



Using soils to predict changes in forest cover in response to climate change (in progress)

Wendy Peterman
and Dr. Dominique Bachelet, Conservation Biology Institute

11 July 2012, NP LCC webinar



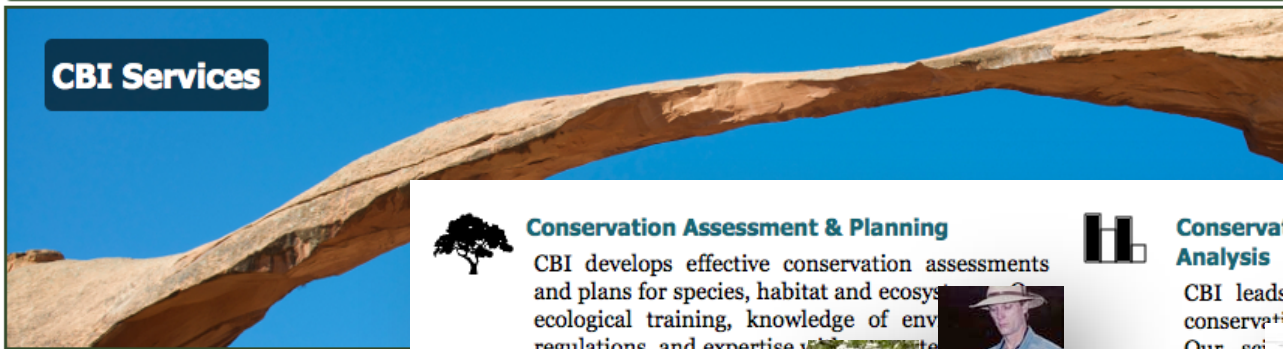
CONSERVATION BIOLOGY INSTITUTE
Bridging conservation science and practice



consbio.org

30 staff
 23 scientists
 Corvallis, CA (7)

WHAT WE DO NEWSROOM & BLOG PEOPLE PRODUCTS & PUBLICATIONS ABOUT CBI



CBI Services

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CBI Services

The Conservation Biology Institute (CBI) maintains biodiversity in its natural state through applied science.

Our expertise includes GIS and decision-support systems, and infrastructure development.



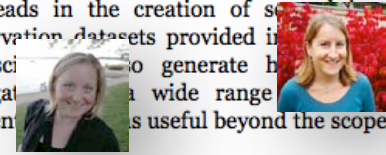
Conservation Assessment & Planning

CBI develops effective conservation assessments and plans for species, habitat and ecosystems. We provide ecological training, knowledge of environmental regulations, and expertise with GIS analysis and remote sensing.



Conservation Dataset Development & Analysis

CBI leads in the creation of some of the most important conservation datasets provided in the world below. Our scientists generate high quality data aggregated from a wide range of sources for different purposes useful beyond the scope of the project.



Ecological Modeling

CBI develops and provides special services focused on ecological forecasting and customized decision support tools for a variety of topics listed below. In all of these cases, researchers and program managers at CBI design spatially explicit models.



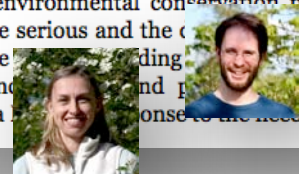
Science Support & Education

CBI provides conservation science education (formally and informally) through a variety of means (listed below). Our highly trained and experienced science and technical staff are available to be effective in translating the latest research into practical applications.



Data Basin

As environmental conservation problems become more serious and the complexity of solving them grows more rapidly, the need for strong connections between science and practice is becoming critical. CBI built Data Basin in response to the need to access, analyze, and share data.



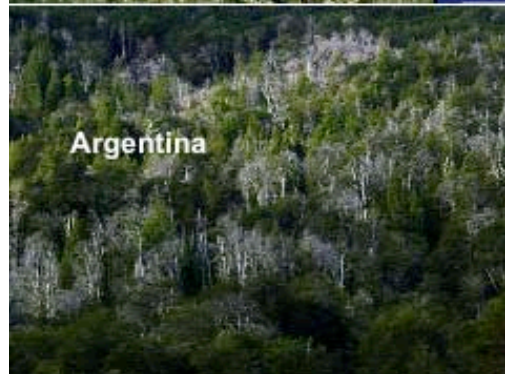
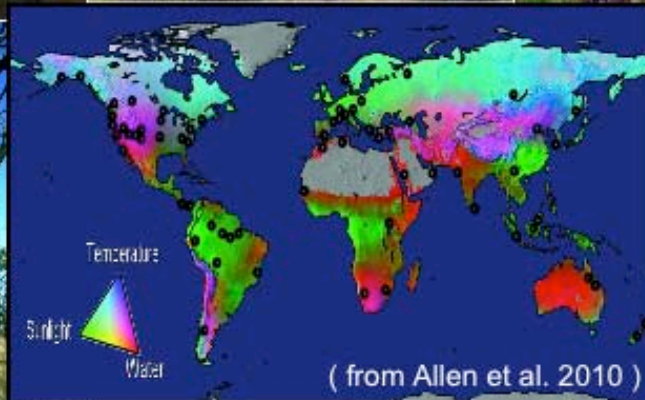
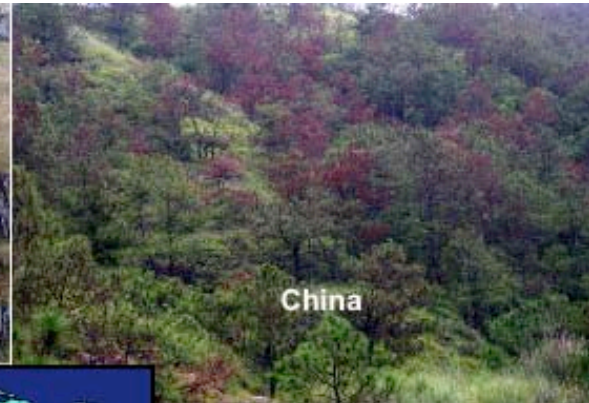
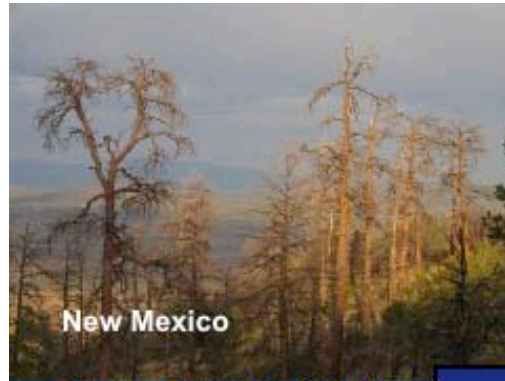
Wendy Peterman



Photo by Sean D. Brown

- GIS specialist
- Soil scientist, in the Climate Change modeling team at CBI
- Ph. D. student at OSU, Dept of Forest Engineering

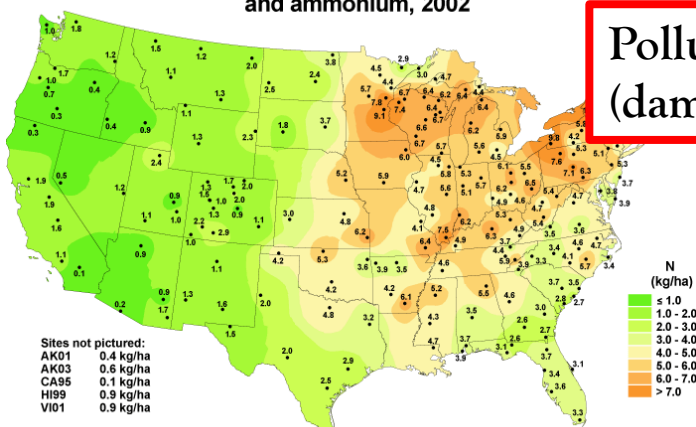
The issue ... Forest mortality, locally and globally



Allen 2010, Allen et al. 2010

The problem ... Identifying cause of mortality

Inorganic nitrogen wet deposition from nitrate and ammonium, 2002



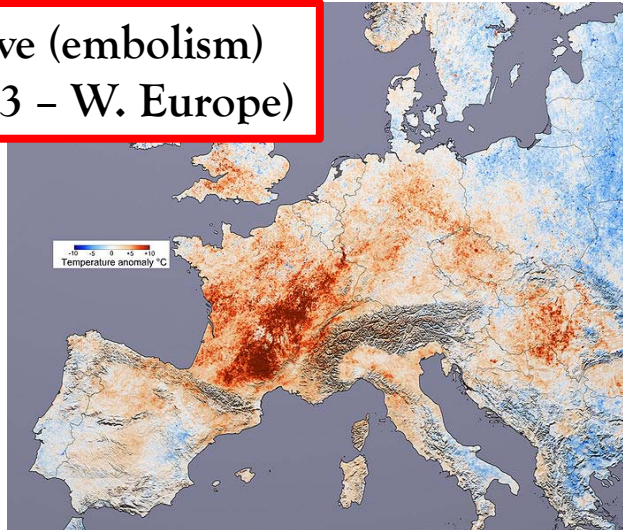
National Atmospheric Deposition Program/National Trends Network
<http://nadp.sws.uiuc.edu>

Pollution
(damaged stomates)



Pest & Insect Outbreaks

Heat Wave (embolism)
(July 2003 – W. Europe)



Extended drought

Available soil water is an issue as climate warms ...

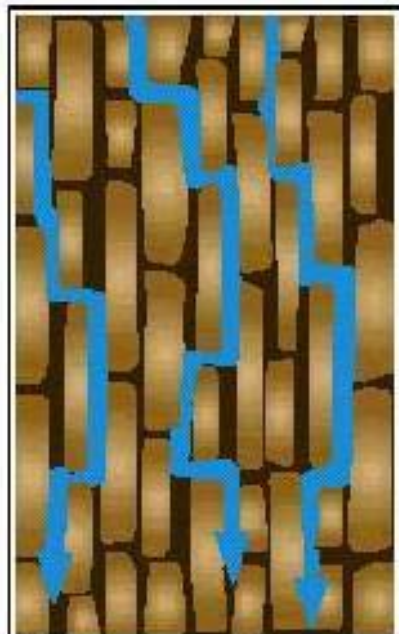


Drought thresholds vary with soil characteristics:
4 examples of how water moves through the soil

GRANULAR



PRISMATIC



BLOCKY

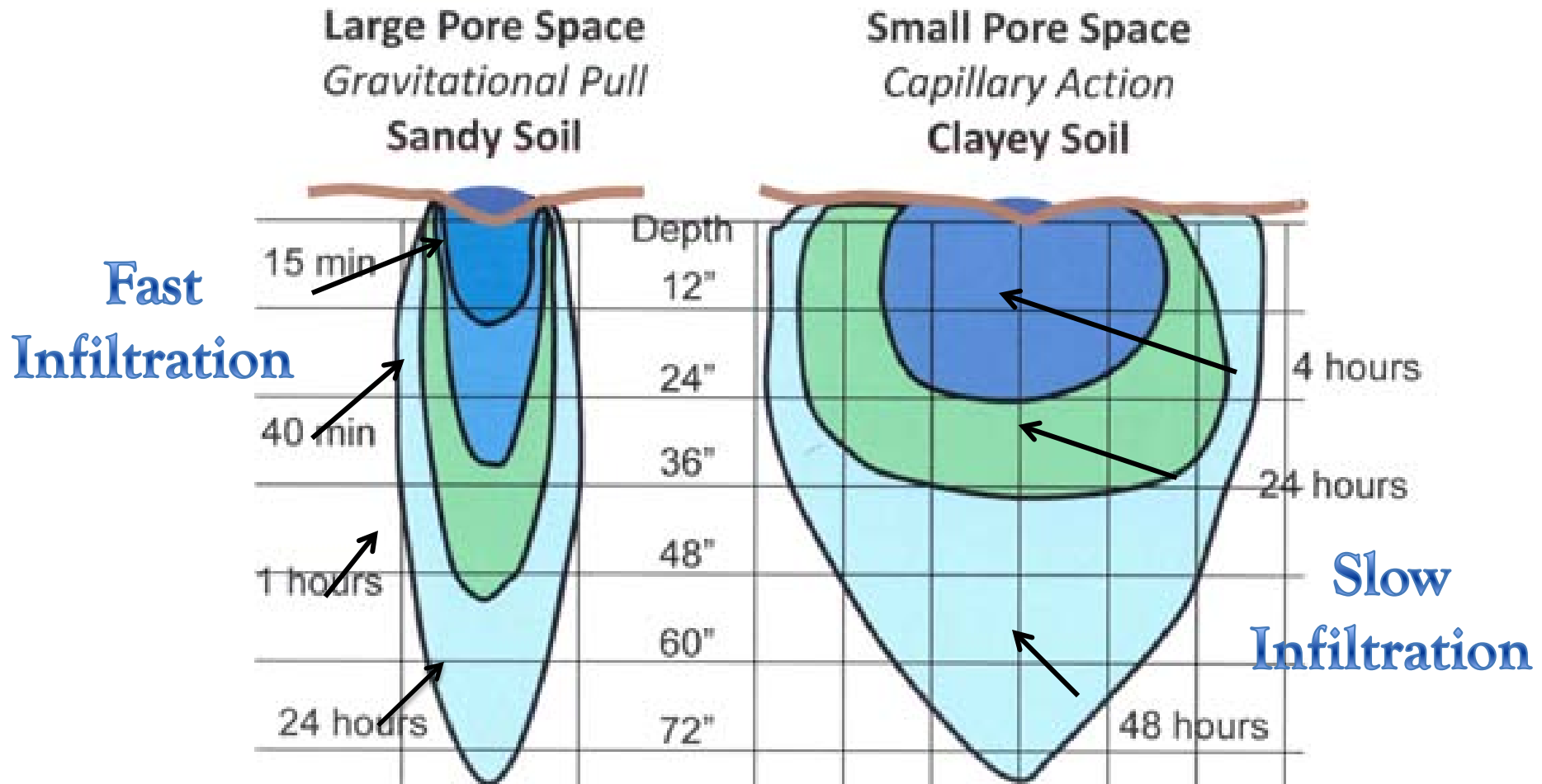


PLATY



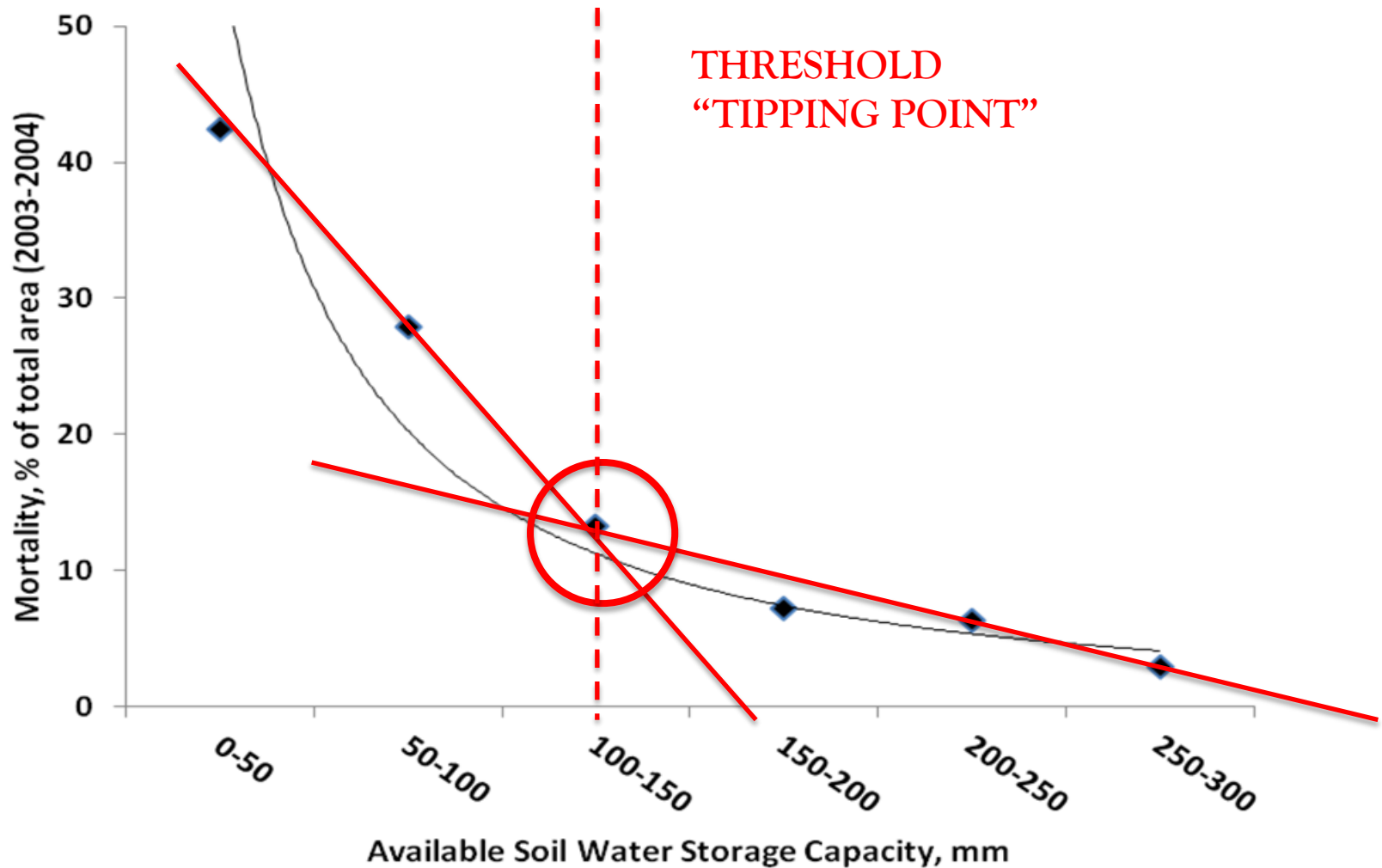
Source: NRCS

Soil type determines water infiltration rate

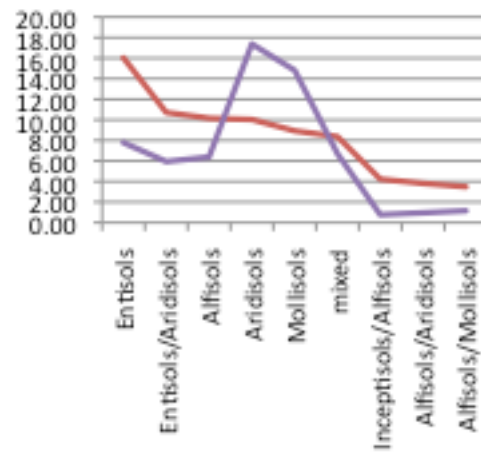
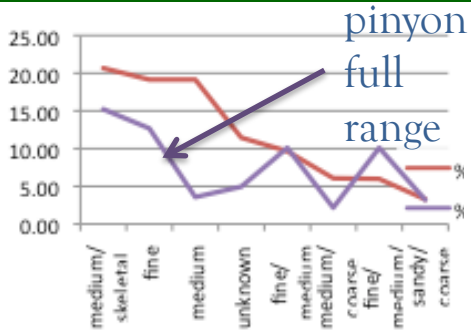
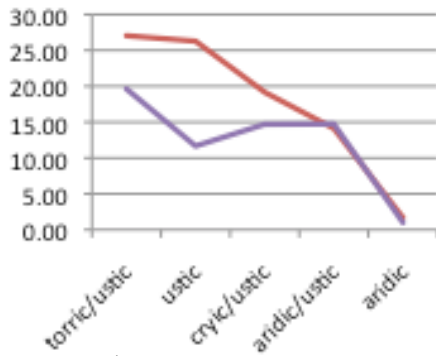
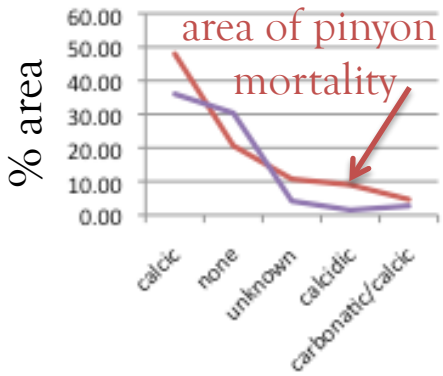


Source: Colorado State University

In Southwest USA: drought impacts – pinyon mortality



Data Analysis ... Trends - Correlations - Forecast



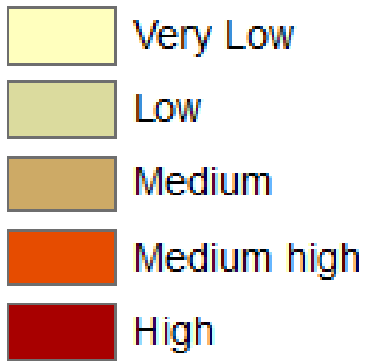
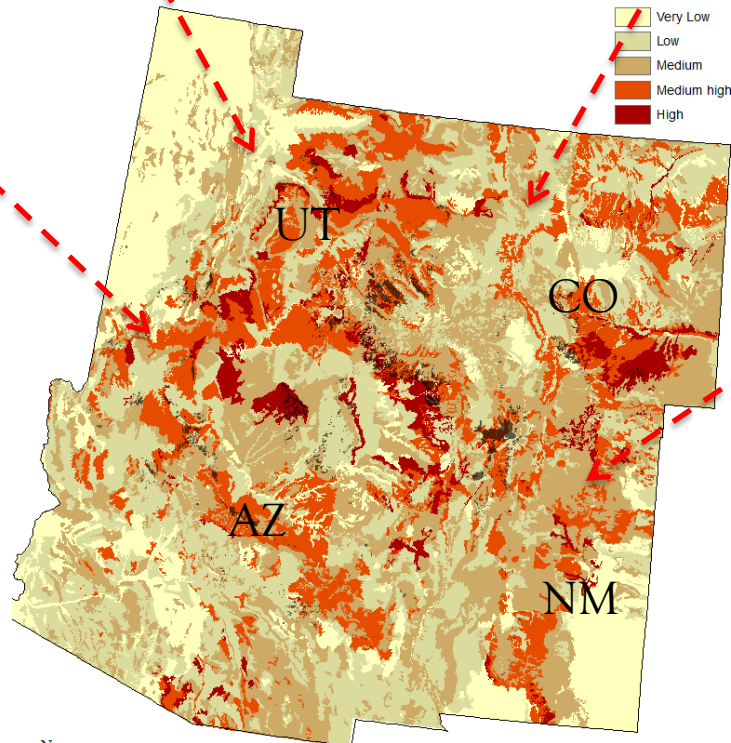
Mineral/Salt

Climate

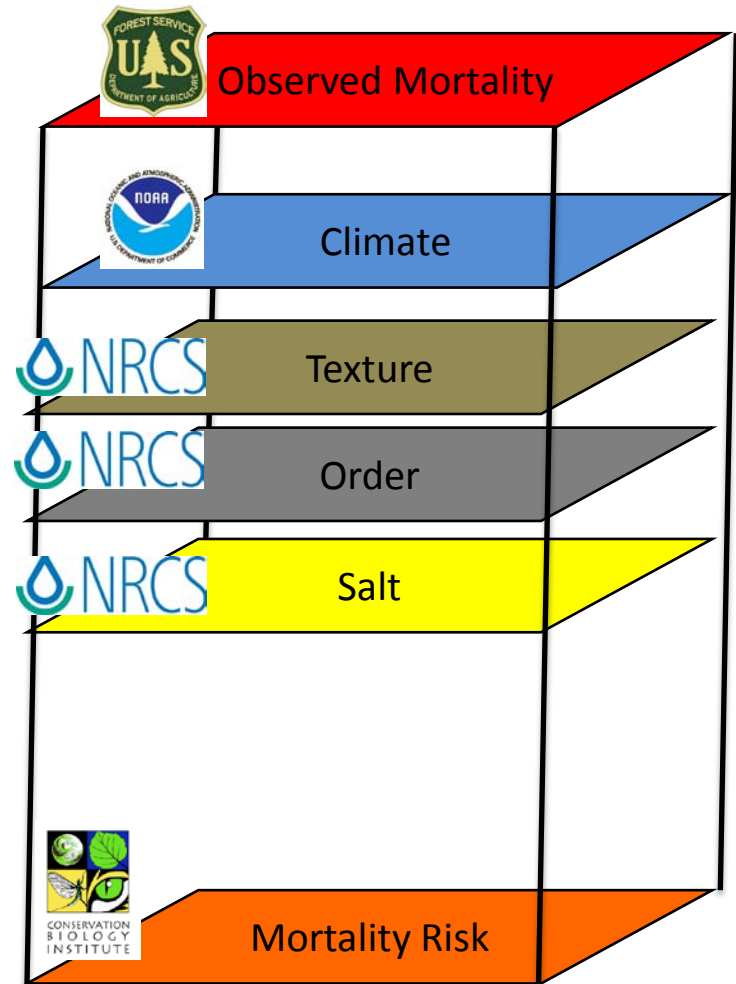
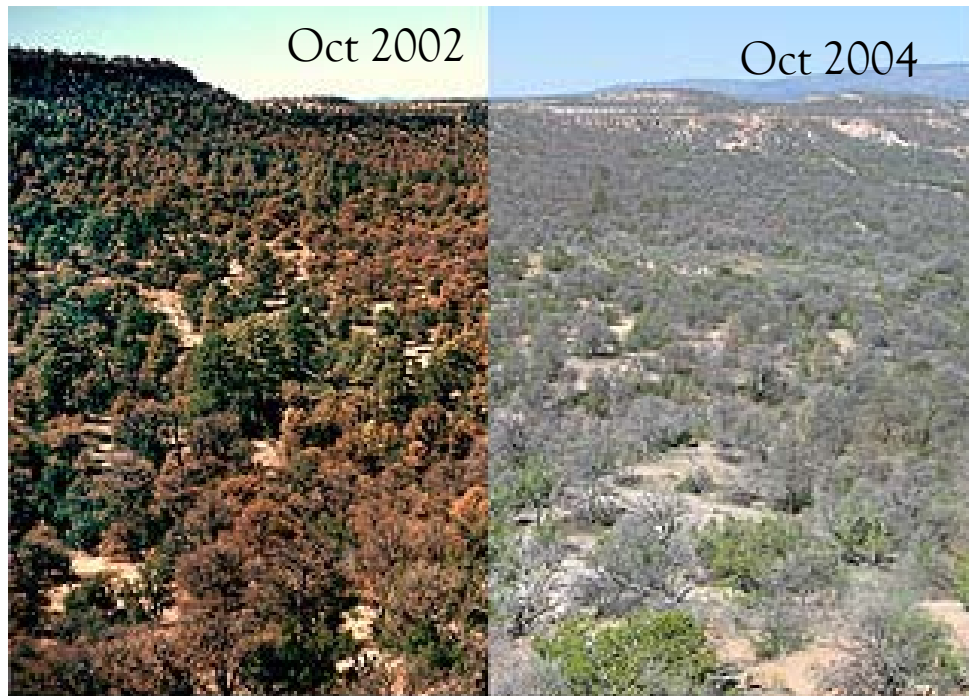
Texture

Soil order

Resulting MORTALITY RISK



Method: GIS Model - Correlation



FORECAST



NP – LCC different mortality issues – causes



Alaska Yellow Cedar
early springs: wet soils – vulnerability to late frost

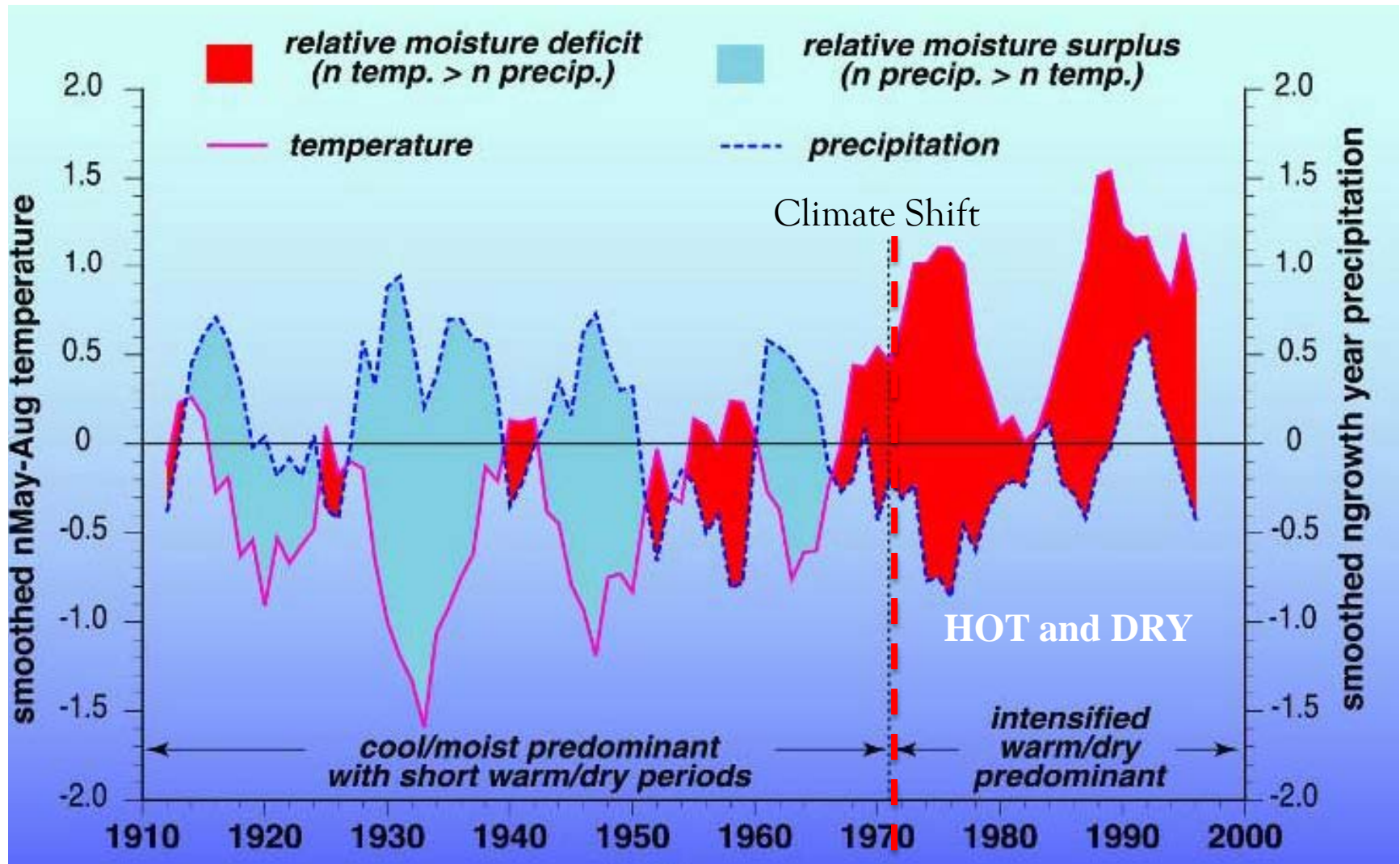


Mountain Pine Beetle
temperature threshold for beetles



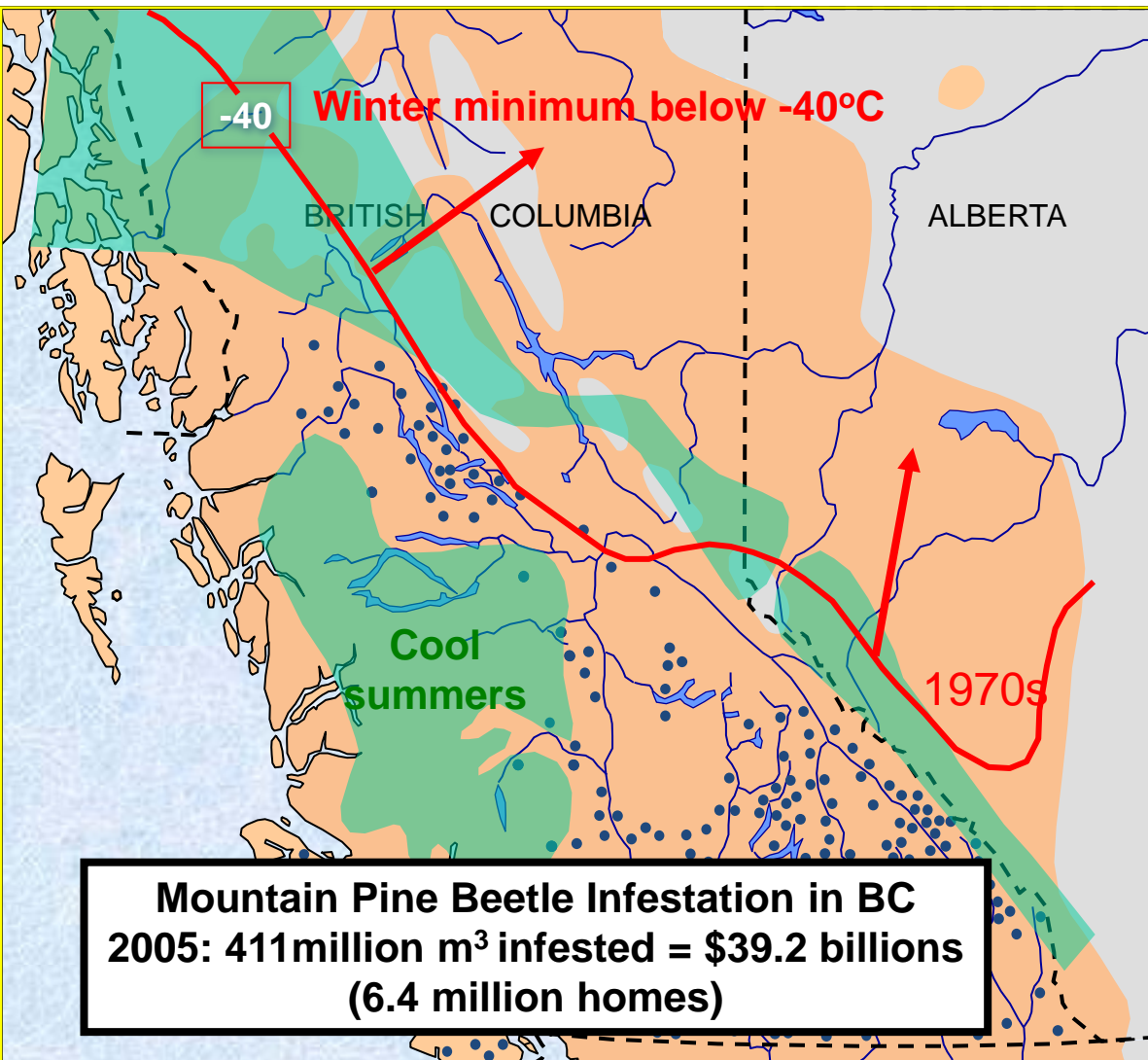
Sudden Oak Death
endemic pathogen

NP-LCC Thresholds ex. #1 Alaska

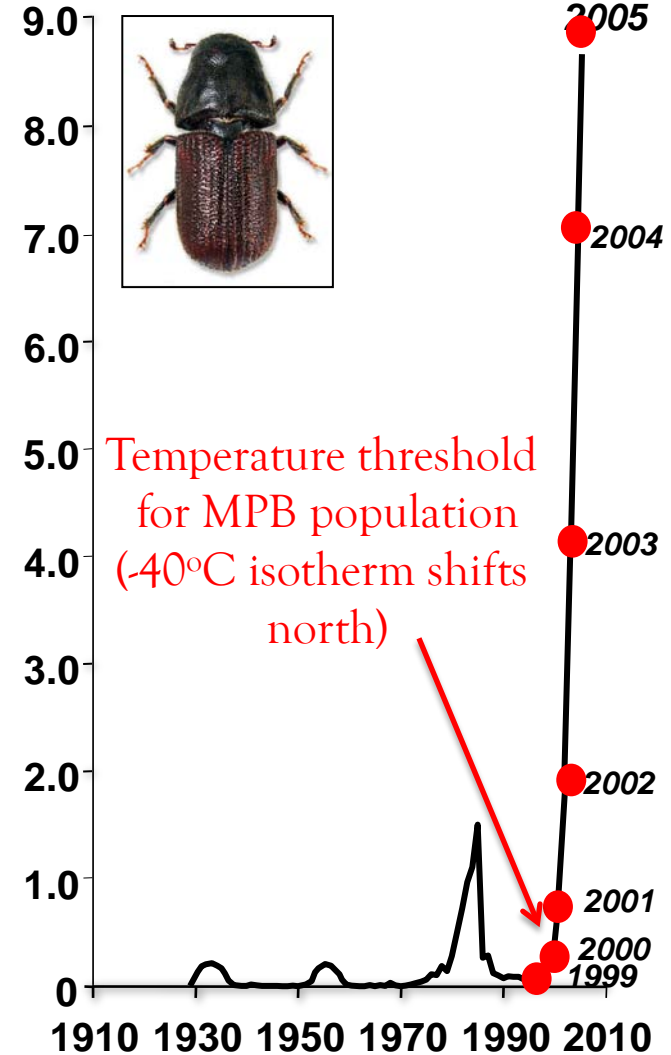


source: Glenn Juday, U. Alaska

NP-LCC Thresholds ex. #2 British Columbia

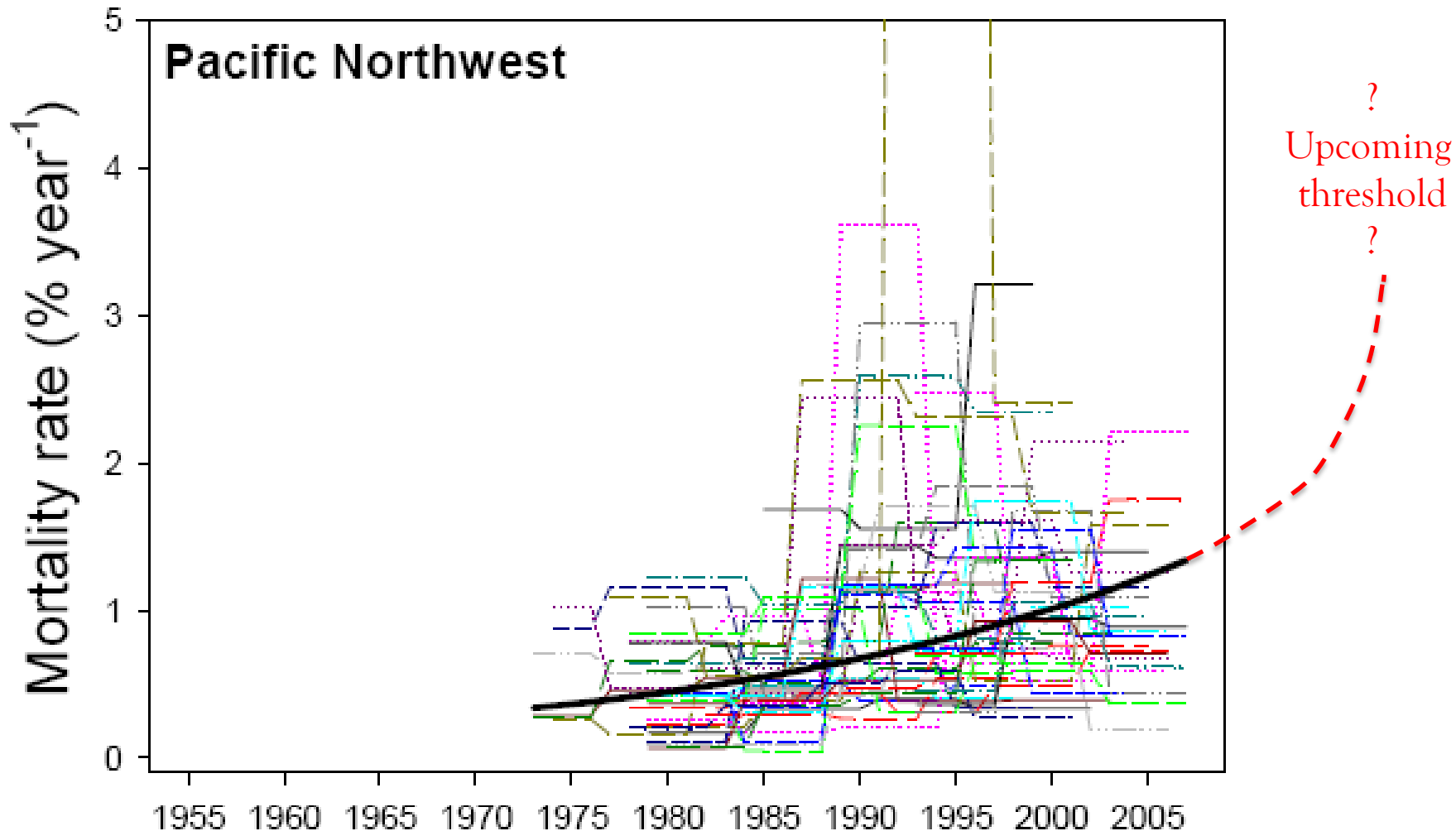


10^6 ha infected



Source: Allan Carroll, Pacific Forestry Centre in Victoria

Widespread Increase of Tree Mortality Rates in Western United States



NP- LCC Project Objectives



1. Produce decision support tools:
 - * spatial data: soil characteristics, soil water resources
 - * model projections: trends in soil-plant dynamics
 - * all freely available through databasin.org.

2. Test model assumptions by providing new soil drivers:
 - * several models;
 - * several spatial and temporal scales;

3. Produce soil vulnerability maps

NP - LCC Project : Progress to date



1. Gathered soils data for 4 US states and one Canadian province, mapped the data, shared all the results through databasin.org.
2. Finished the training to run the models (MC1, 3PG)
 - in the process, published paper in Ecohydrology using 3PG to simulate mortality for a class project focusing on SW region

Wendy Peterman, Richard H. Waring, Trent Seager, William L. Pollock. Soil properties affect pinyon pine - juniper response to drought. Ecohydrology, 2012; DOI: [10.1002/eco.1284](https://doi.org/10.1002/eco.1284)

NP- LCC Project: Progress so far ...



DATA BASIN | GALLERIES | SOIL AND FOREST VULNERABILITY TO ...

Bookmark Share Export List

Soil and Forest Vulnerability to Climate Change in the North Pacific Landscape Conservation Cooperative

Wendy Peterman
Created May 19, 2012

Overview Contents

- Content
 - Soils
 - California
 - Oregon
 - Washington
 - Alaska
 - Canada
 - Forest Mortality
 - Alaska
 - Contiguous: Canada
 - Landfire Vegetation
 - California
 - Alaska
 - Oregon
 - Washington
 - DEM
 - Ecology
 - Models
 - 3-PG
 - MC1/MAP
 - Envelope n
 - Climate

Showing 1 - 2 of 2 items

Sort By: Creation Date (newest to oldest) Items per page: 10

Forest damage surveys and soil attributes in the North Pacific Landscape Conservation Cooperative, southern Alaska (a)

Credits: Wendy Peterman
This dataset is for general comparison between forest damage data and soil characteristics in the southern Alaska portion of the NP LCC.
4 datasets Created Jun 15, 2012 by Wendy Peterman

North Pacific Conservation Cooperative boundary

Credits: US FWS
Landscape conservation cooperatives (LCCs) are conservation-science partnerships between the U.S. Fish and Wildlife Service, U.S. Geological Survey (USGS), and other federal agencies, states, tribes, NGOs, universities and stakeholders within a ...
Layer Package
Uploaded Mar 7, 2012 by Wendy Peterman

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SOILS

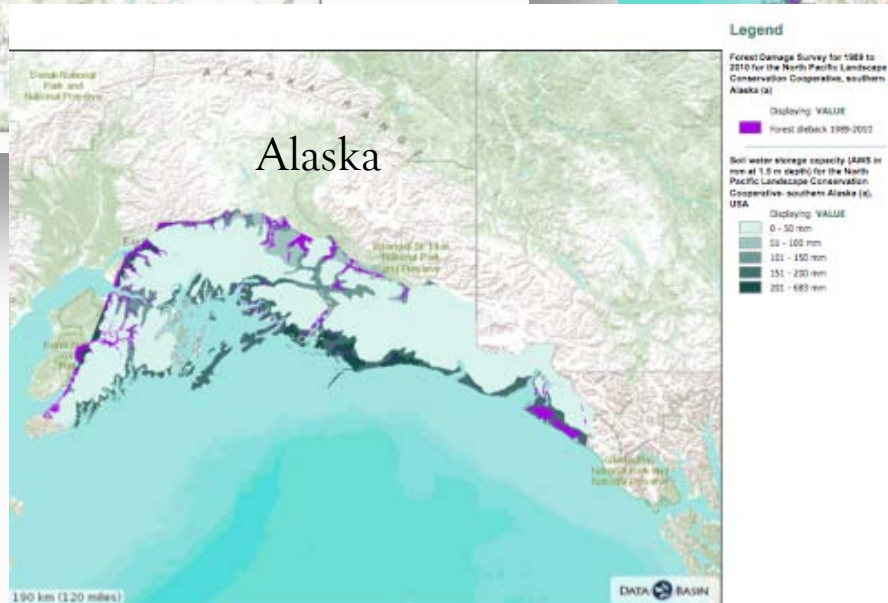
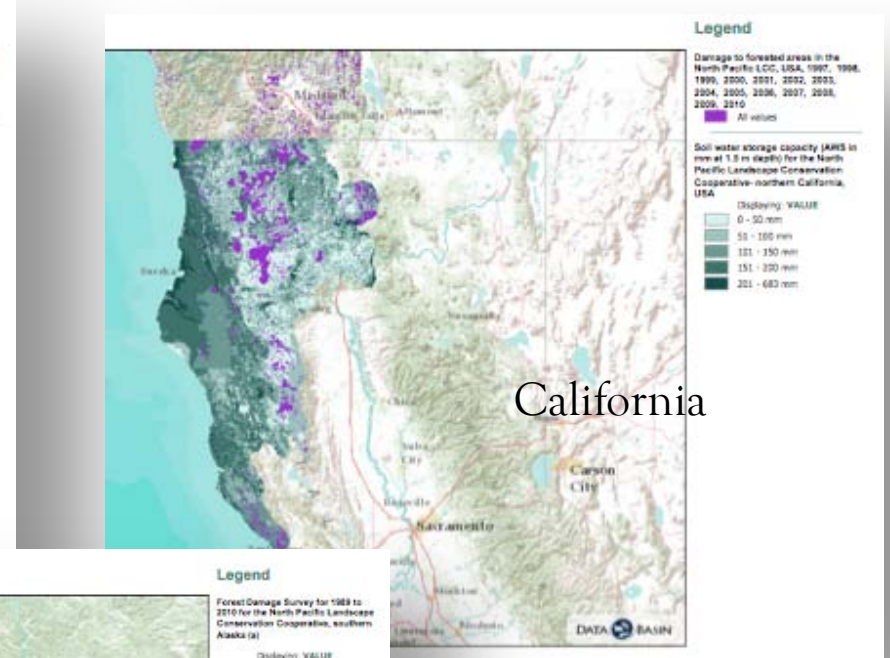
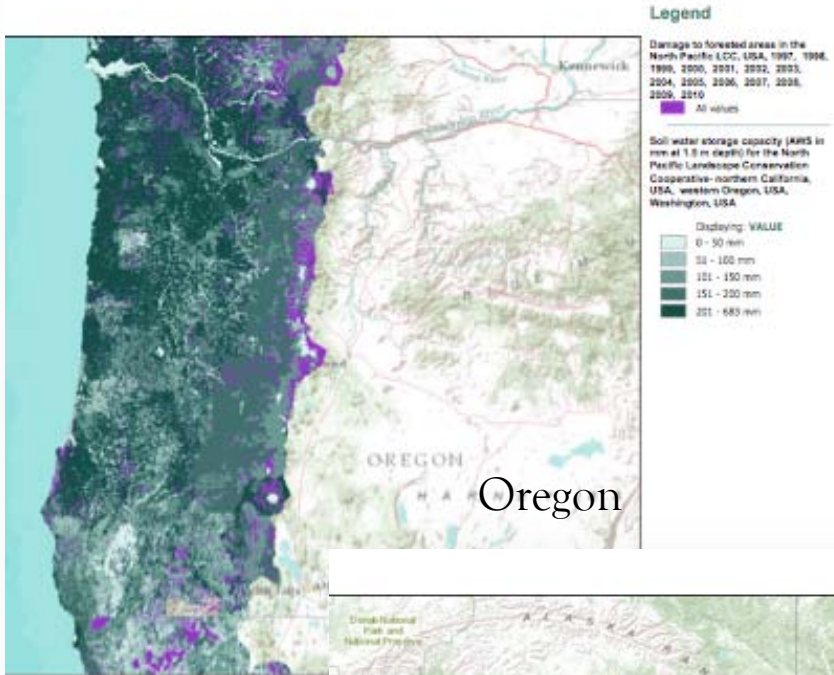
MORTALITY

VEG COVER

PHYSICAL

next, simulations

NP - LCC : data gathering, mapping and sharing



examples in
databasin.org



1. Gathered soils data for 4 US states and one Canadian province, mapped the data, shared all the results through databasin.org.
2. Finished the training to run the models (MC1, 3PG)
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NP – LCC : challenges

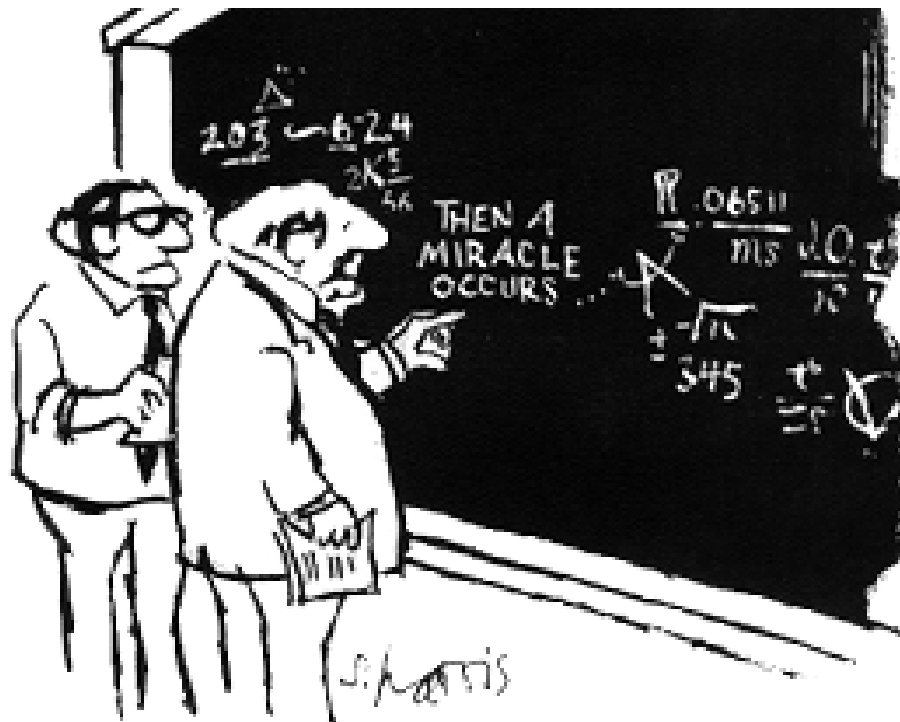


- International boundaries, methods and sources of data
 - British Columbia/Yukon soils data
- Data scarcity and gaps to be filled
 - National Forests – gaps filled with STATSGO –
 - would be useful to have Forest Service Soil Resource Inventory data
- Abundance of data that need to be analyzed

Testing the value of the new soil data with models



The purpose of models is not to fit the data but to sharpen the questions. *Samuel Karlin* (1924-2007)



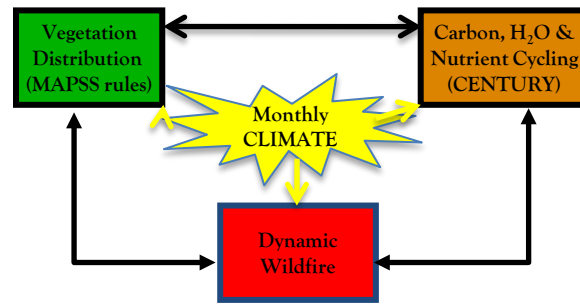
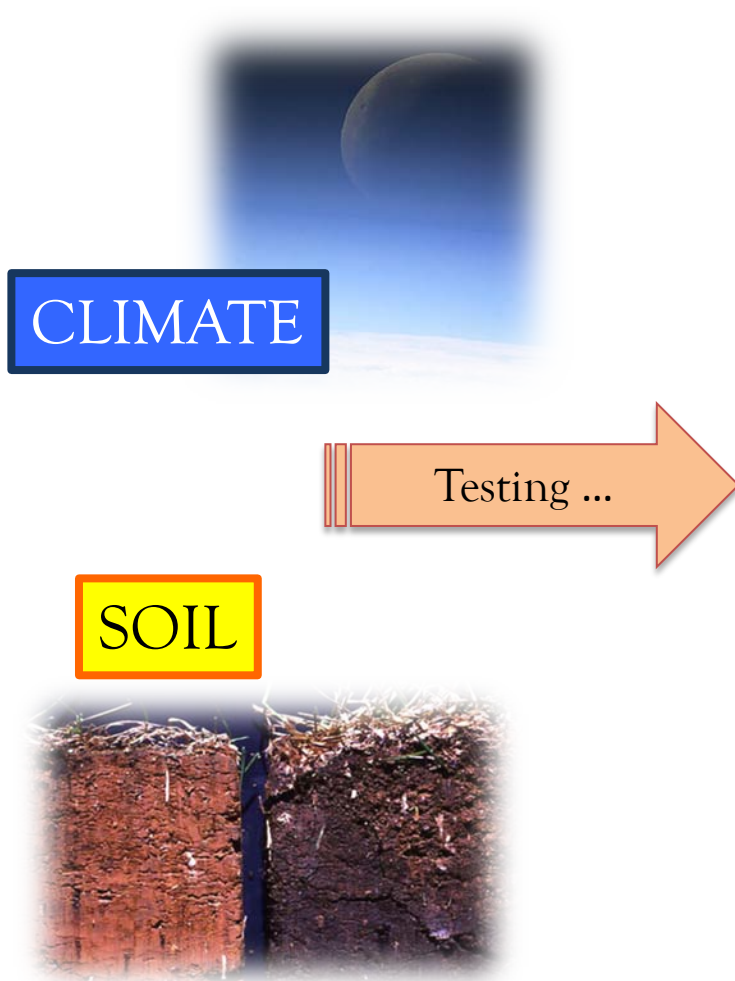
"I think you should be more explicit here in step two."

NEXT PHASE: test role of soils to project future plant cover

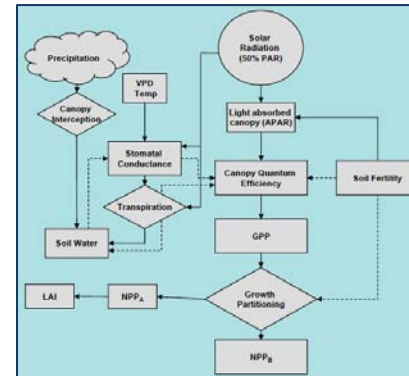


Input Drivers

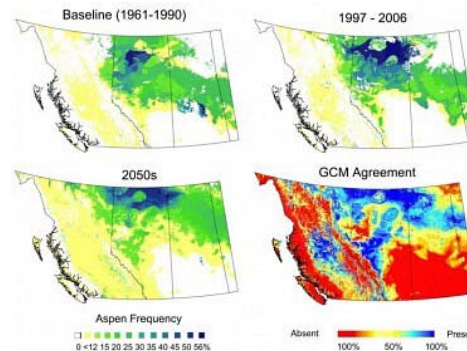
Vegetation Models



DGVM
(thresholds)

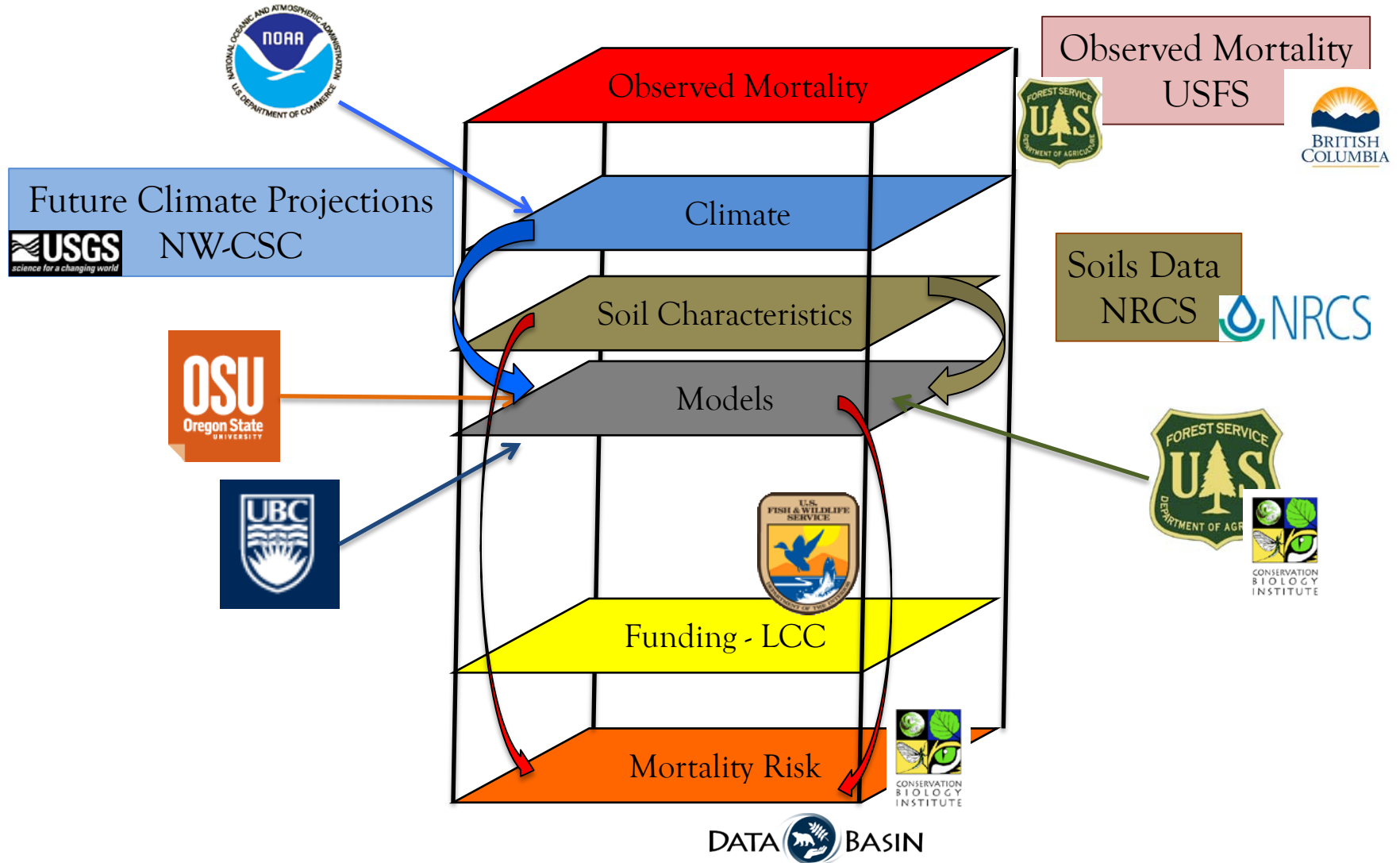


Process Model
(physiological controls)



SDM
(species sensitivity)

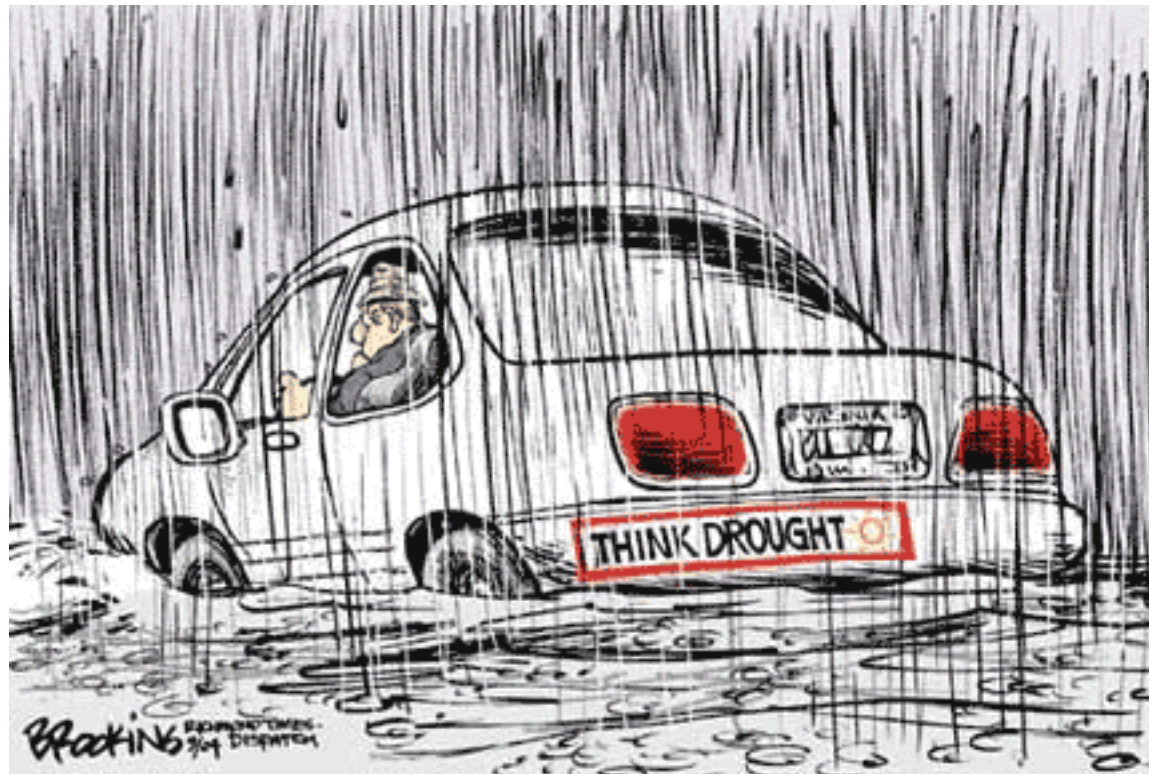
NP - LCC : multi-agency, NGO collaborative



Questions/feedback?

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541.757.0687 ext. 117



Links



NP LCC webpage:

<http://www.fws.gov/pacific/Climatechange/nplcc/>

NP LCC gallery on databasin.org:

<http://app.databasin.org/app/pages/galleryPage.jsp?id=33a551e59b824cf7ab908644fb420880>

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