NPS Inventory & Monitoring with Landsat: NCPN & SCPN

Zhiqiang Yang
Warren Cohen
Robert Kennedy

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.

NCPN & SCPN Landscape Indicators

Vital Sign	Landscape Indicator	Changes/Features to Monitor	Thematic Resolution	Spatial Resolution	Temporal Resolution
Land use/Land cover (LULC)	**Land use/Land cover** (LULC)	Type conversions Boundary changes	Anderson Level II or equivalent	2-5m at small parks 30m at medium and large parks	every 5 years
Landscape vegetation pattern	**Vegetation pattern**	Type conversions Boundary changes	NVCS[1] formation level or NatureServe ecosystem level	2-5 m at medium parks 30m at large parks	every 5 years
Vegetation or Land condition	**Vegetation condition** (ground cover and/or bare ground[2], and age class distribution[3])	Changes to ground cover Changes in age class distributions for wooded systems	Continuous data set layer Continuous data set layer for wooded systems (detect changes at alliance level)	2-5m at small parks 30m at medium and large parks	every 5 years
Disturbance patterns	**Disturbance patterns**	Type, extent, and severity of major disturbances	Data set layer	30m for medium and large parks	Annual trends

Objectives

- Remote sensing based protocols for:
  - Vegetation mapping
  - Monitoring of landscape scale changes in vegetation

Design

- Colorado Plateau (CP) park networks
  - Northern Colorado Plateau Network (NCPN)
    - Canyonlands National Park
    - Zion National Park
  - Southern Colorado Plateau Network (SCPN)
    - Wupatki National Monument
    - Mesa Verde National Park

- Image Data Source:
  - Landsat TM/ETM+ data
  - MODIS when necessary

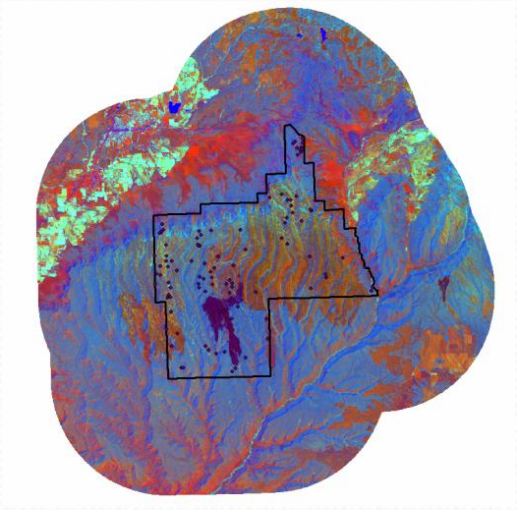
- Target:
  - A general strategy applicable to broad range of vegetation types and conditions in CP.

Status

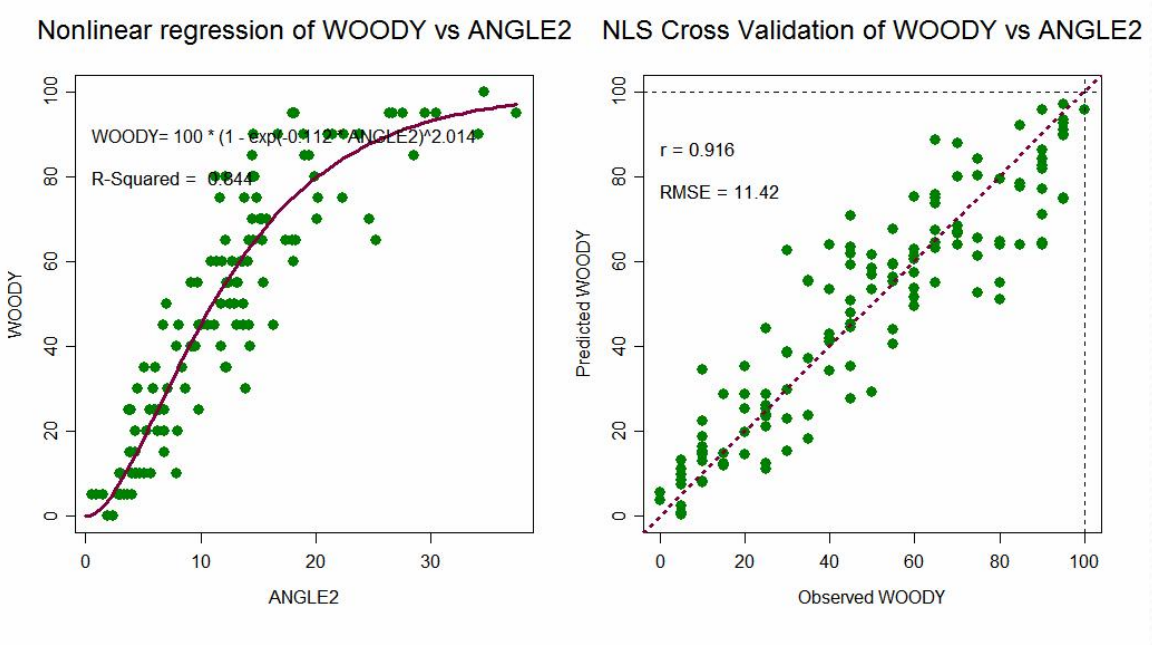
- On going project

- Reference Data
  - Field survey NPS Vegetation plot
  - Photo interpretation
  - NPS Vegetation Map

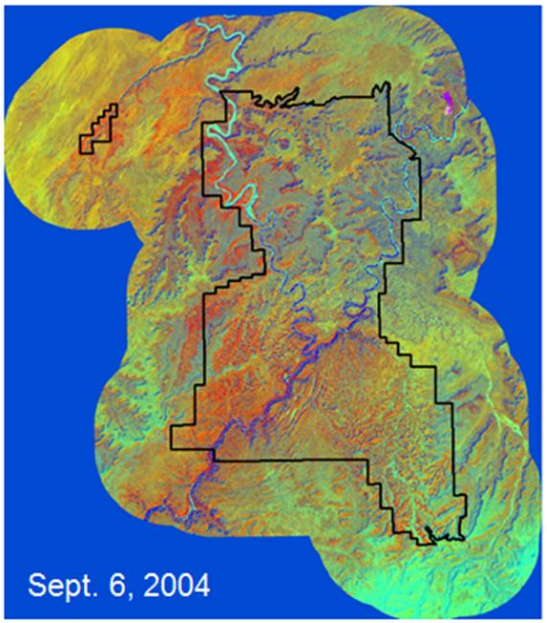
Continuous Modeling



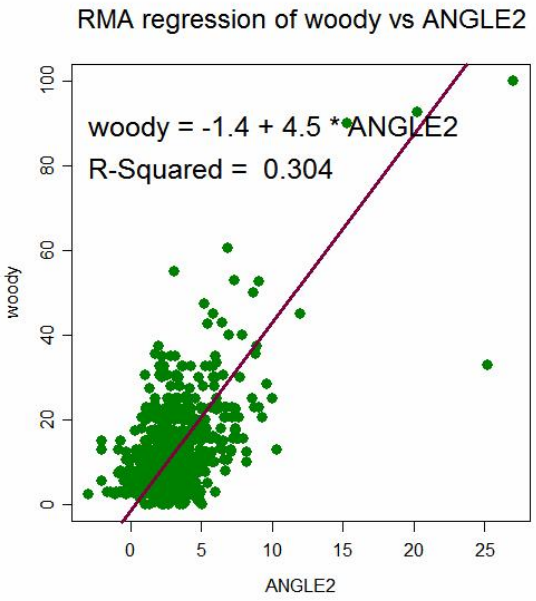
MEVE 08/17/2002

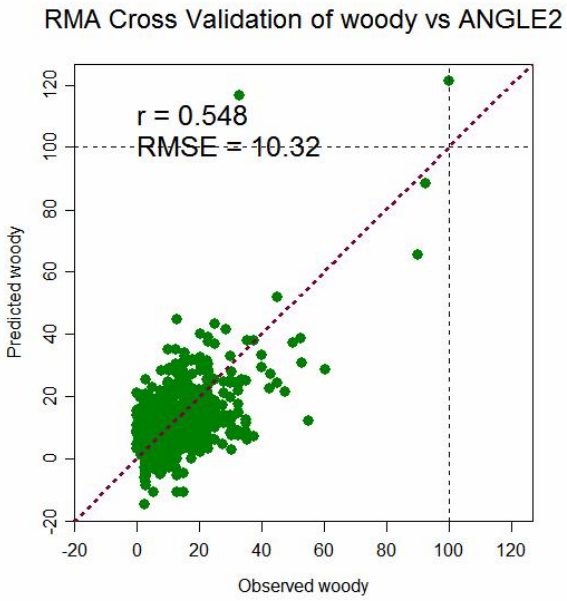


Continuous Modeling



CANY





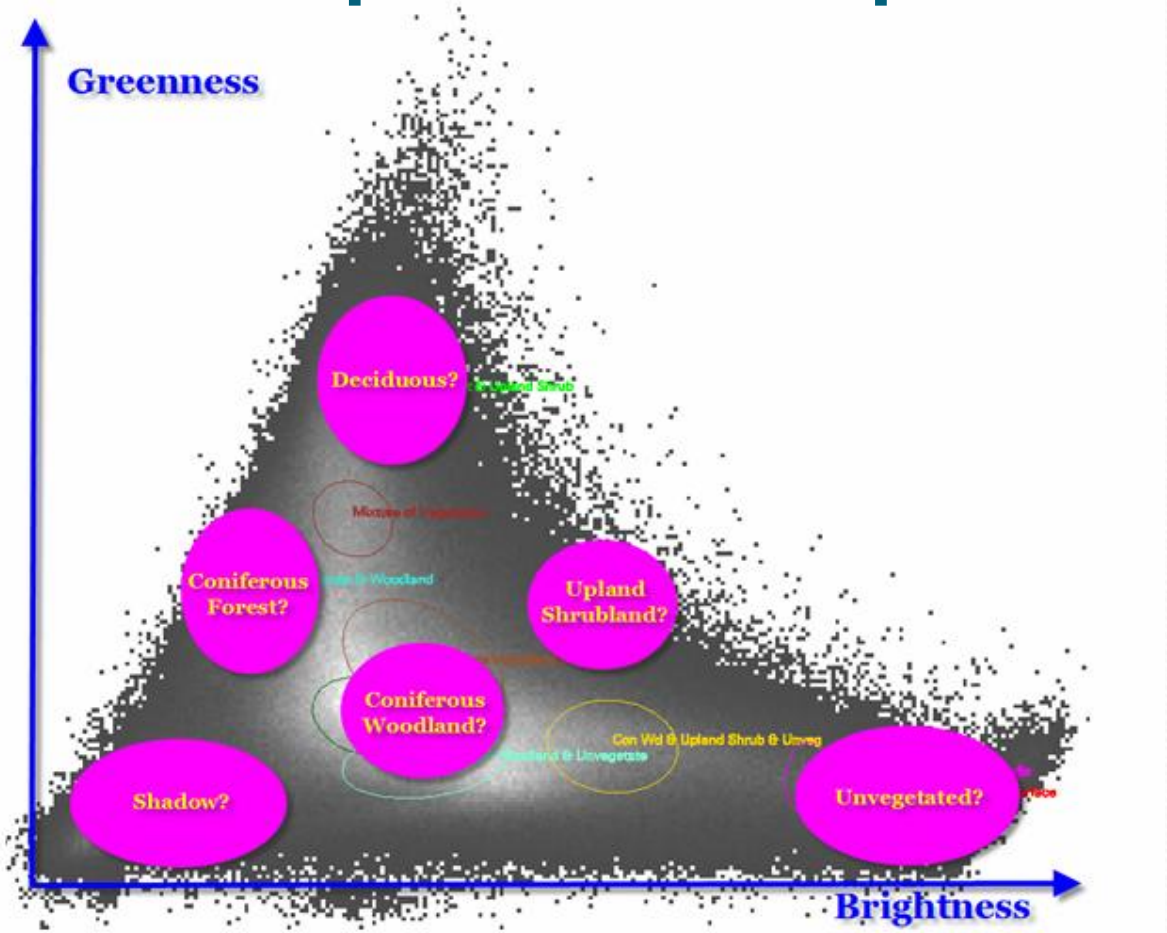
Key results

- Percent live vegetation cover can be modeled with Landsat images
  - ~ 10-15% RMSE in absolute cover estimation.
  - High quality reference data is a must.

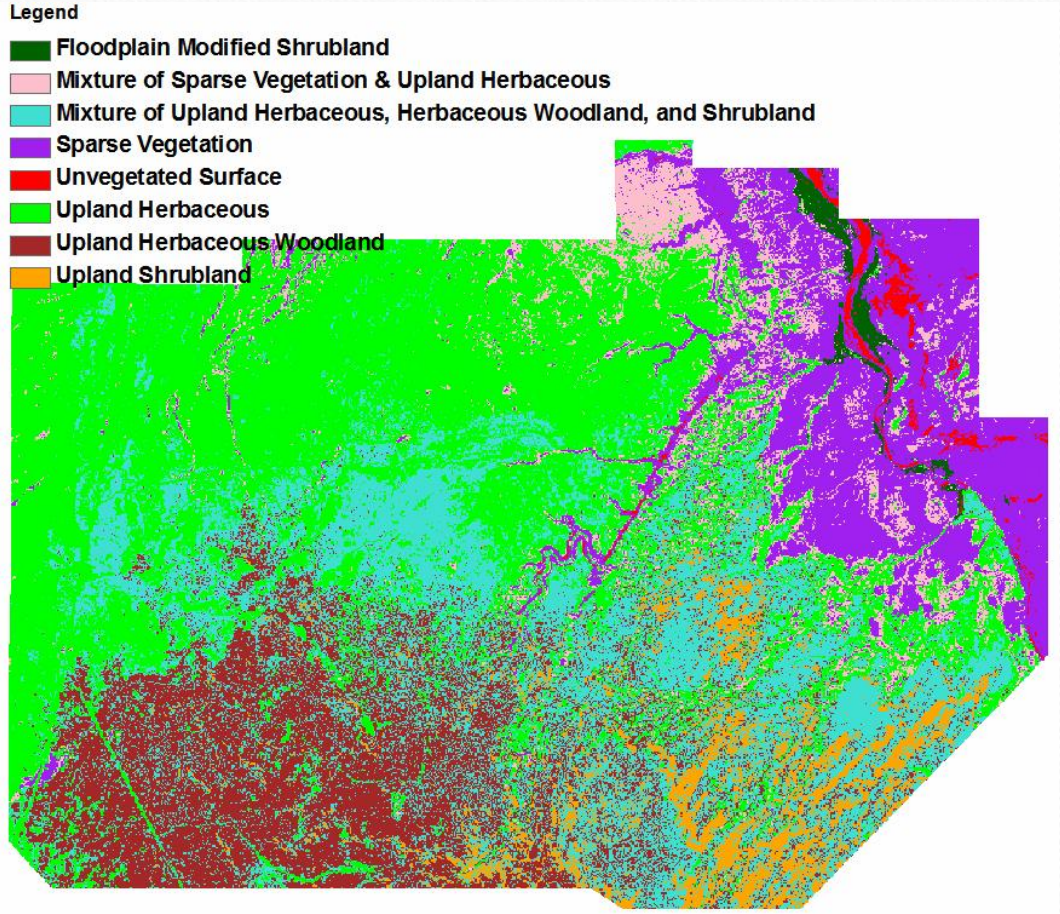
Thematic Mapping

- Mapping GPE based on NPS vegetation map
- NPS Vegetation map is a detailed map based on polygon drawn on aerial photos
  - High thematic resolution, therefore,
  - Not all are spectral separable in Landsat data space.
  - Has to be used in an aggregated fashion.

Landsat Spectral Space

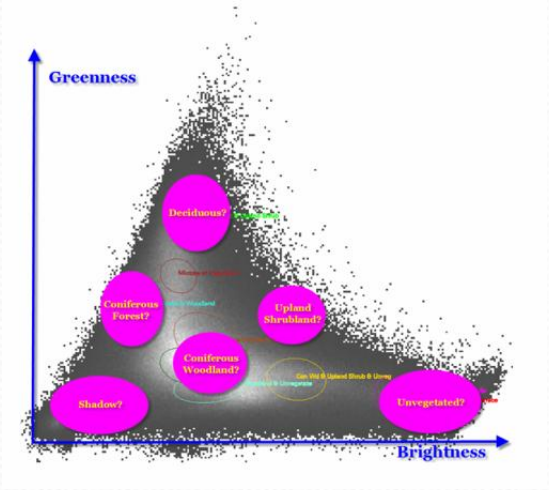


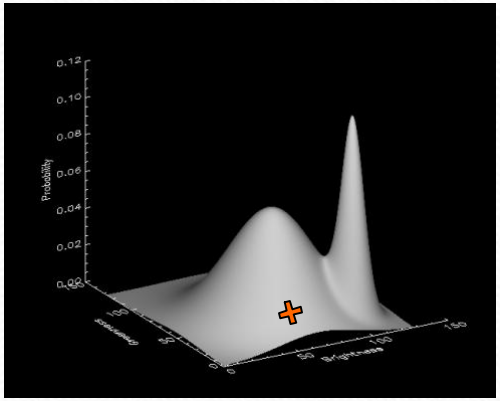
Mapping

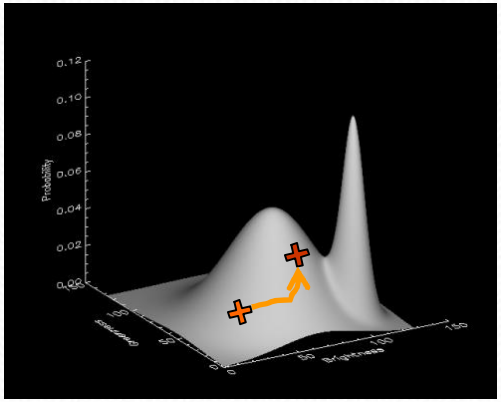


Overall accuracy:
87%

Moving toward POM







Summary

- Landsat images provide an efficient way to meet most inventory and monitoring objectives of NCPN & SCPN.
- There is an upper limit of the utility of Landsat imageries, however,
- With better understanding of Landsat spectral space, it can be used effectively to map vegetation (*and change detection*).