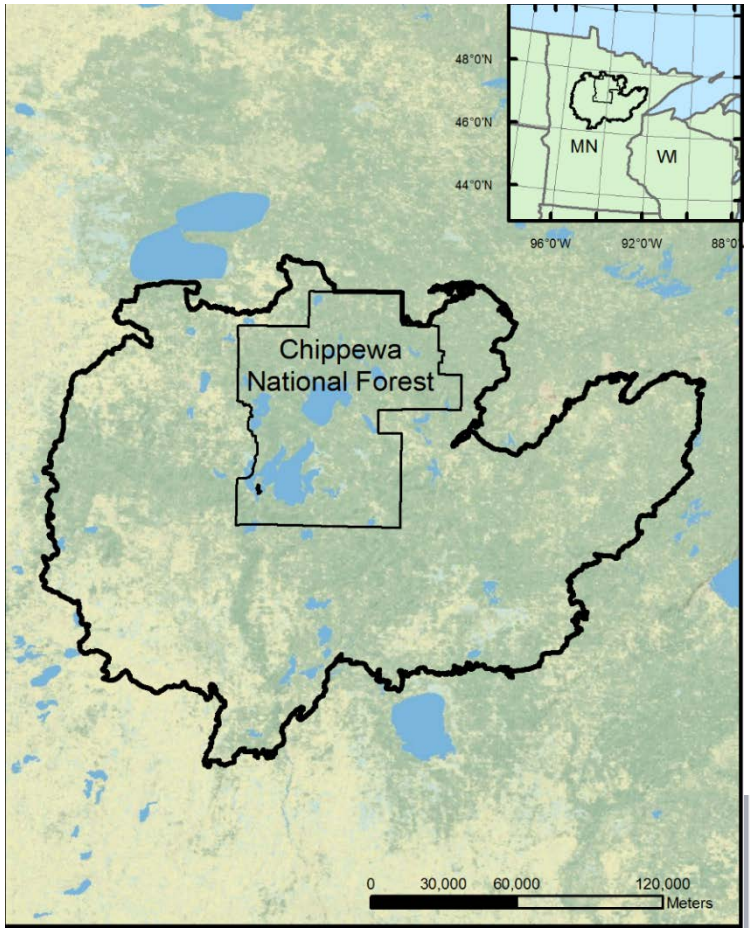
Dr. Melissa Lucash

Portland State UNIVERSITY

Portland State UNIVERSITY

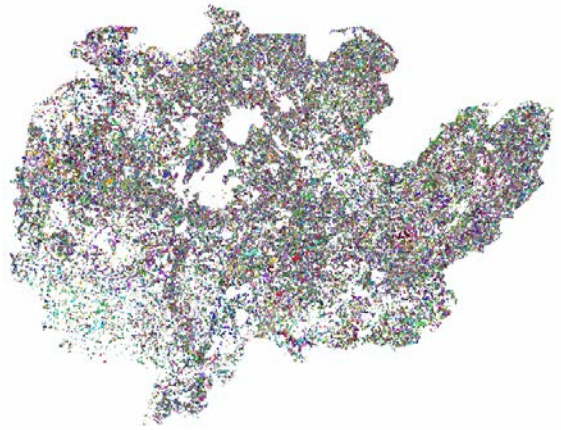
Integrating Climate Science Into Forest Management Decision-Making

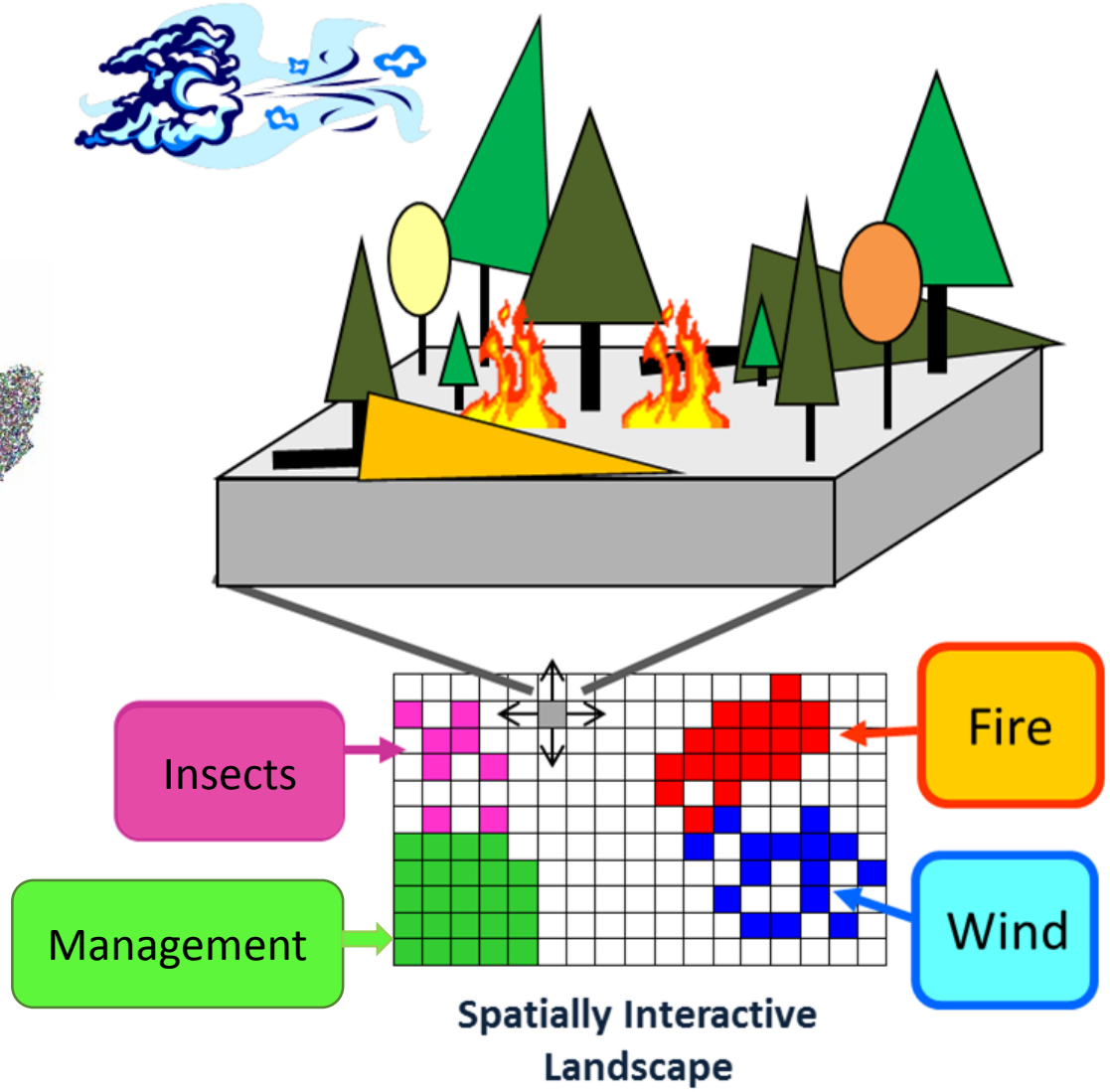
Co-PIs: Robert Scheller, Eric Gustafson, Melissa Lucash, and Brian Sturtevant



USDA United States Department of Agriculture
National Institute of Food and Agriculture

Map derived from FIA data



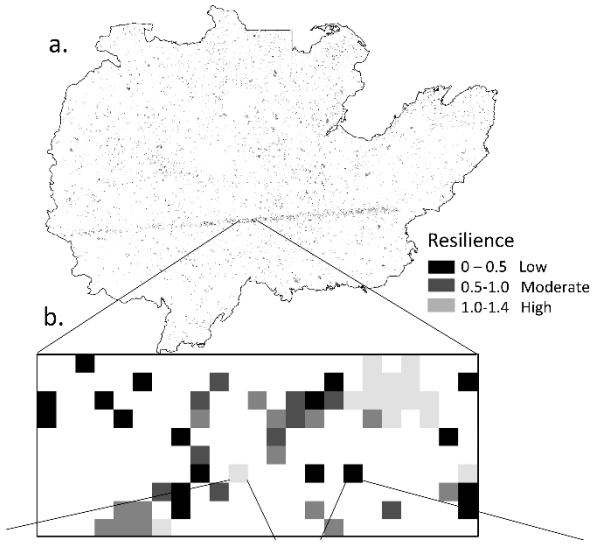


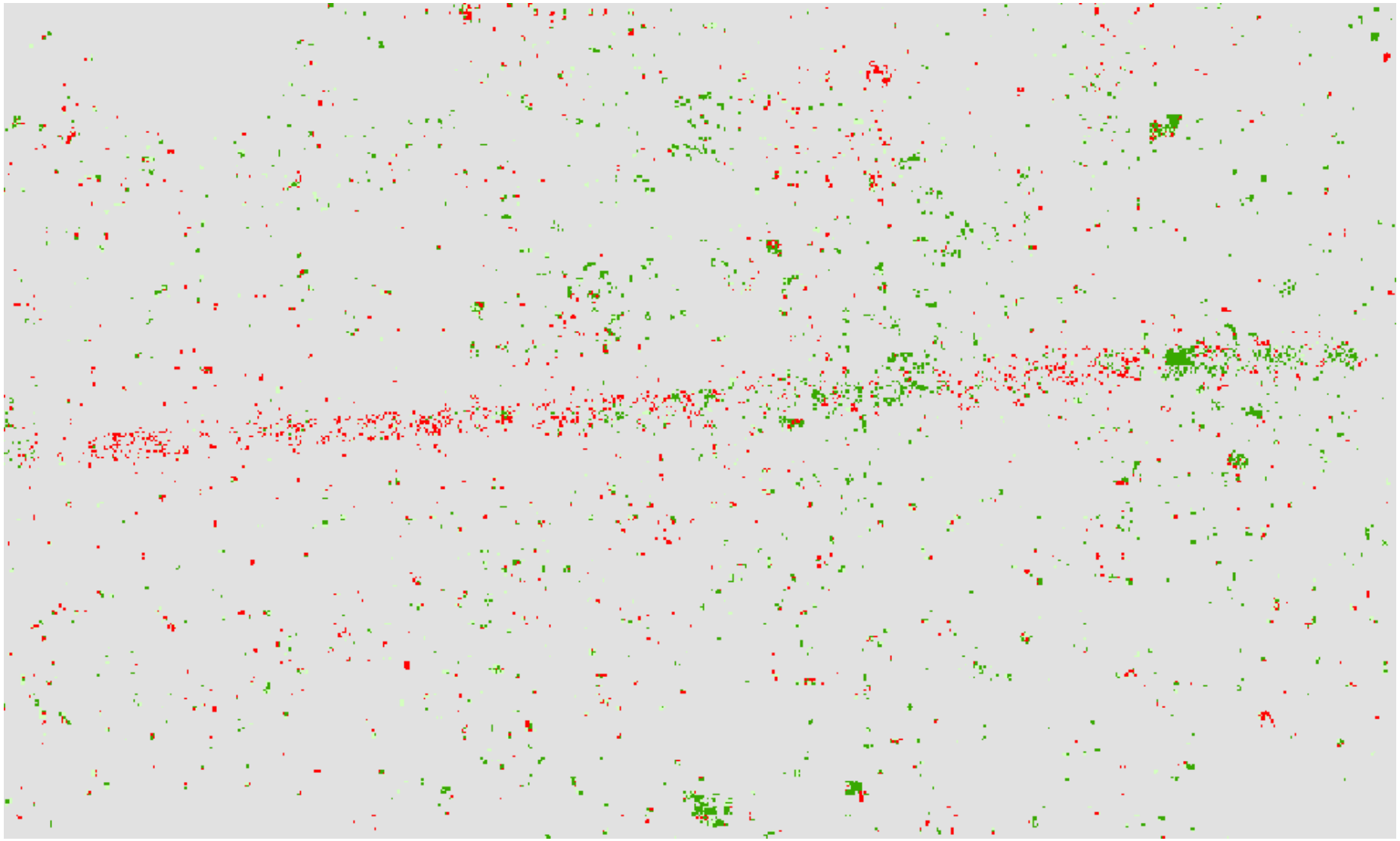
Landscape Ecol (2017) 32:953–969
DOI 10.1007/s10980-017-0501-3

RESEARCH ARTICLE

Spatial resilience of forested landscapes under climate change and management

Melissa S. Lucash · Robert M. Scheller · Eric J. Gustafson · Brian R. Sturtevant





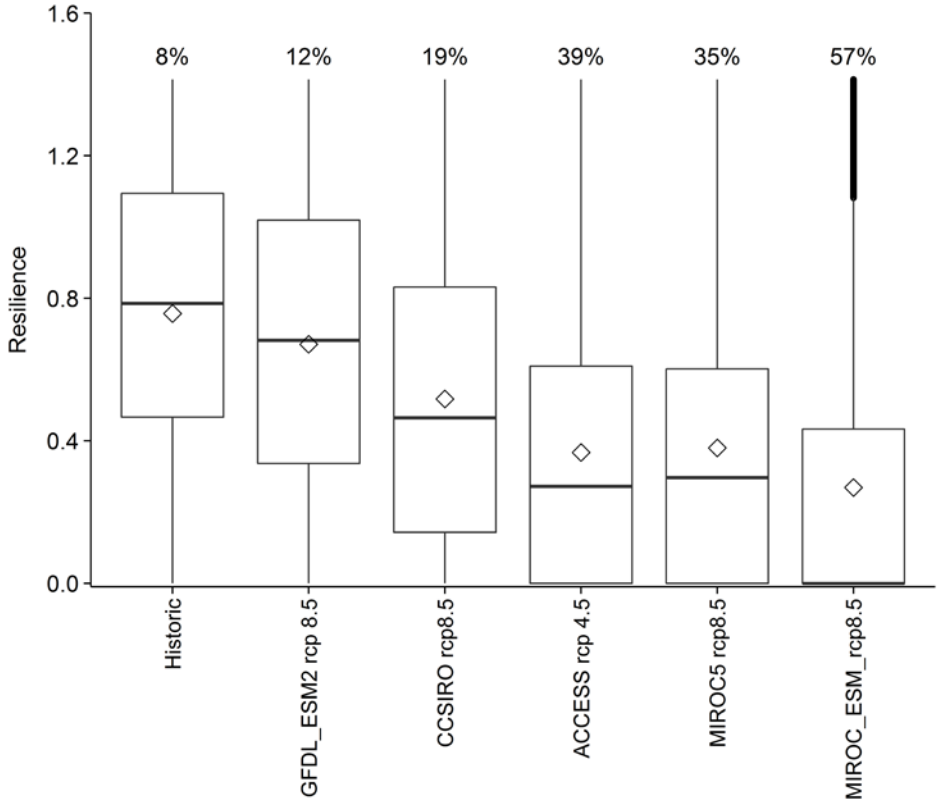
High Resilience

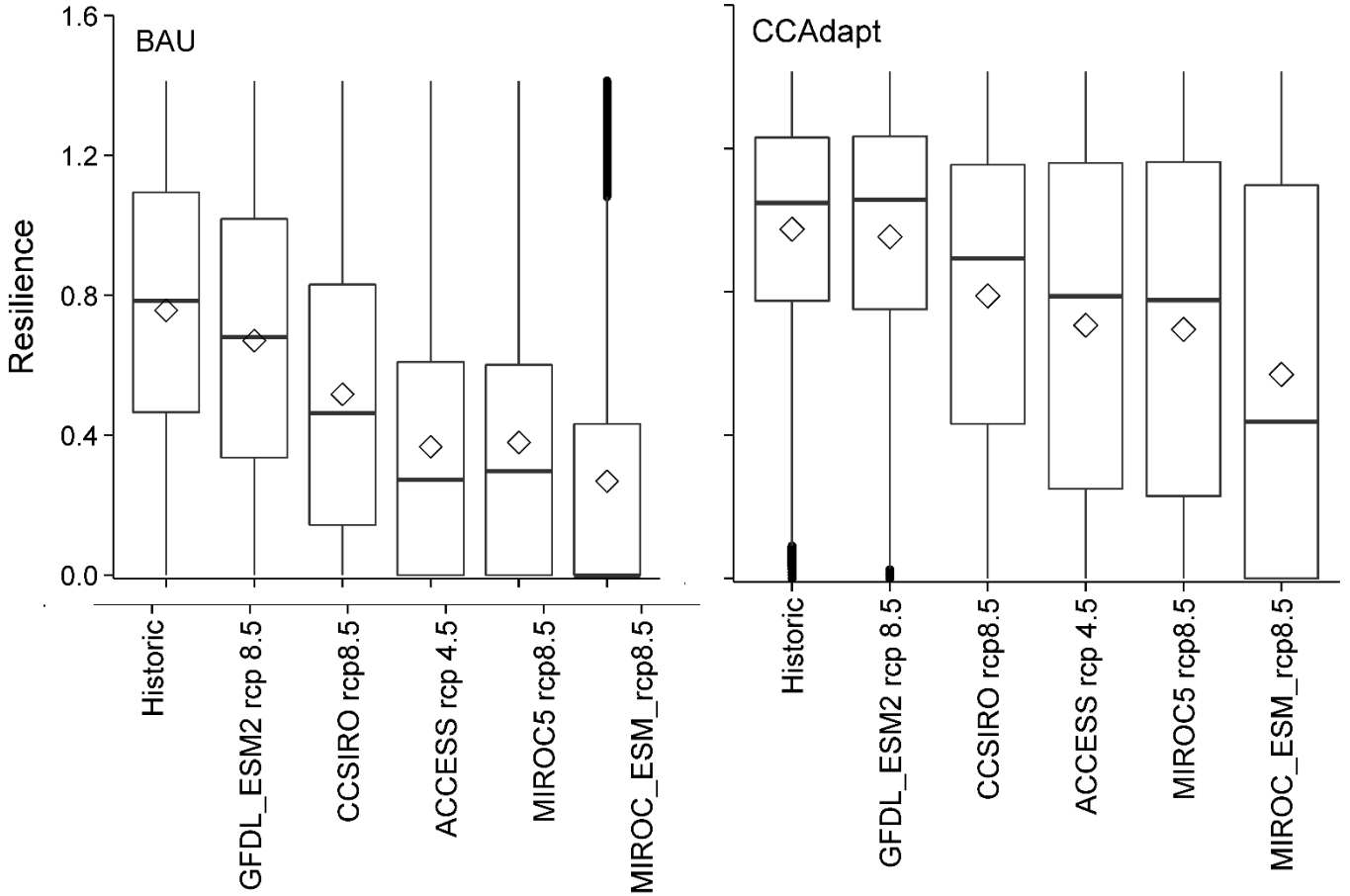
Low Resilience

USDA United States Department of Agriculture
National Institute of Food and Agriculture

Dr. Melissa Lucash

Portland State UNIVERSITY



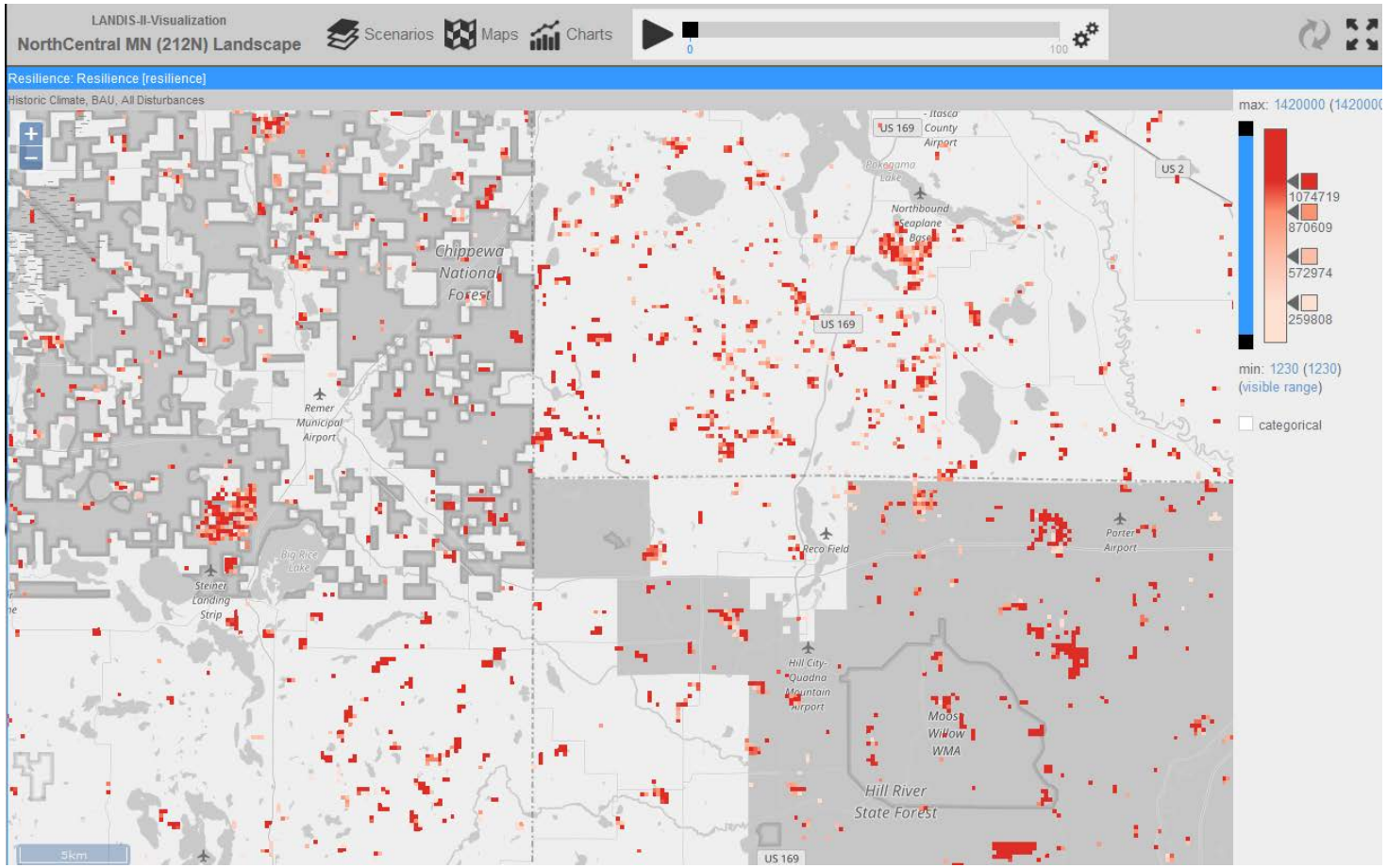


United States Department of Agriculture
National Institute of Food and Agriculture

Dr. Melissa Lucash

Portland State UNIVERSITY

LandViz



https://landis-visualization.research.pdx.edu/Stockholm/

Next steps for using FIA data?

Increasing Fire Frequency and Climate Change on Carbon Dynamics and Species Composition in the Boreal Forest

Arctic Natural Systems (ANS)

Visualizing Forest Futures under Climate Uncertainty

Virtual Reality of Forests under Climate Change

Coupled Human and Natural Systems (CHNS)

Dr. Melissa Lucash

Portland State UNIVERSITY

Next new project?

Global Environmental Change Lab

The Team

Dr. Andrés Holz, Assistant Professor (Lab Director)

Dr. Melissa Lucash, Research Assistant Professor (Lab Co-Director)

Although Drs. Holz and Lucash have research programs that are largely independent, we have combined our resources to build a larger and stronger (!) community of talented post-docs, graduate students and undergraduates.

Alec Kretchun, Research Staff

Wes Hoyer, Research Staff

Lesley Bross, Research Staff

Kyla Zaret, PhD student

Douglas Thalacker, MS student

Ignacio Falcón-Dvorsky, MS student

Emily Sykes, MS student

Laura Platt, MS student

Sebastian Busby, MS student

Terry Marcey, Undergraduate Researcher

Zachary Robbins, Undergraduate Researcher

Dmitri Kalashnikov, Undergraduate Researcher

Luna Canizales, Undergraduate Researcher

Thank you!!

https://sites.google.com/a/pdx.edu/gec_lab/home