Vegetation, carbon and fire: translating MC1 simulations results for managers

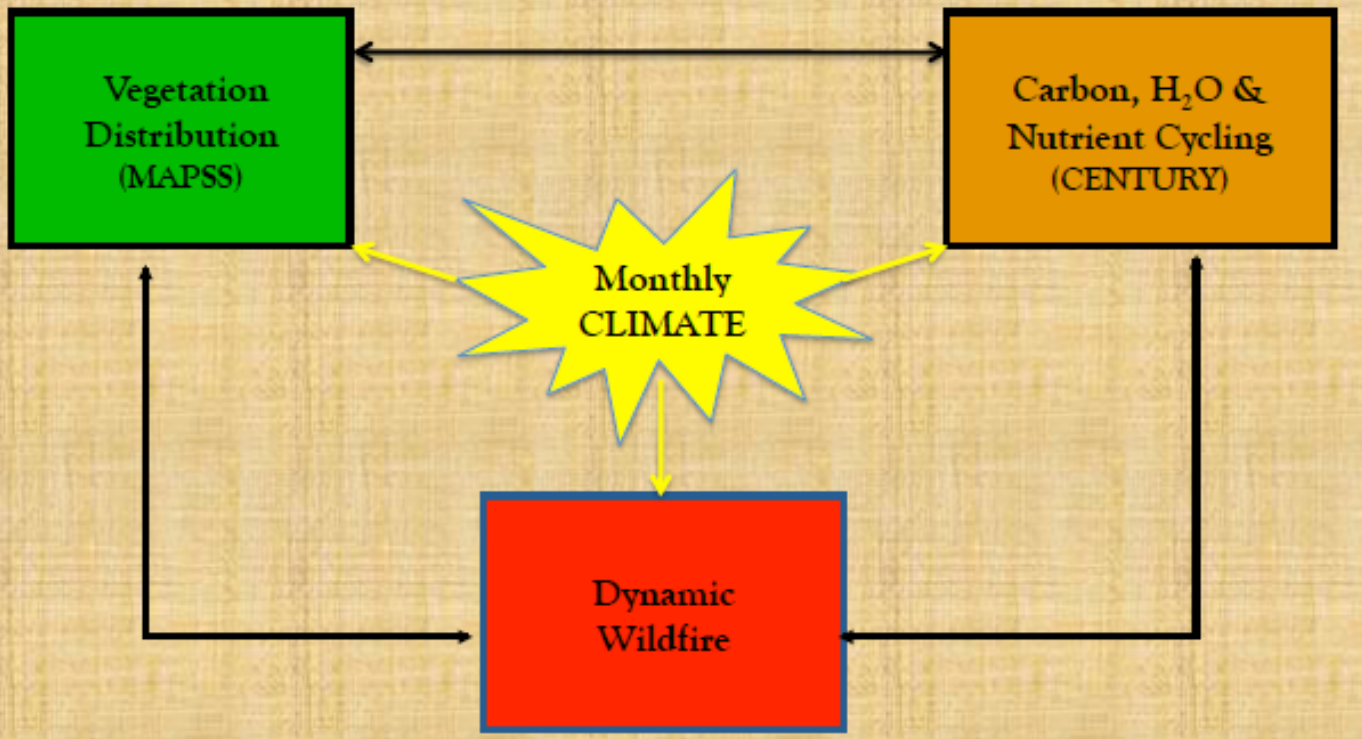
Dr. Dominique Bachelet
Conservation Biology Institute, Corvallis OR

Dr. Tosha Comendant
Conservation Biology Institute, Napa, CA

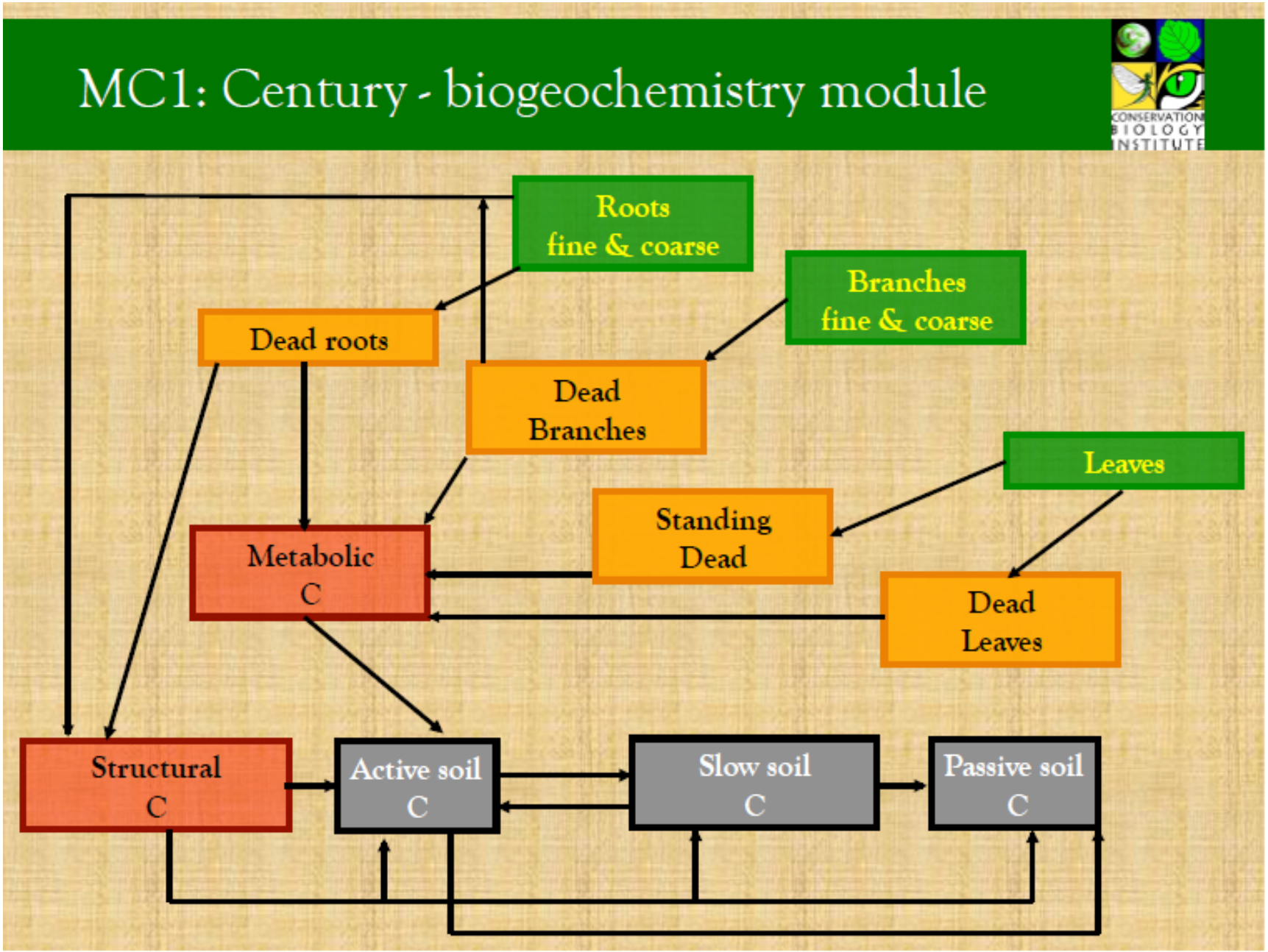
MC1: simulating climate change impacts

"How do you want it—the crystal mumbo-jumbo or statistical probability?"

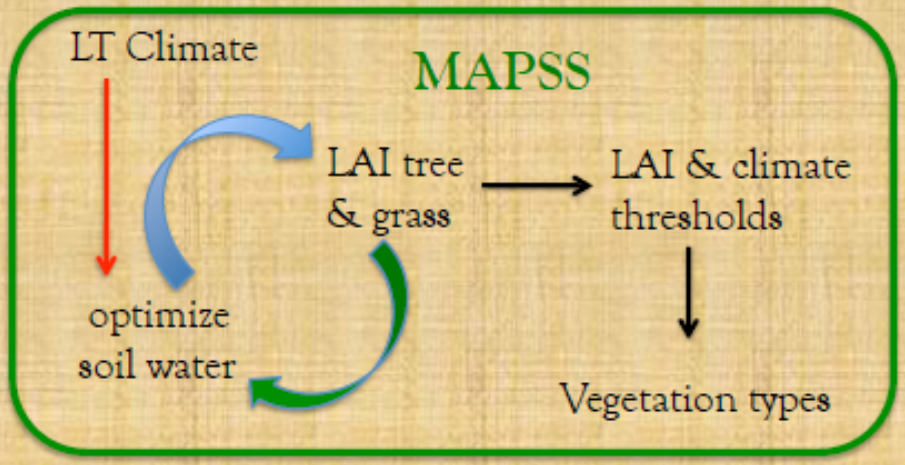
MC1 Dynamic Global Vegetation Model



MC1: Century - biogeochemistry module

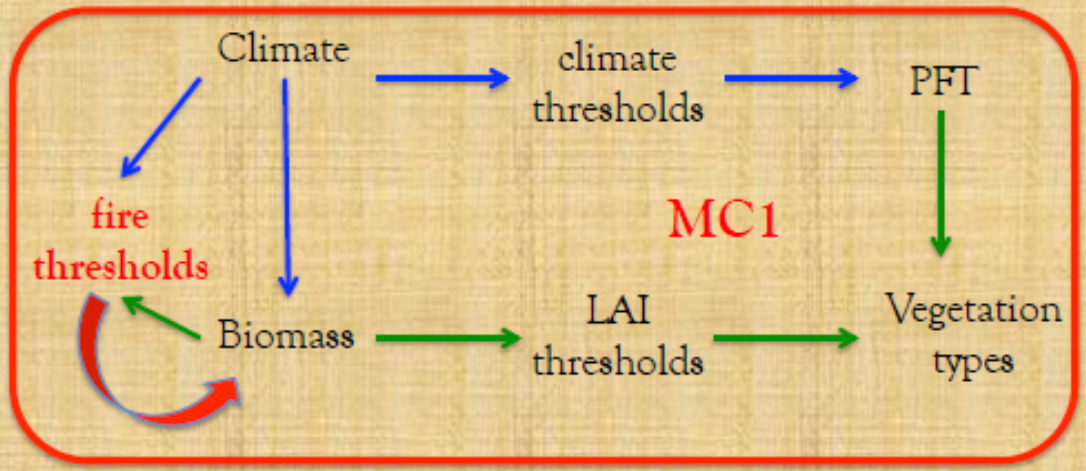


MC1: MAPSS derived - biogeography module

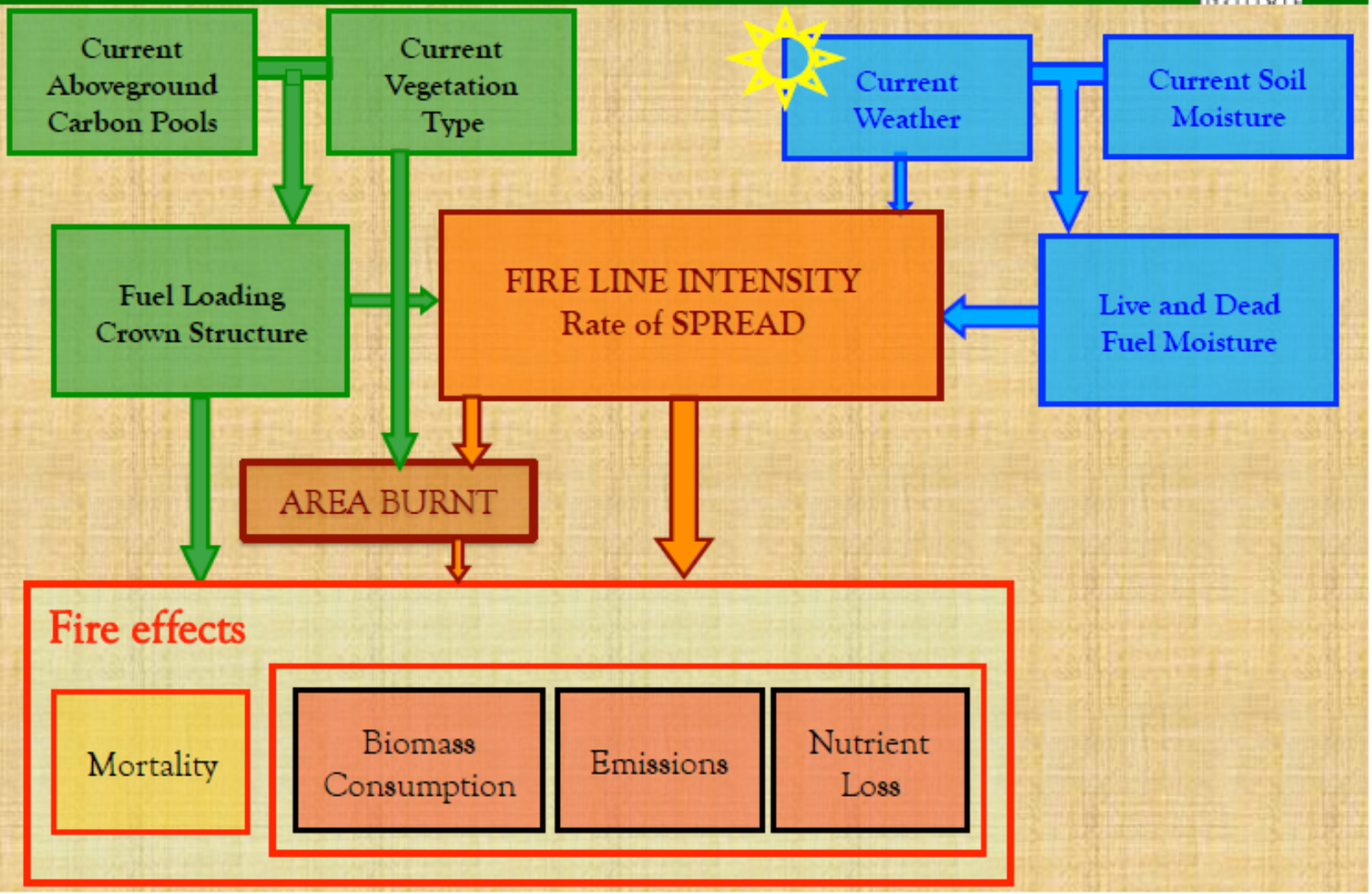


Static biogeography model using long term (LT) climate inputs

Dynamic (biogeography and biogeochemistry) vegetation model using monthly climate inputs



MC1: fire module



MC1: necessary inputs

- Soil information
  - mineral soil depth
  - % sand and % clay in 3 soil layers
  - % rock fragment in same layers
  - bulk density
- Monthly climate inputs (time series) include:
  - Tmin and Tmax
  - Precipitation
  - Vapor pressure deficit (dew point Temp, VPR…)
  - 1895-2009 and projections to 2100

MC1: running protocol

- Run MAPSS equilibrium model (fixed fire) on historical average climate to initialize vegetation distribution; Run biogeochemistry module to initialize carbon stocks (stable soil carbon, several 1000 years)
- Run iteratively over several 100s years biogeography and dynamic fire module to stabilize fire-sensitive carbon stocks (NBP near 0.0): 1500 year spinup
- Run with historical and future climate

MC1: calibration and testing

- spatially with vegetation maps
- spatially with carbon stocks records: e.g. Blackard et al. (2007)
- temporally with stream gauge data
- temporally with Fluxnet data
- temporally and spatially with fire observations
- always with available expert advice

MC1: calibration issues e.g. N inputs

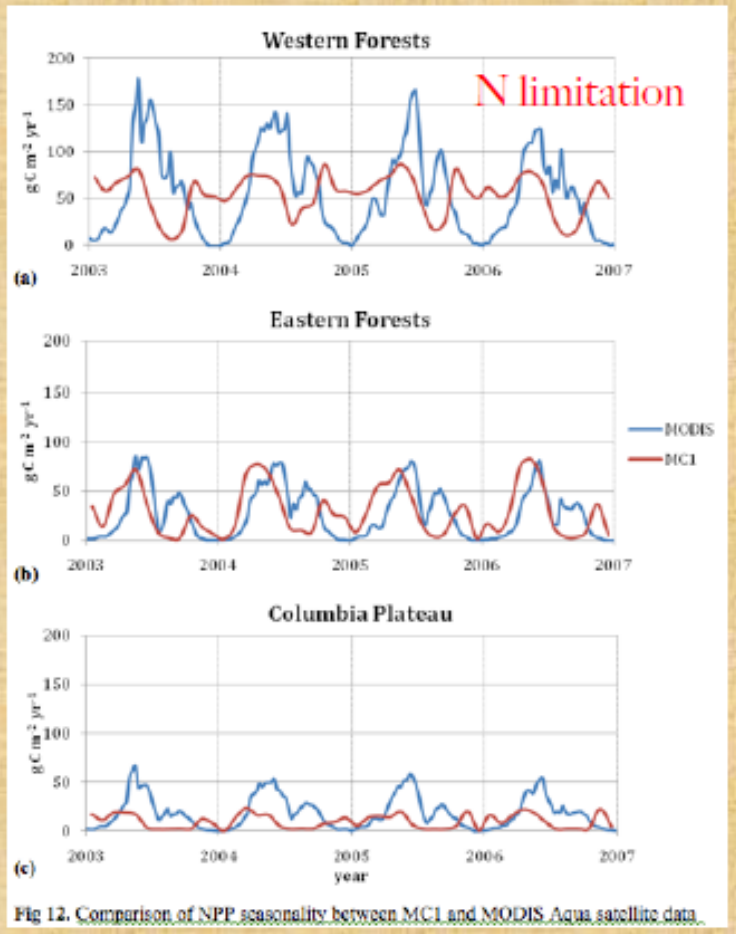
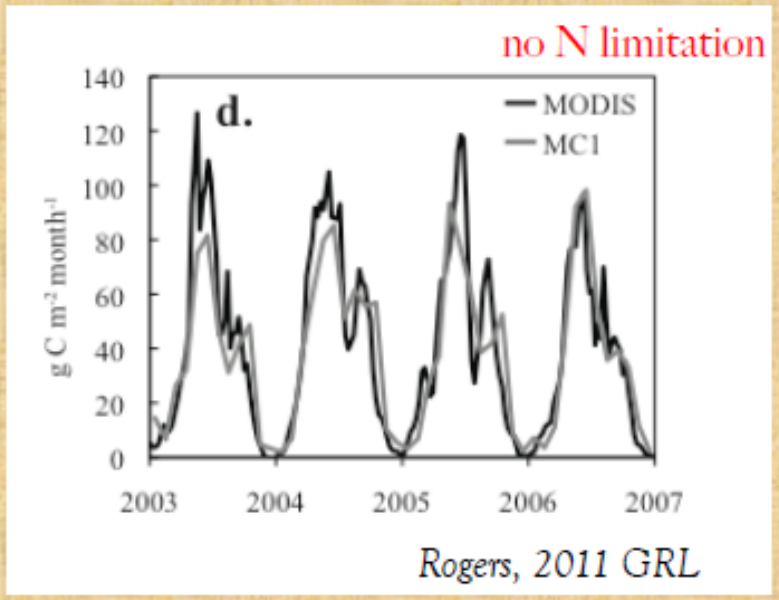


Fig 12. Comparison of NPP seasonality between MC1 and MODIS Aqua satellite data

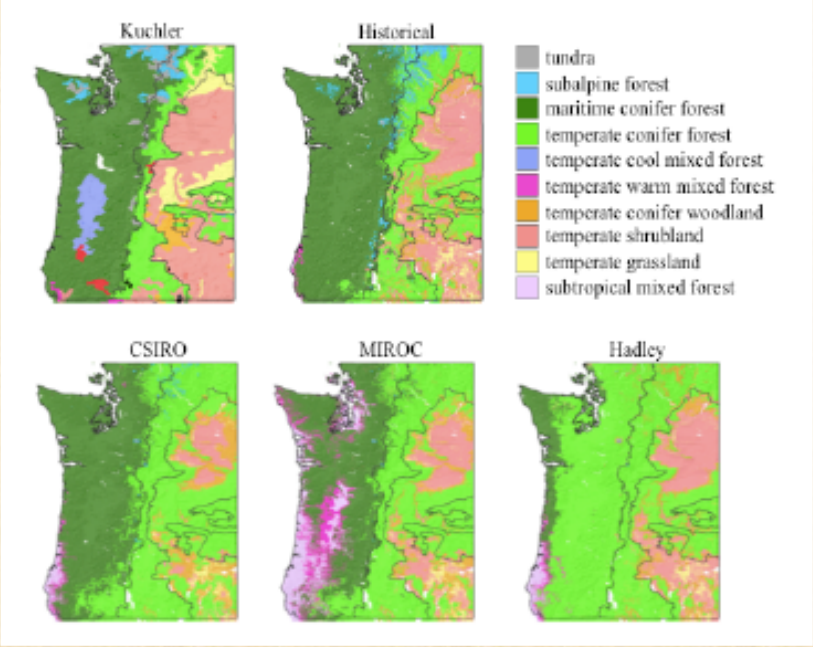
Rogers, 2009



Rogers, 2011 GRL

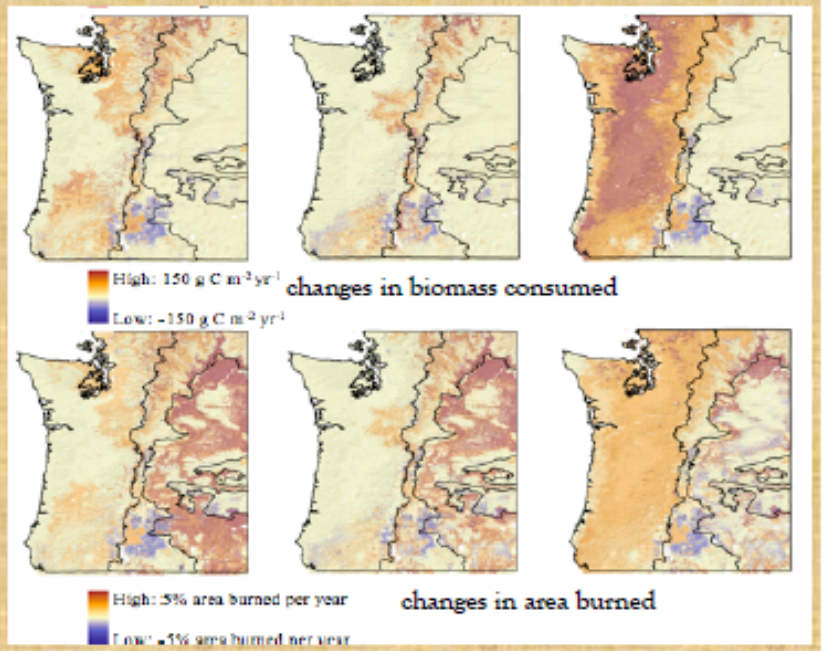
Proposal with S. Perakis, USGS Corvallis

MC1: simulating spatial variability

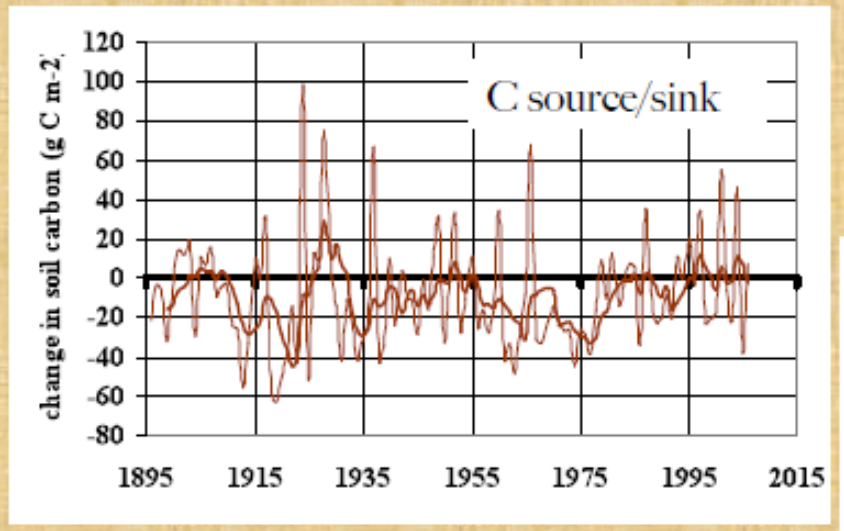


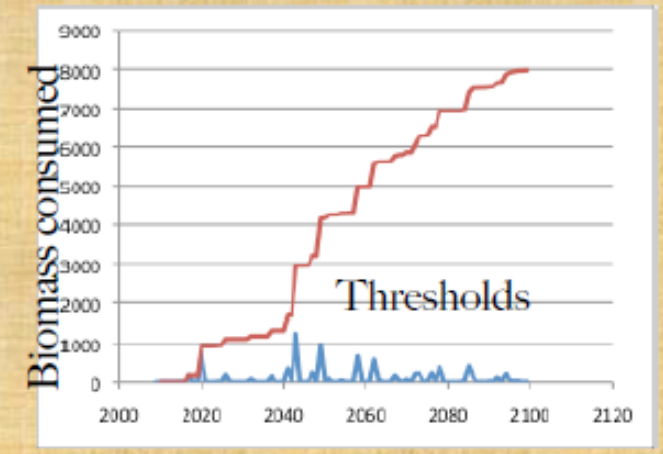
shifts in vegetation types

Vegetation distribution, carbon stocks, fire occurrence and impacts

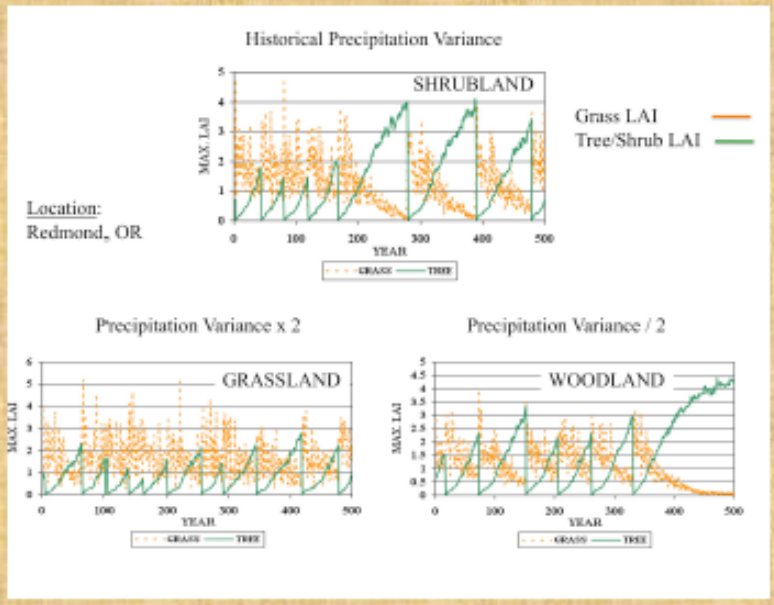


MC1: simulating temporal variability





Vegetation response to climate



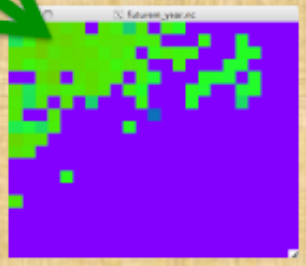
MC1: counterintuitive results

Wind Cave National Park, South Dakota

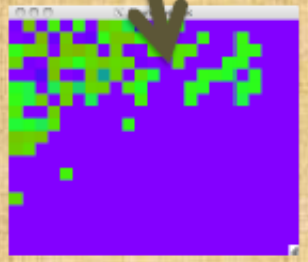
Historical year 2000

CSIRO
cool & wet
year 2100

Fuel build-up
stand replacing fire



MIROC
hot &dry
year 2100



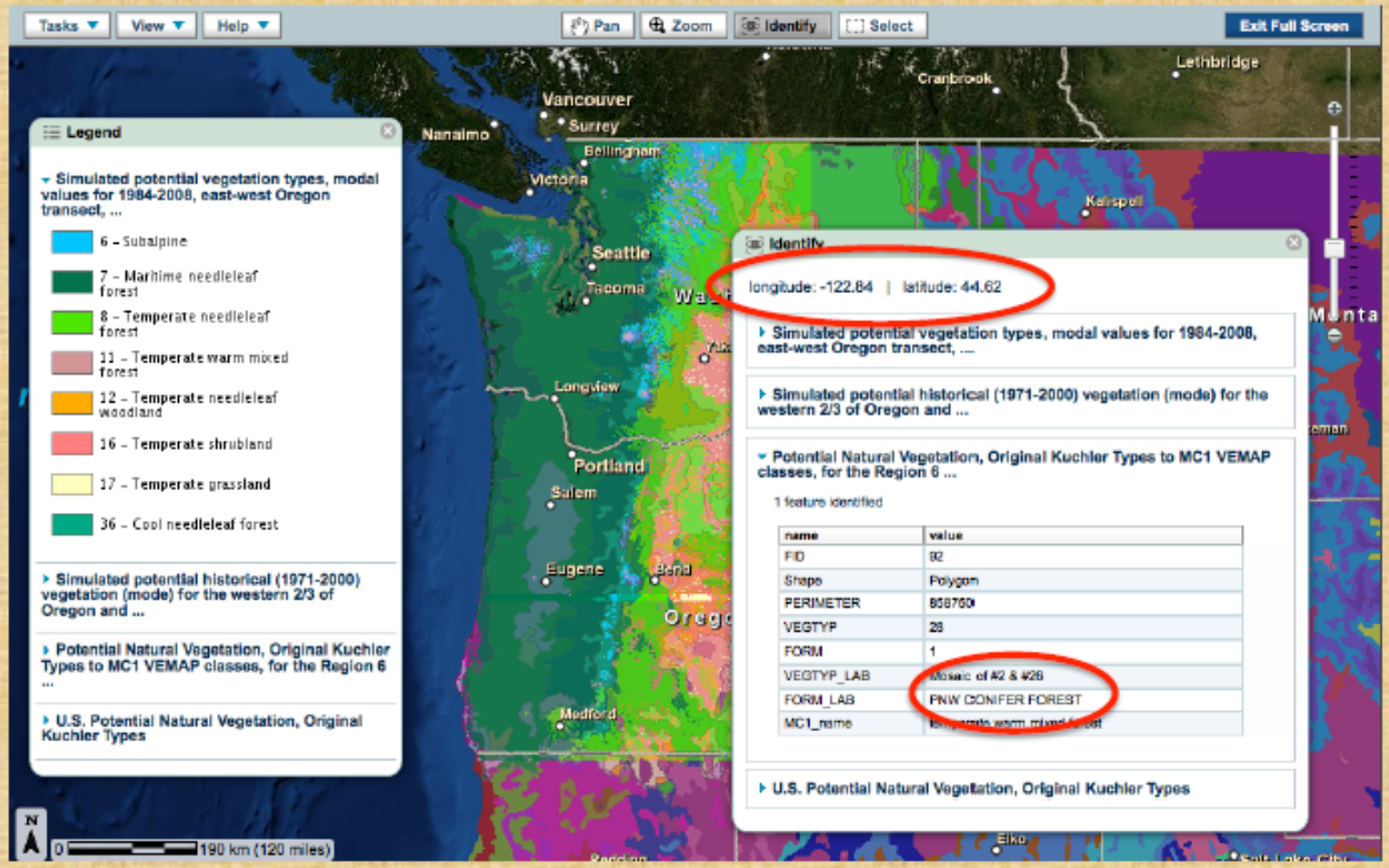
Hadley
warm & dry
year 2100

Live tree C: 0 (purple) – 8.7 kg/m^2 (red)

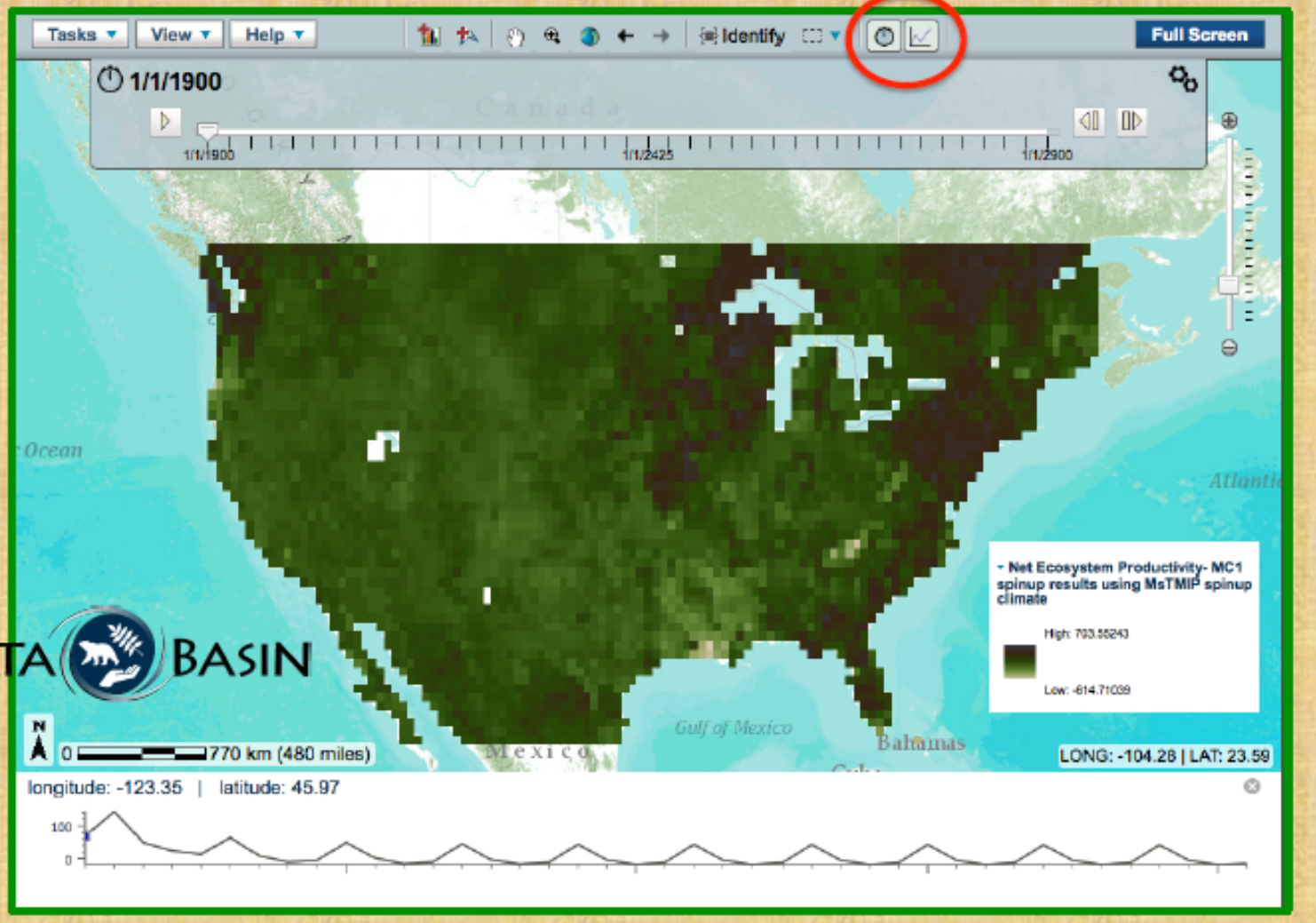
MC1: producing usable information

- Make results easily available on the web (*Kresge Foundation - databasin.org*)
- Bring climate change projections into an existing tool (VDDT) used by managers (*ARRA – ILAP*)
- Bring results in Envision software environment to summarize by user-defined unit of choice (*ex. HUC5 – ARRA-ILAP*)
- Inform and get informed by species model (*NOAA - DISTRIB*)
- Translate simulated vegetation response into change in habitat characteristics (*Yale framework*)

MC1: communicating via databasin.org



MC1: visualizing through animation, t.s.



DATA BASIN

MC1: code availability and support

. MC1 code in Oregon S.U. repository
http://envision.bee.oregonstate.edu/svn/mc1

. MC1 users group
http://groups.google.com/group/mc1-dgvm-users
announcing code changes, answering users questions as a collaborative

. MC1 developers group
http://groups.google.com/group/mc1-developers
discussing new developments and bugs

www.consbio.org > Products & Publications > Tools

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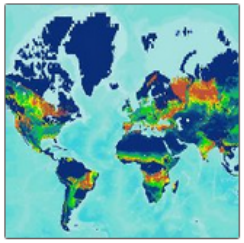
MC1 Dynamic Vegetation Model



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Projects

A Landscape-Level Approach to Fuels Management

This project will identify ways to reduce wildfire hazard and the loss of imperiled ecosystems by exploring the joint effects of climate and land use changes in western Oregon's ...

Read more.

Climate Smart Models: VDDT and MC1

The purpose of this agreement is to develop a process for making Vegetation Dynamics Development Tool (VDDT) climate smart using MC1 output. This project incorporates climate change into the state ...

Read more.

Estimating carbon pools and fluxes using a DGVM with prescribed landuse: MC1 contribution to the LandCarbon project

The LandCarbon project is designed to provide information in the form of simulation model results to complete a national assessment of carbon sequestration and greenhouse gas emissions in and out ...

Read more.

Integrated Landscape Assessment: Fuel Treatment Priorities

The goal of the project (part of ILAP= Integrated Landscape Assessment Project - Water Supply, Vegetation & Climate Change Module) is to develop an automated GIS user interface that produces summaries and

Contact

Dominique Bachelet, Ph.D.

Senior Climate Change Scientist

email

541-368-5807

www.yale.databasin.org > EXPLORE > Conservation Biology Institute >See full project

Yale *Mapping Framework*

INTEGRATING CLIMATE ADAPTATION AND LANDSCAPE CONSERVATION PLANNING

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YALE MAPPING FRAMEWORK | CONSERVATION BIOLOGY INSTITUTE

Conservation Biology Institute

Effects of climate and vegetation on the current and future distribution of martens and fishers in the Sierra Nevada, California

Contributors: Wayne D. Spencer, Dominique Bachelet, Heather Rustigian-Romsos, Ken Ferschweiler

Overview | Methods | Outcomes | Interpretation | Related Data

CONSERVATION BIOLOGY INSTITUTE

CBI investigated the effects of climate and vegetation on the distribution of martens (*Martes caurina*) and fishers (*Martes pennanti*) in the Sierra Nevada in California under current and projected future conditions to inform conservation efforts for these species and to investigate how different modeling methods and resolutions may affect predictions about species' responses to climate change. Martens and fishers are closely related forest carnivores of conservation concern in California, where both reach their southernmost distributions. The species have contiguous elevation ranges, with the smaller marten occupying high subalpine forests that experience deep and persistent snow, and the larger fisher occupying mid-elevation forests that experience less snow and warmer temperatures.

The goals of this project were to:

1. add robust, downscaled, climate-change effects assessments to CBI'S Sierra Nevada Carnivores project, which is a comprehensive, science-based effort to map areas important to sustaining rare carnivore populations and improving forest management.
2. compare alternative analytical approaches and resolutions for assessing climate impacts on vegetation and sensitive species.

Because martens and fishers require similar forest structural conditions (dense forests with large trees and abundant dead wood) but different climate regimes (cooler, moister, and snowier conditions for martens; warmer, drier and less snowy conditions for fishers) they offer a unique opportunity to investigate how our changing climate may affect the species directly as well as via changes in vegetation. Also, because they compete with one another for food, and fishers will kill martens when they meet, this system offers an opportunity to investigate how species interactions may also affect future populations.

Specific study tasks:

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YALE MAPPING FRAMEWORK | GALLERIES | MC1 SIMULATION RESULTS FOR THE SIERRAS (CA) - MULTISCALE (YALE)

MC1 Simulation Results for the Sierras (CA) - multiscale (Yale)

Created by: Dominique Bachelet — Jun 5, 2012

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About

The goal of the Yale framework project is to add robust, downscaled, climate-change effects assessments to what is already a comprehensive, science-based, and collaborative conservation planning effort in the Sierra Nevada ecoregion, and to compare alternative analytical approaches and resolutions for assessing climate impacts on vegetation and on two carnivore species of conservation concern: fisher (Martes pennanti) and marten (M. americana [caurina]).

This gallery includes only climate and vegetation spatial datasets that were generated using simulation models.

This gallery is visible to everyone

Gallery contains

22 Folders

110 Datasets

Usage

bookmarked by 1 member

Tags

climate change, mc1, dynamic vegetation model, simulation, california, usa, sierra nevada

Gallery Contents | Gallery Credits

- Climate Inputs (6 folders and 49 items total)
- MC1 results (14 folders and 61 items total)
  - Vegetation cover (6 folders and 17 items total)
  - Carbon results (6 folders and 44 items total)
    - 10km (14 items total)
    - 4km (3 folders and 25 items total)
      - Hadley (10 items total)

- Fisher Results All Resolutions (7 items total)
- Marten Results All Resolutions (20 items total)
- 10km x 10km Resolution Data (10 folders and 86 items total)
- 4km x4km Resolution (10 folders and 84 items total)
  - Climate Data (3 folders and 35 items total)
  - Vegetation Data (3 folders and 35 items total)
    - Hadley A2 (14 items total)
    - Historical (7 items total)
    - MIROC A2 (14 items total)
  - Fisher Results 4km x 4km (7 items total) — Display:

Dataset

Predicted probability of fisher year-round occurrence, 2076-2095, MIROC ...

Dataset

Predicted probability of fisher year-round occurrence, 2046-2065, MIROC ...

Dataset

Predicted probability of fisher year-round occurrence, 2076-2095, ...

Dataset

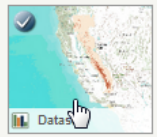
Predicted probability of fisher year-round occurrence, 2046-2065, ...

Dataset

Predicted probability of fisher occurrence in winter (December – ...

Dataset

Predicted probability of fisher occurrence in summer (May – November), ...



Dataset

occurrence, 1986-2005, 4 km ...

Predicted probability of fisher year-round occurrence, 1986-2005, 4 km resolution

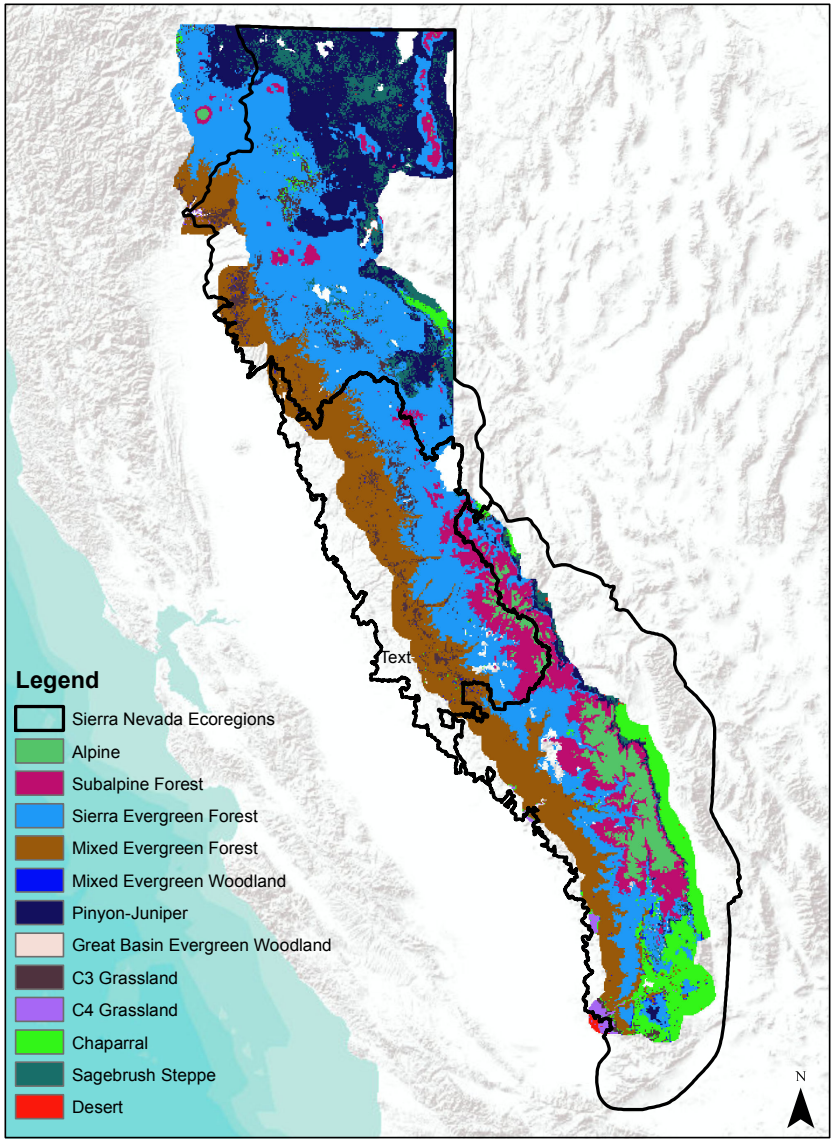
Actions

Predicted probability of fisher year-round occurrence created with Maxent (Phillips et al. 2006) using fisher detections (N = 102, spanning 1993 – 2011) and nine predictor variables: mean winter (January – March) precipitation, mean summer (July...

Conservation Biology Institute (May 31, 2012)

- Marten Results 4km x 4km (7 items total)
- 800m x 800m Resolution (12 folders and 70 items total)

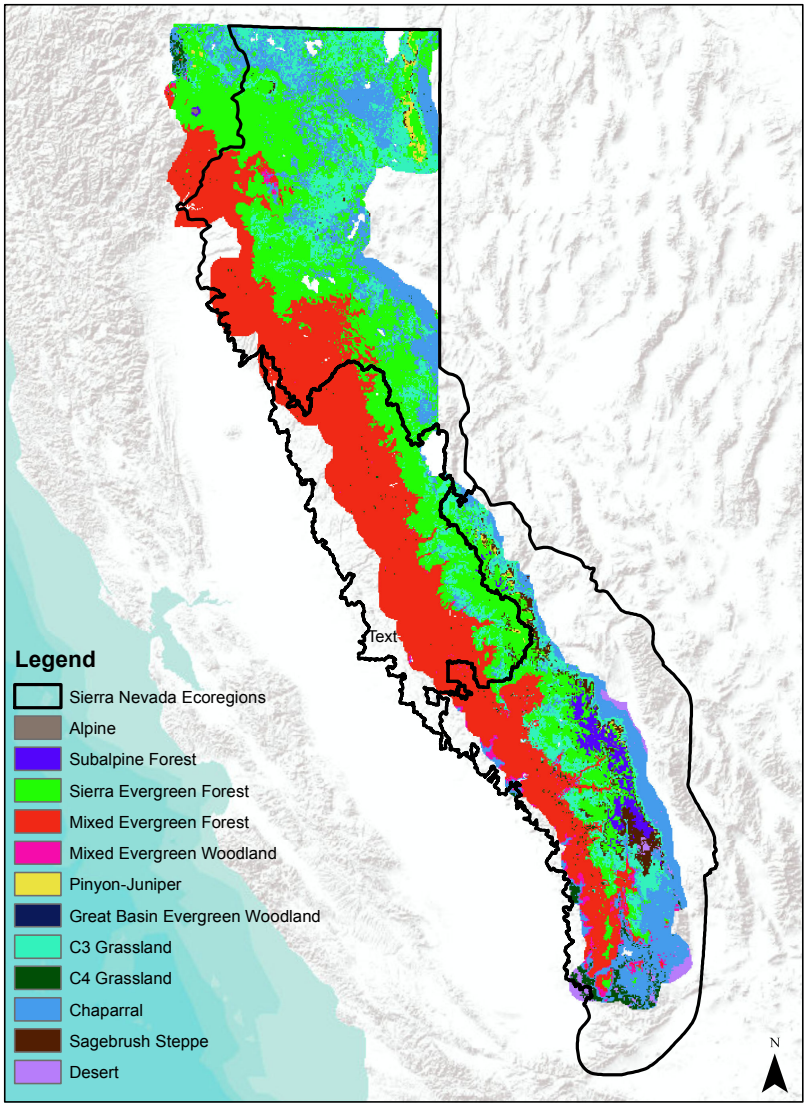
Historic simulated vegetation class (mode), 1986-2005



Dataset Credit: Conservation Biology Institute

Data Resolution: 800 meter

Simulated vegetation class, 2076-2095, Hadley CM3 A2



Dataset Credit: Conservation Biology Institute

Data Resolution: 800 meter

MC1 Dynamic Global Vegetation Model

Questions/feedback?

dominique@consbio.org
541.757.0687

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