

Landsat and Vegetation Change: Towards 50 Years of Observation and Characterization

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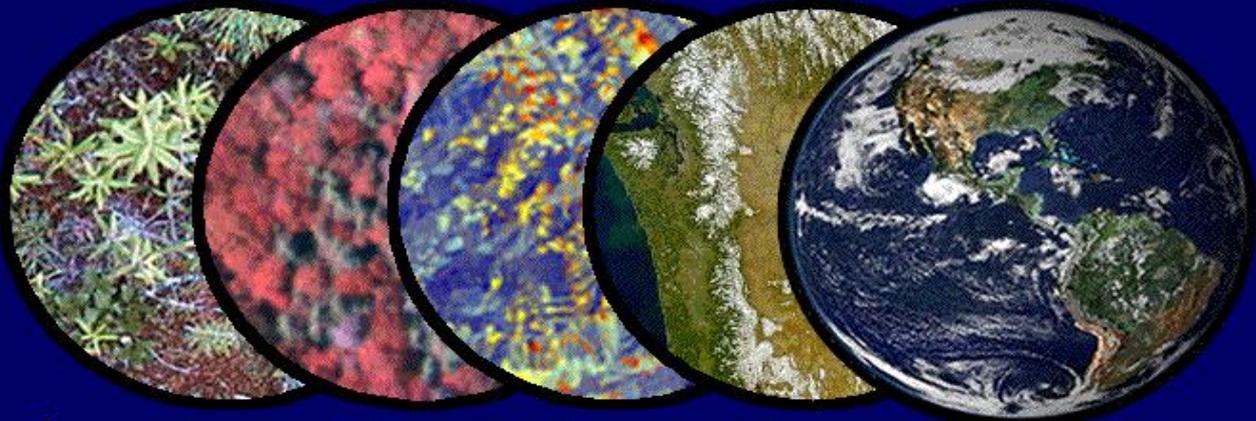
**Collaborators: S. Goward, C. Haung, S. Healey, R. Kennedy, J.
Masek, G. Moisen, S. Powell, T. Schroeder, Z. Yang**

LDCM Science Team Meeting, 12-14 June 2007

Two Main Studies

- **National Park Service Inventory & Monitoring**
- **North American Forest Dynamics**

Those two studies within the broader context



LARSE Laboratory for Applications of Remote Sensing in Ecology

A collaborative research lab supported by the USFS Pacific Northwest Research Station, Oregon State University, and external funding.

Warren Cohen, Director
Robert Kennedy & Yang Zhiqiang, Co-Directors
Maureen Duane, Lab Manager

Overview of research program—more depth by the troops

Administrative Context...

USDA Forest Service

PNW Research Station

Ecosystem Processes Program

Forest Landscapes and Ecosystems Team

Laboratory for Applications of Remote Sensing in Ecology (LARSE)

Oregon State University

College of Forestry

Department of

Forest Science



Ecological Science Context

Decomposition/C dynamics

Soils/nutrient dynamics

Biodiversity

Information Management

Forest-stream interactions

Disturbance/landscape

Hydrology/small watersheds

Vegetation succession

PNW/OSU

forestry research

IBP

LTER

ecosystem research

LARSE

1948

1950s

1960s

1970s

1980s

1990s

2000s

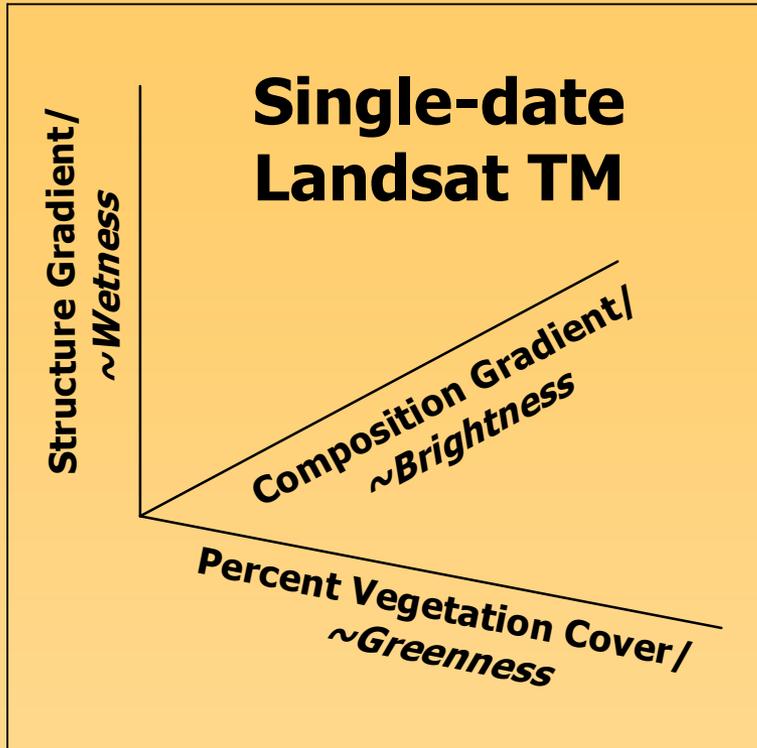
Translating Remotely-sensed Data Into Useful Ecological Information

- Evaluation of effects of forest management and natural processes on disturbance and succession
- Linkage of remote sensing and process models for characterizations of ecosystem dynamics
- Evaluation of ever-improving remote sensing datasets for characterizing vegetation structure and composition
- Assessing the quality of global terrestrial remote sensing products

**Once upon a time (1989) to recent
past)**

**Spotted owls, Endangered Species
Act, Old-growth forest, KG & PMR**

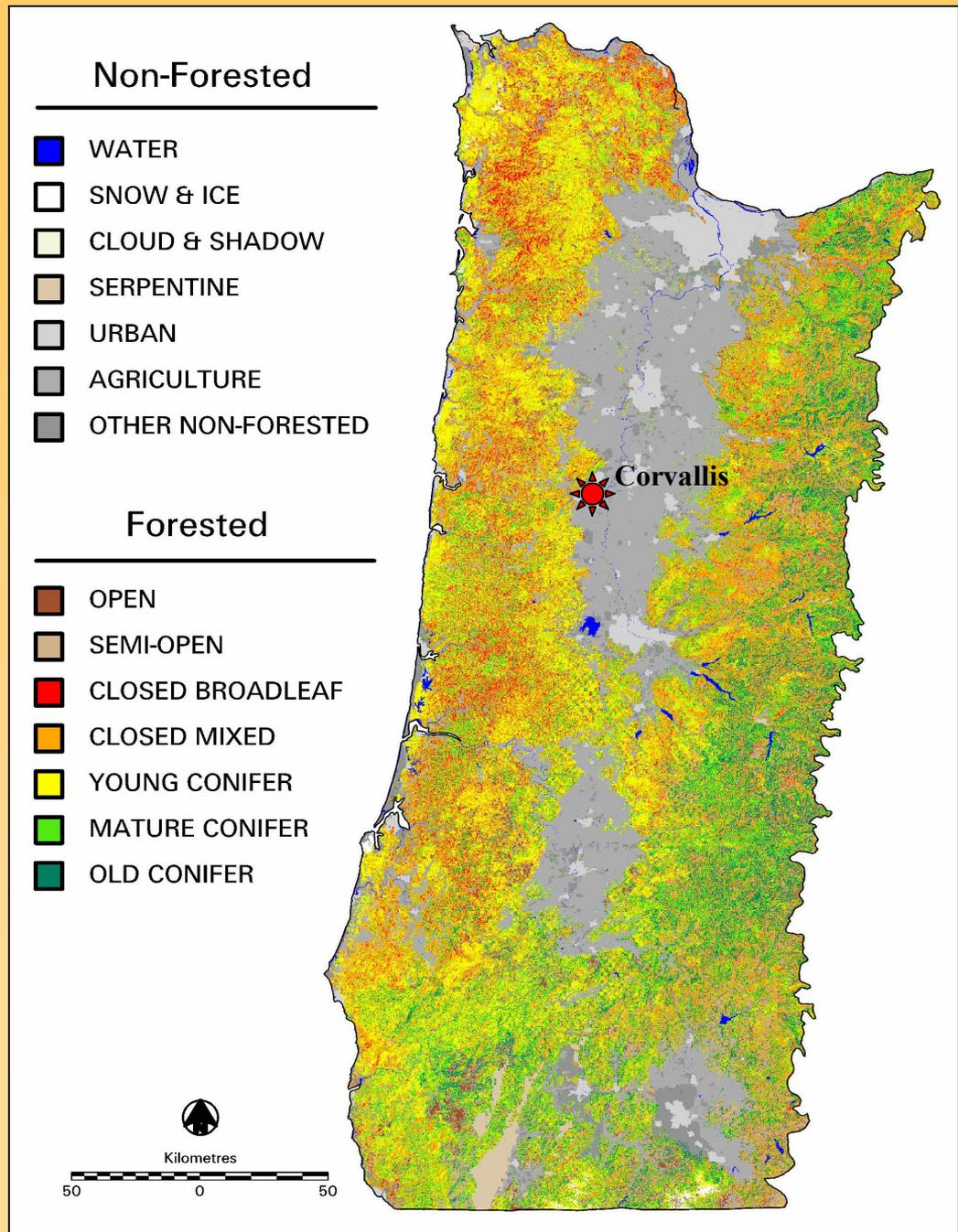
Land/forest cover...

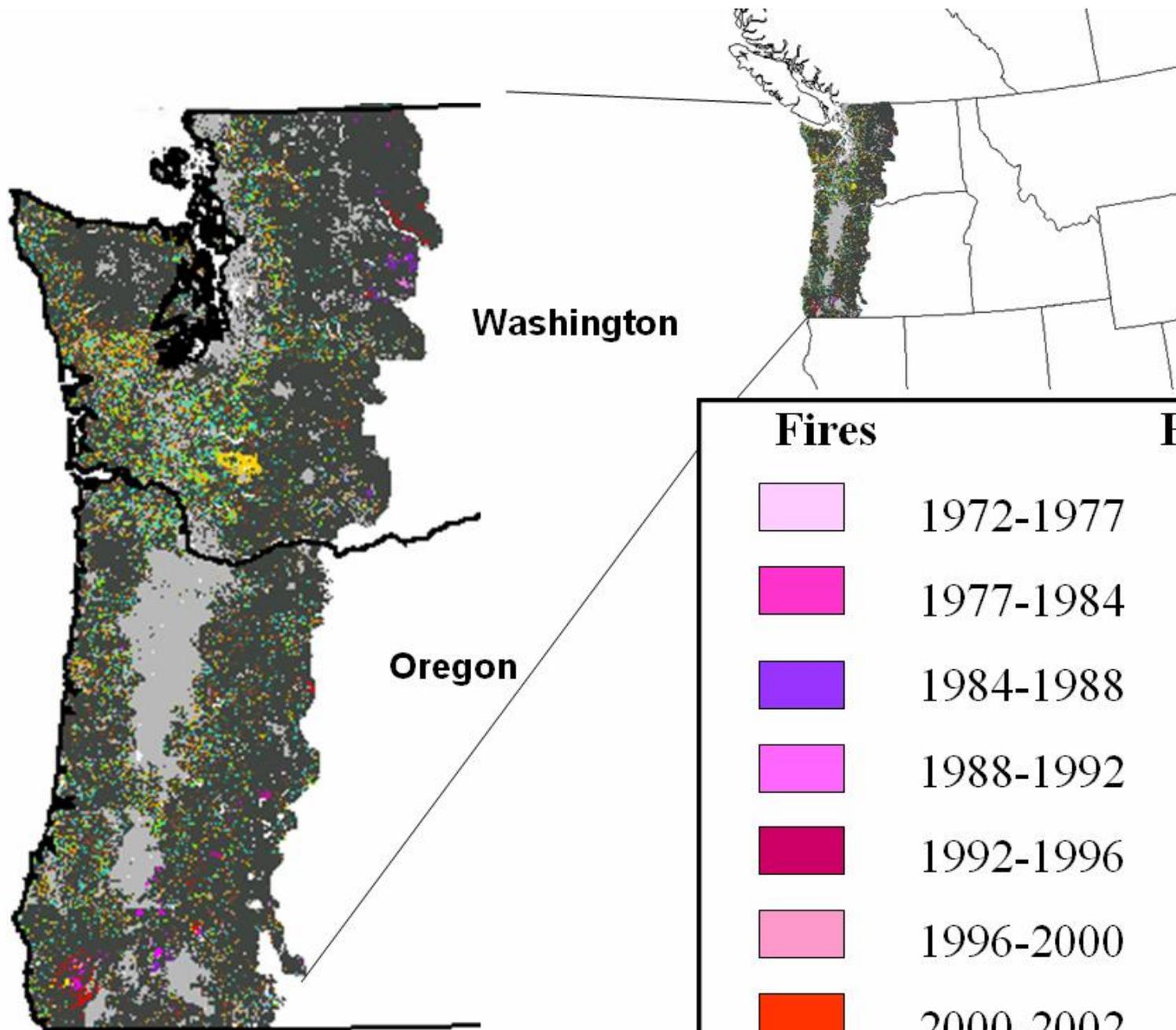


$$\text{Cover (\%)} = b_0 + b_1 \text{ greenness} + b_2 \text{ brightness}$$

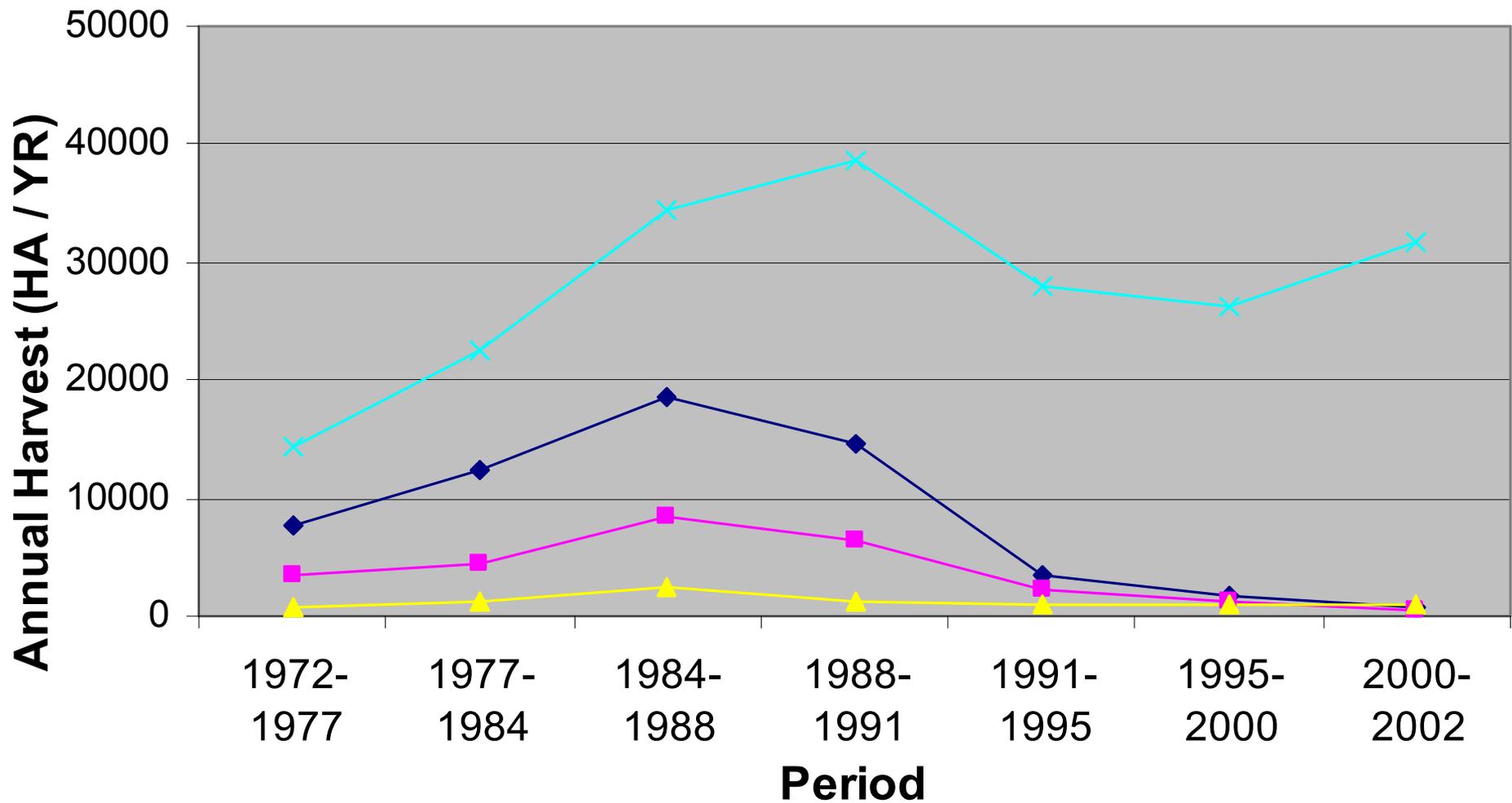
$$\text{Conifer (\%)} = b_0 + b_1 \text{ brightness} + b_2 \text{ wetness}$$

$$\text{Age (yrs)} = b_0 + b_1 \text{ wetness} + b_2 \text{ greenness}$$



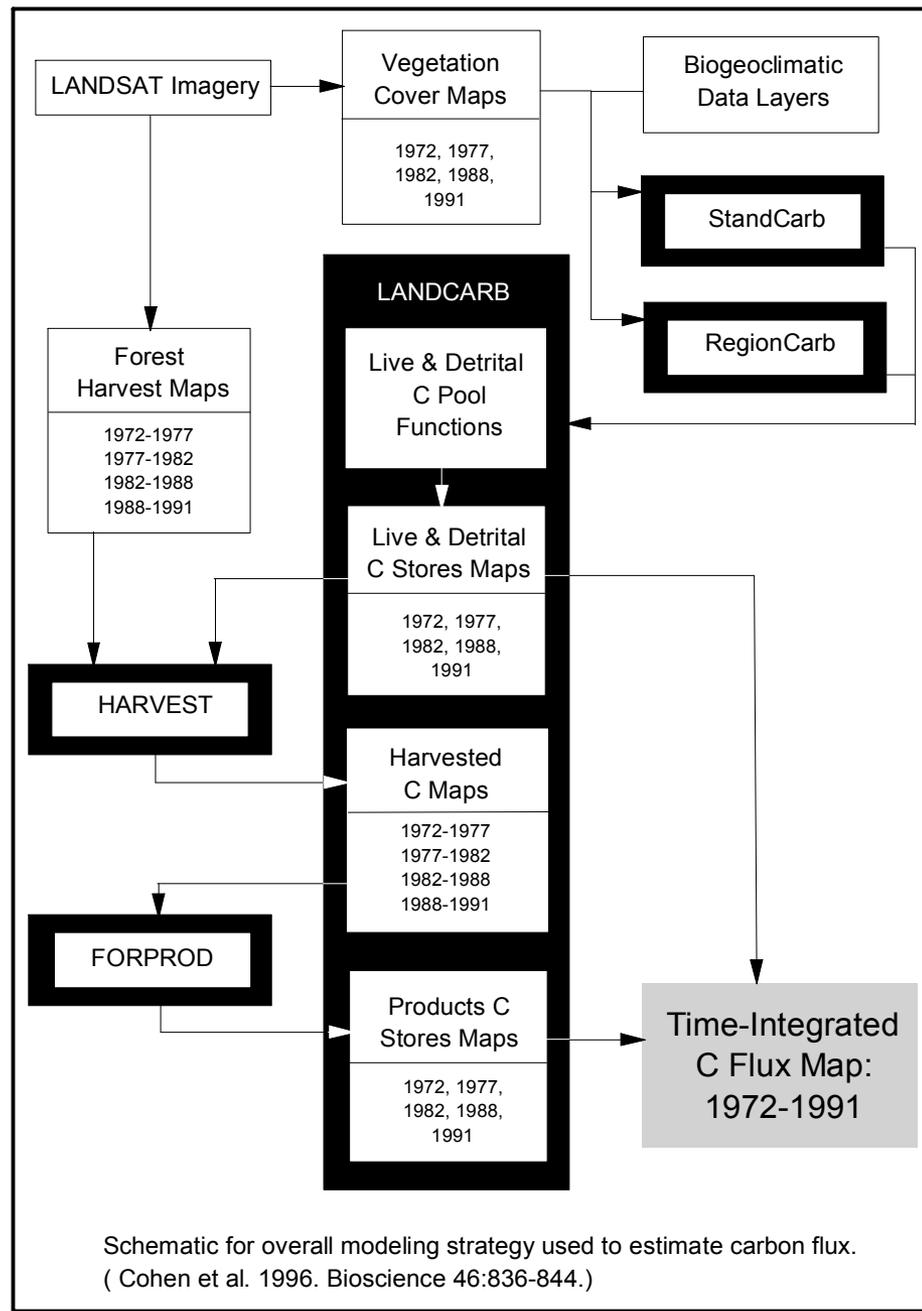
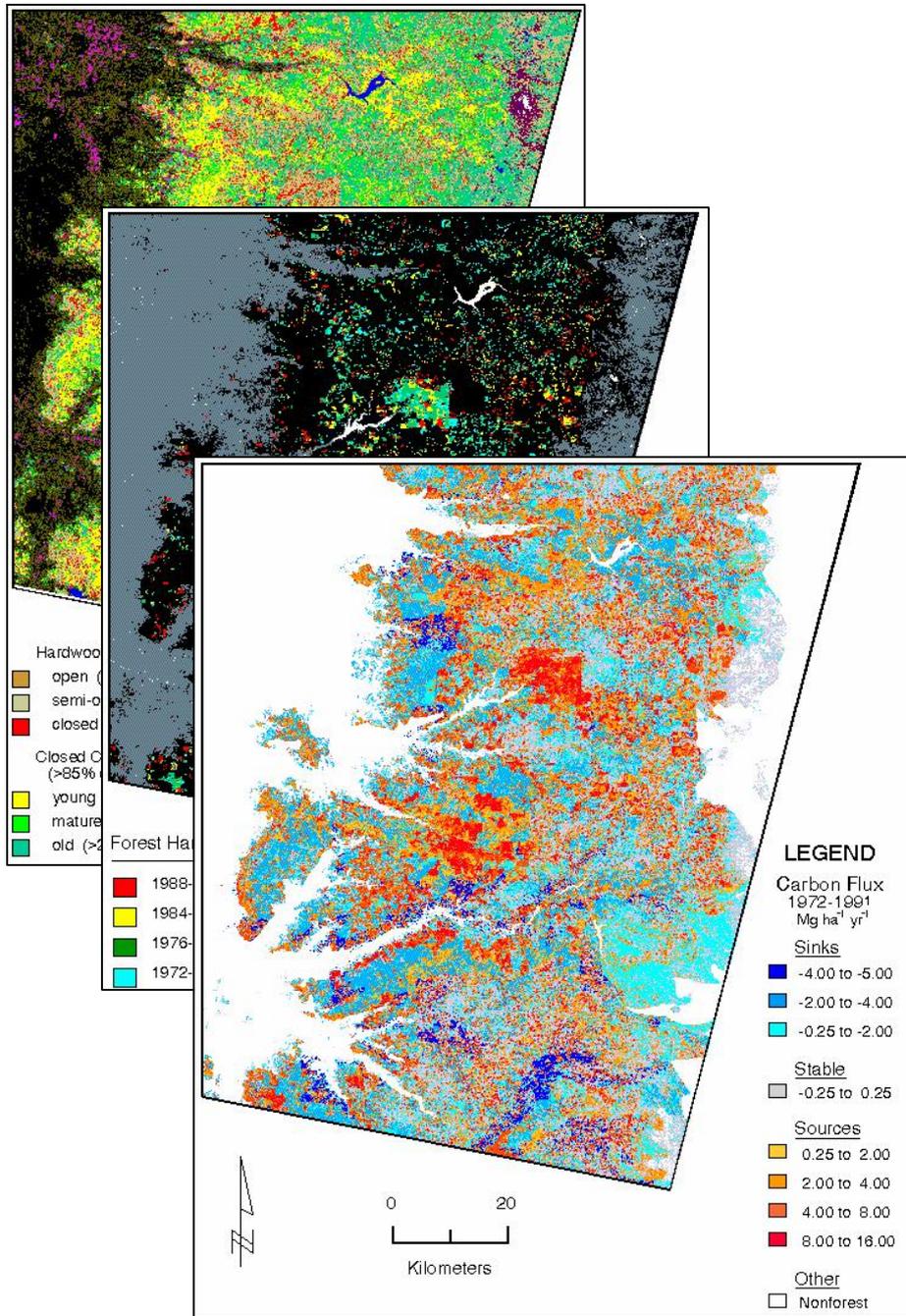


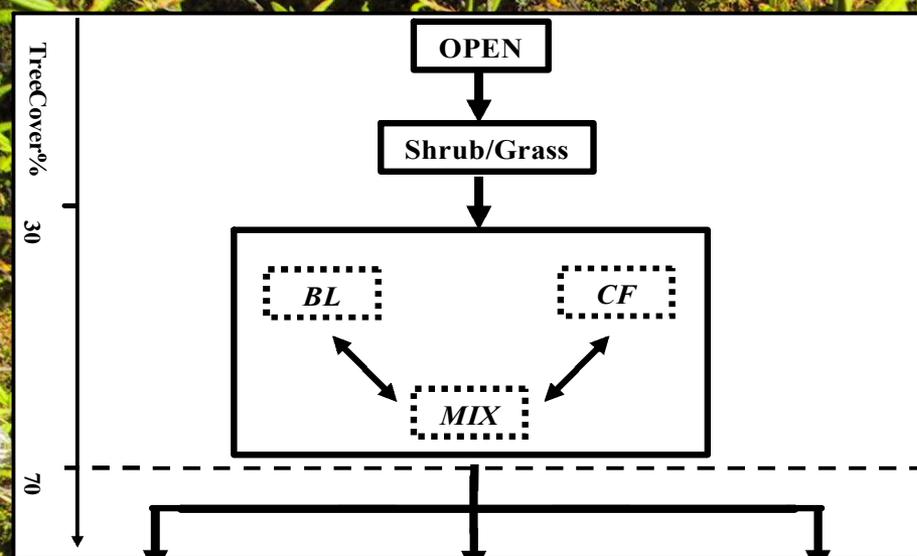
Stand-replacing disturbance in the Mount St. Helen's



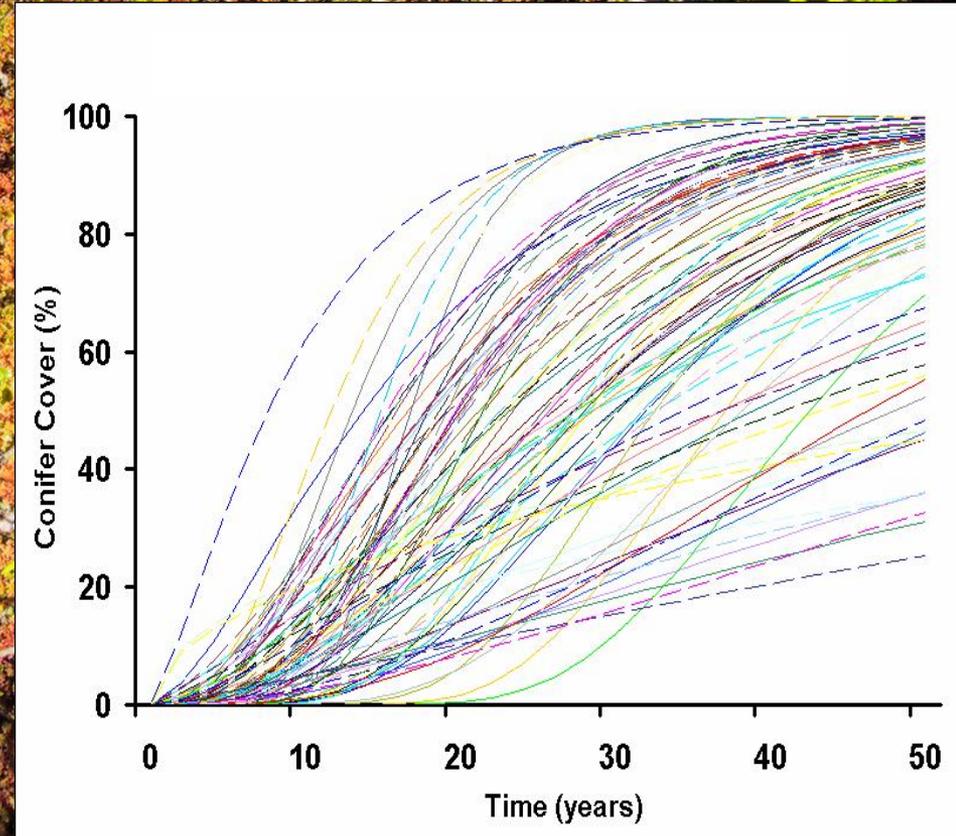
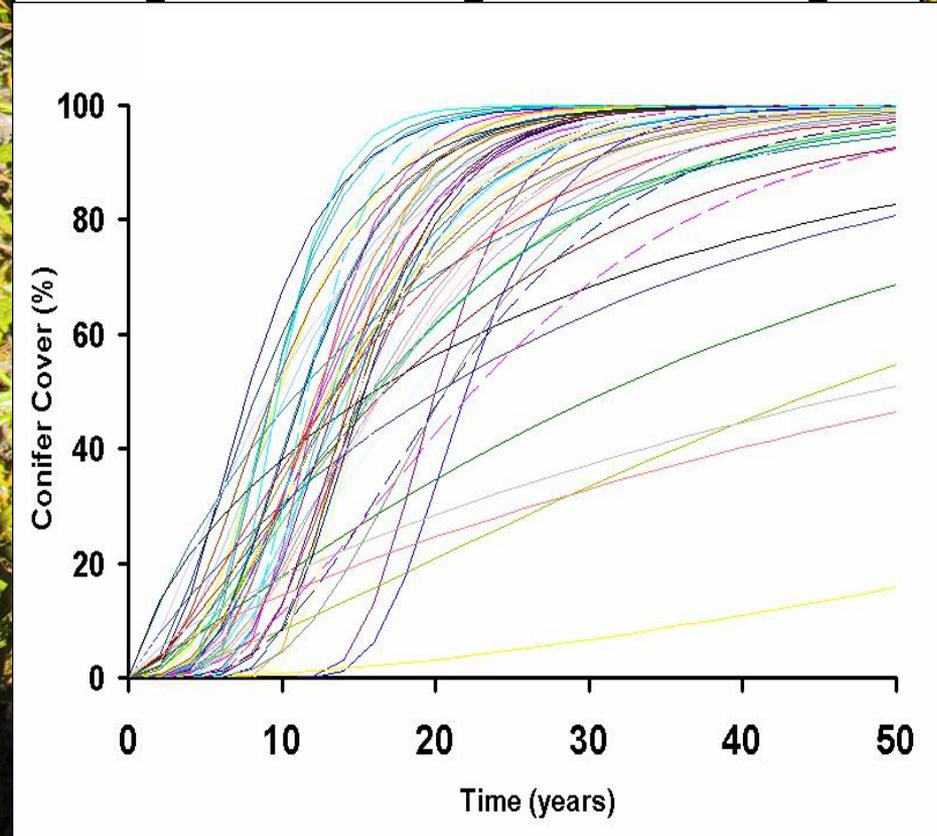
◆ Forest Service ■ BLM ▲ State × Private

■ Volcanic eruption
■ Non-forest

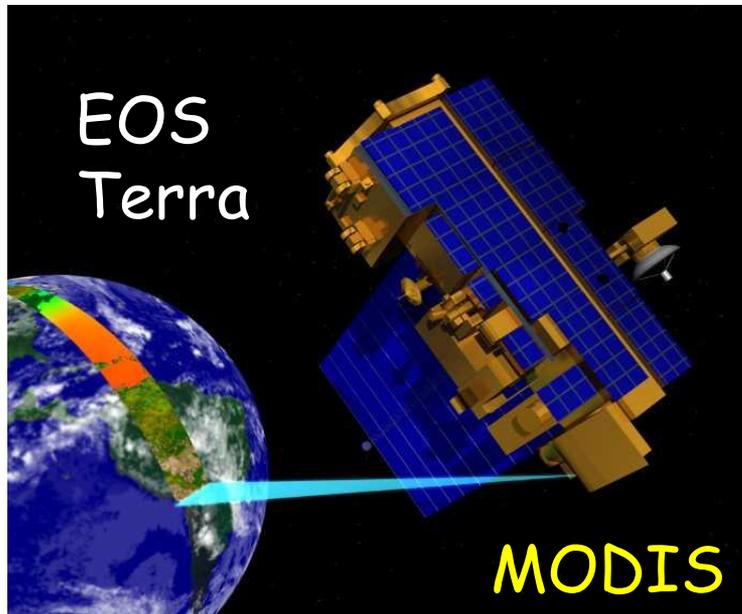




Succession:
Douglas-fir
region

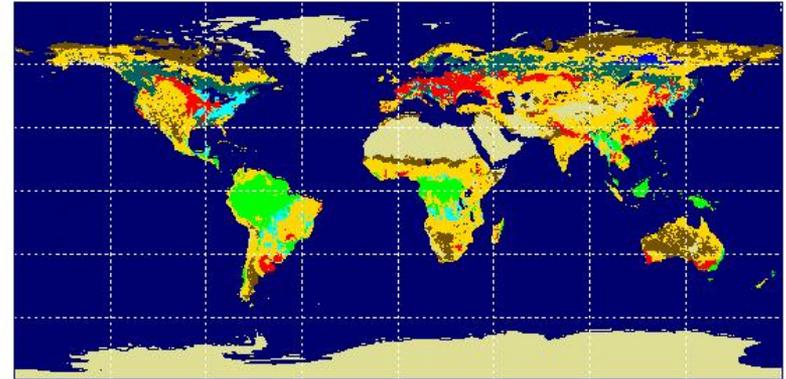
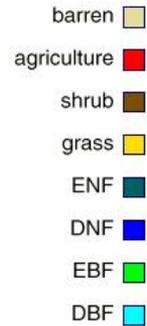


MODIS Products

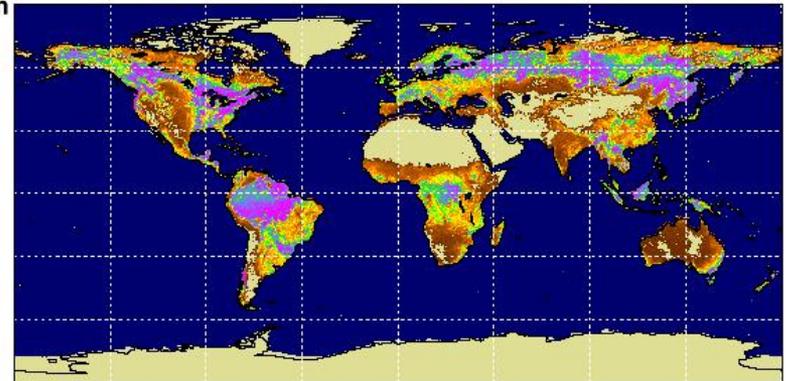
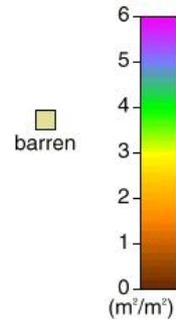


Highly generalized data,
algorithms, & models:
how accurate?

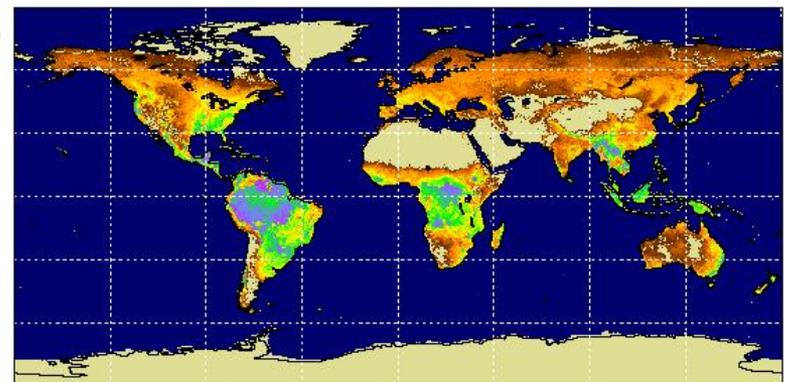
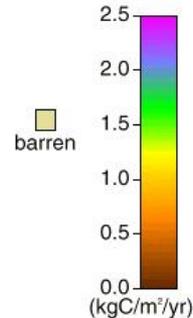
Landcover



Annual Maximum LAI

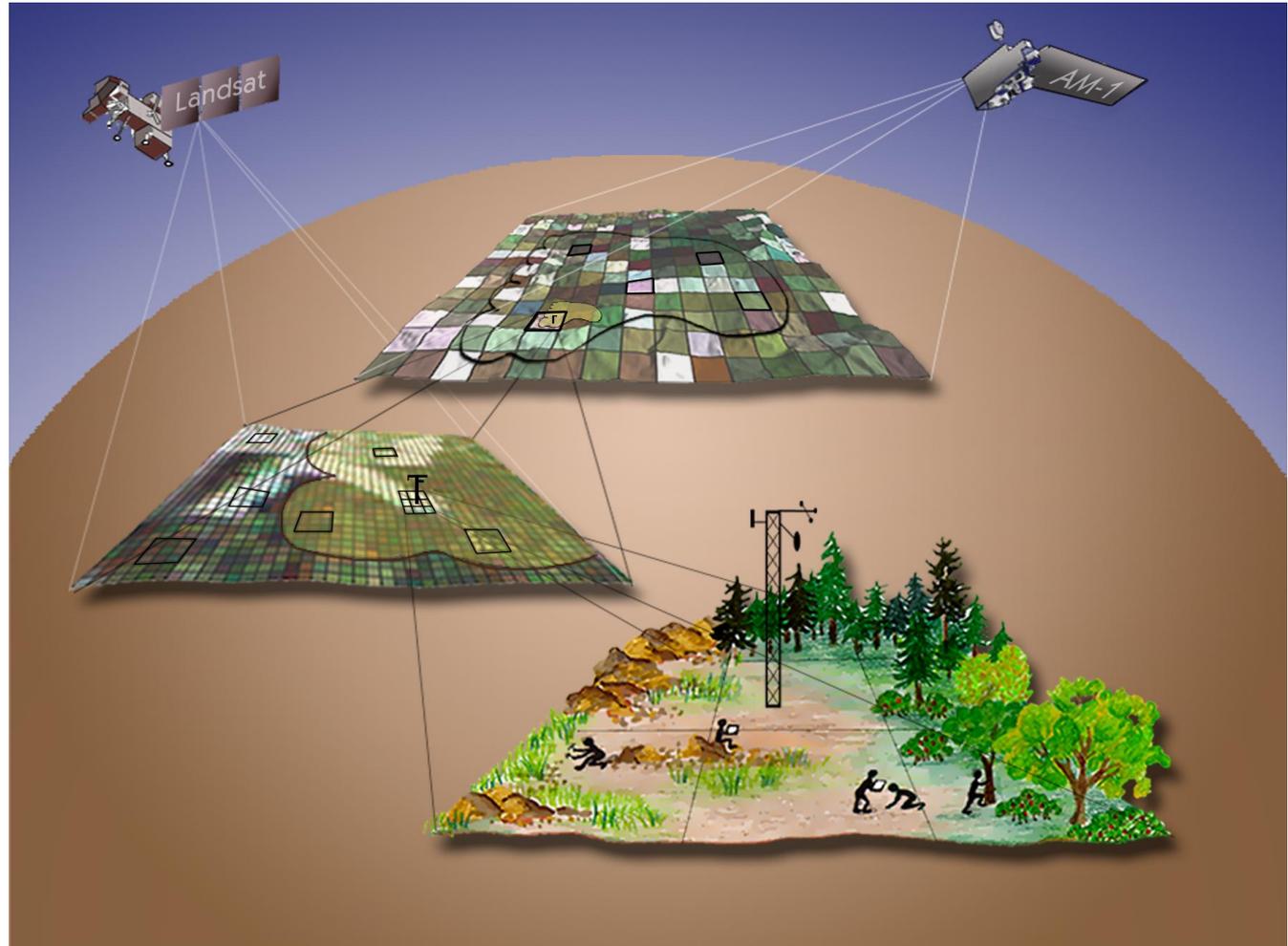


Annual Total NPP/GPP



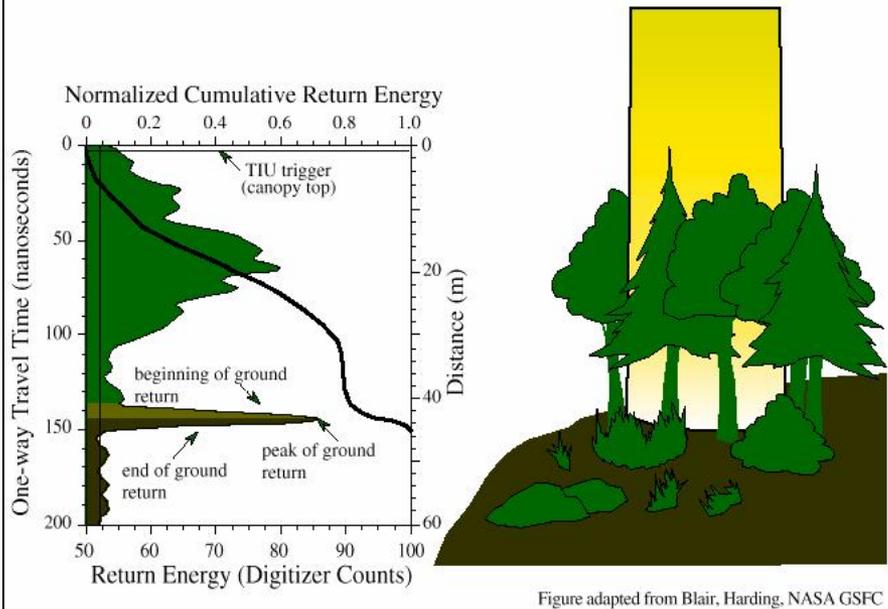
- Fundamental to acceptance and use by the general science community of MODIS products is an independent assessment of their quality

Conceptual Framework

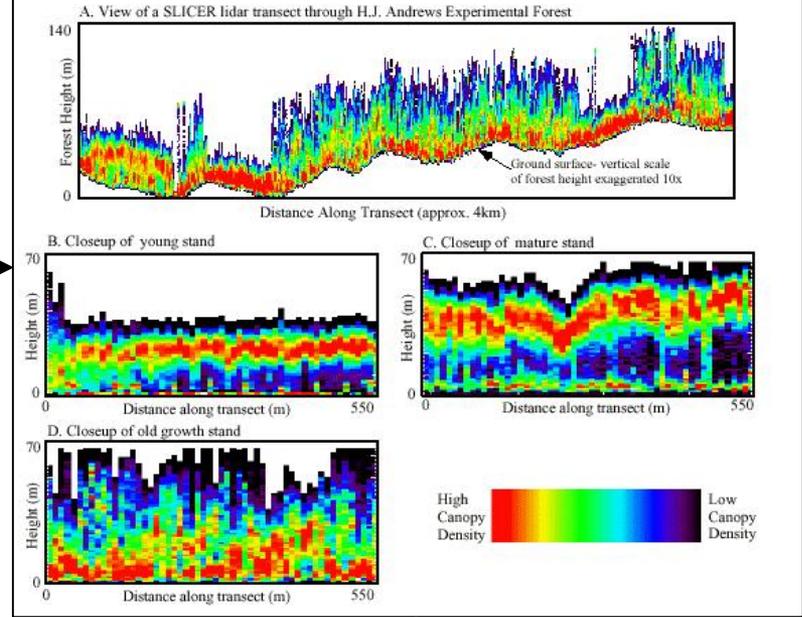


- BigFoot developed “bottom-up” scaling logic for assessing MODIS product quality using field measurements, high resolution remote sensing (i.e., Landsat), and models

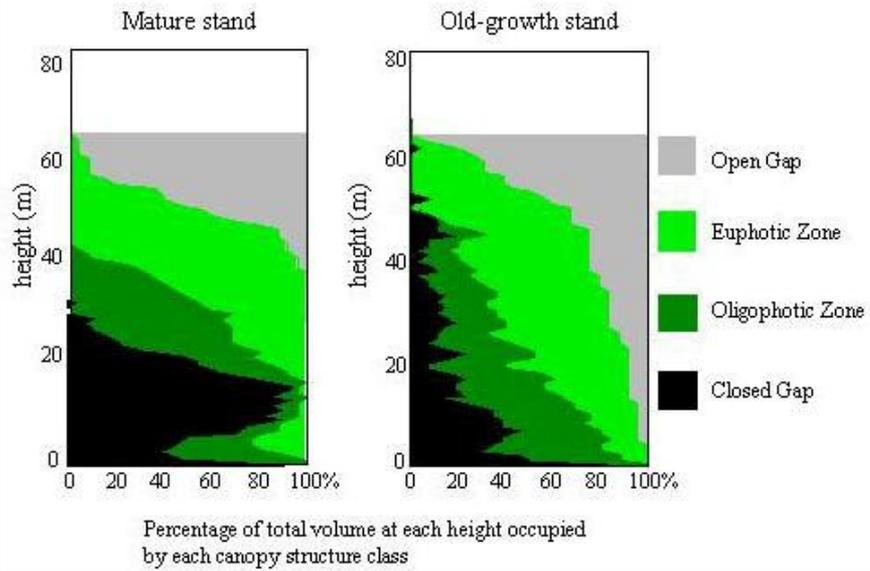
SLICER RETURN PULSE WAVEFORM



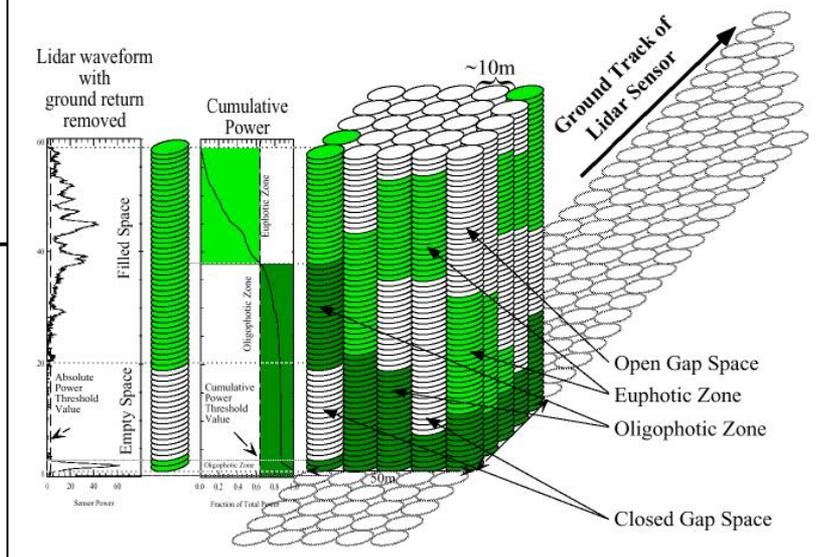
SLICER Transects at the H.J. Andrews Experimental Forest



Comparison of the vertical distribution of canopy structure classes At the HJ Andrews Experimental Forest.



The Canopy Volume Profile method of canopy description.



Current Research— the troops

<i>Current Research: Landsat focused projects</i>
National Park Service Inventory & Monitoring: Overview*
NCCN & SWAN
NCPN & SCPN
ORCA Overview and role of remote sensing
NELDA Overview and role of remote sensing
North American Forest Dynamics Overview (Incl. Apps.)*
Sample design & estimation: early results
Trajectory-based change detection
Biomass modeling and related outputs
LEDAPS and NAFD validation
Future directions
Urbanization trends: Everett, WA
Pinyon dieback
<i>Lidar focused projects</i>
GLAS & forest biomass
<i>LARSE Canada Section</i>
Landsat trajectory applications