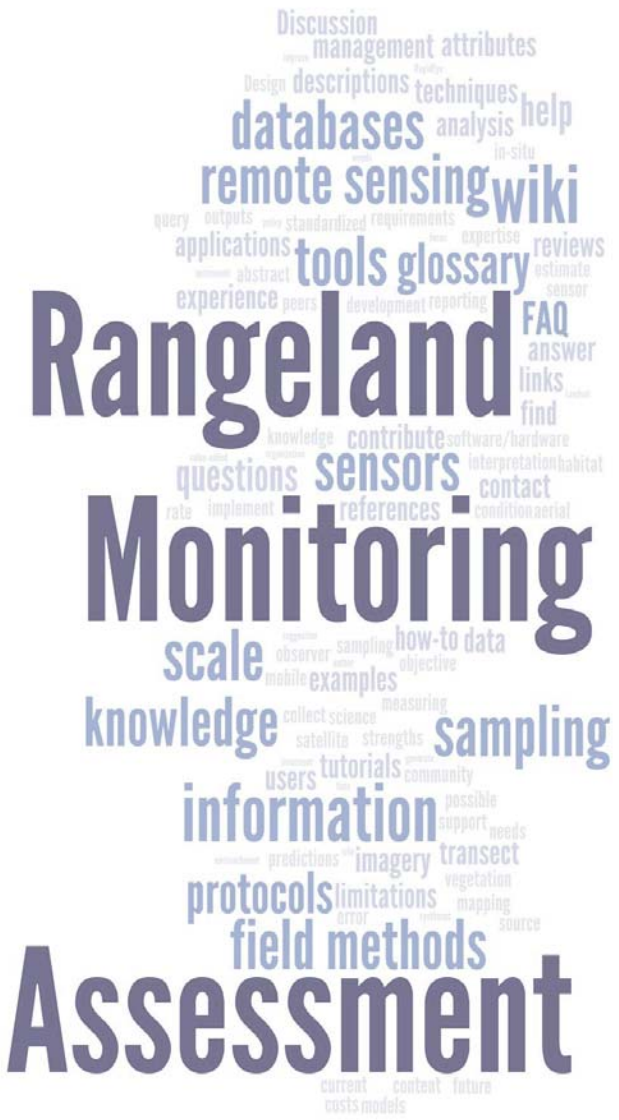
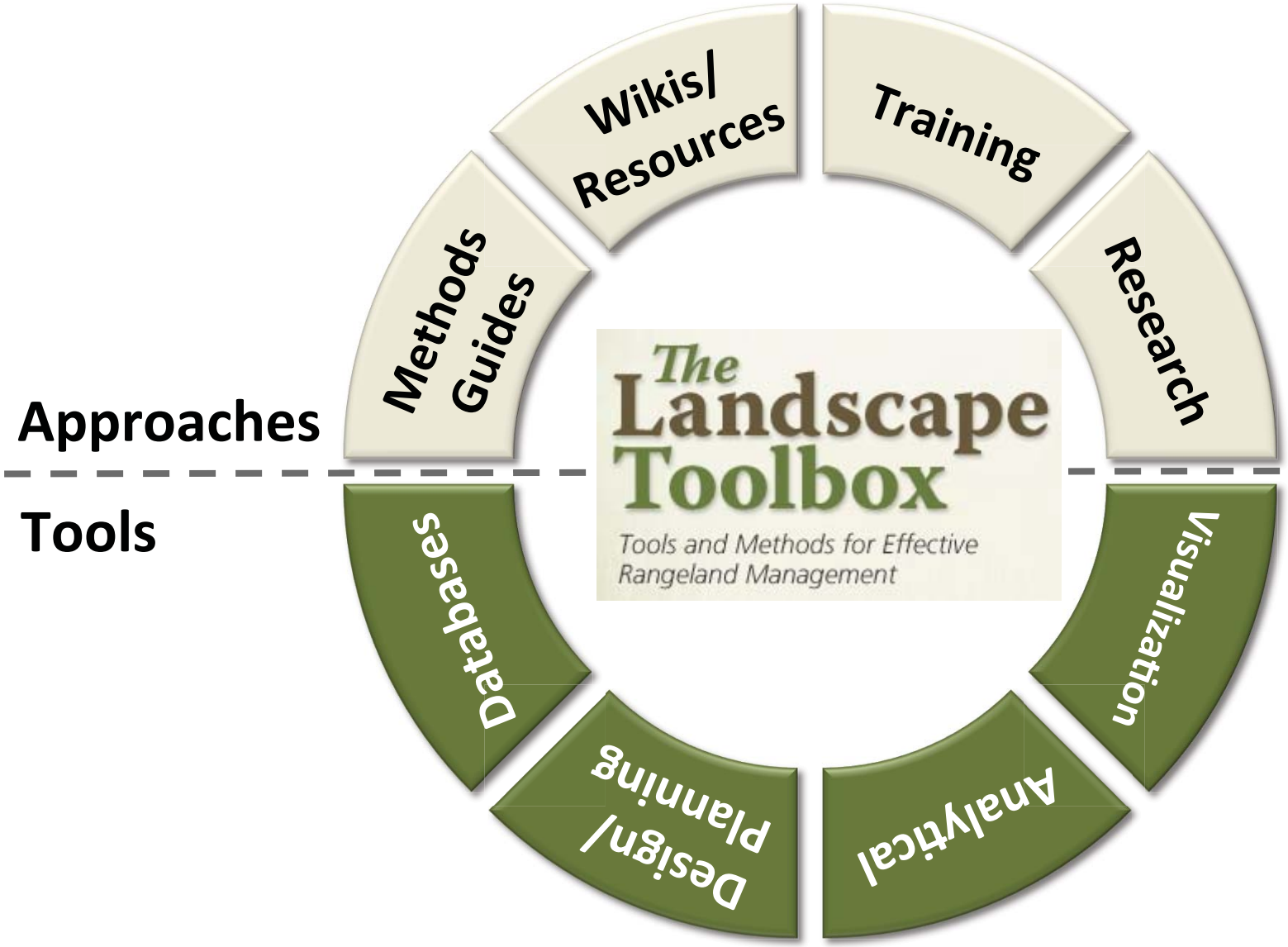


the Landscape Toolbox

Jason Karl

USDA ARS

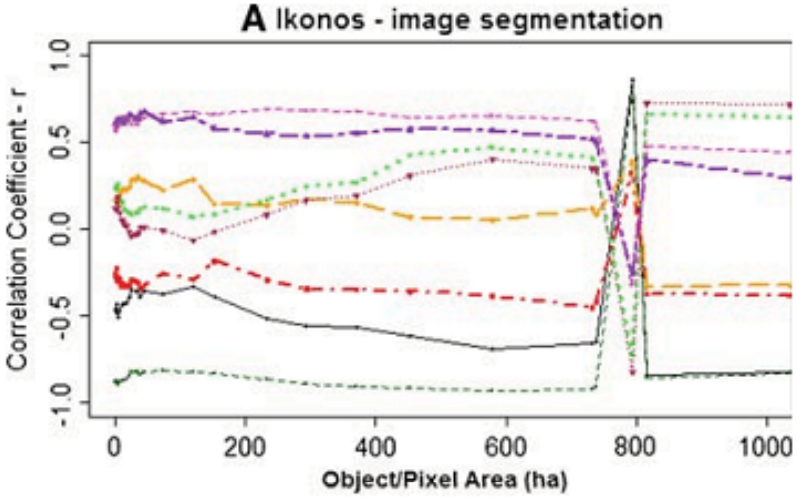
The Jornada
http://jornada.nmsu.edu
Arid Land Research Programs

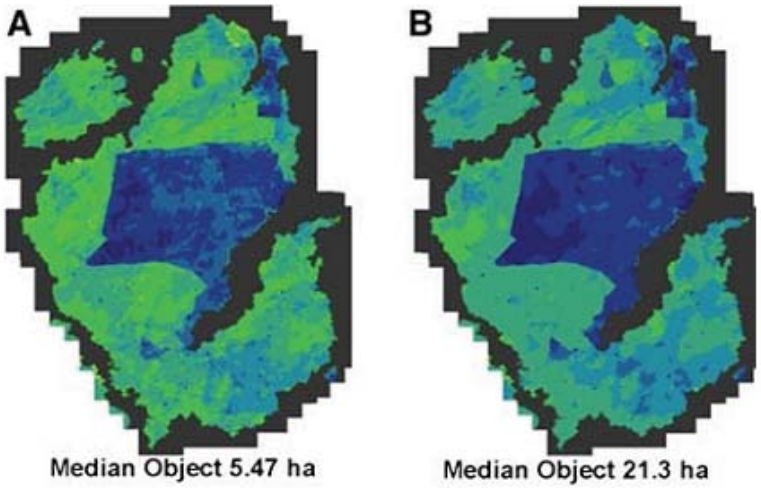

Approaches
Tools
Wikis/ Resources
Training
Methods Guides
Research
The Landscape Toolbox
Tools and Methods for Effective Rangeland Management
Databases
Visualization
Design/ planning
Analytical

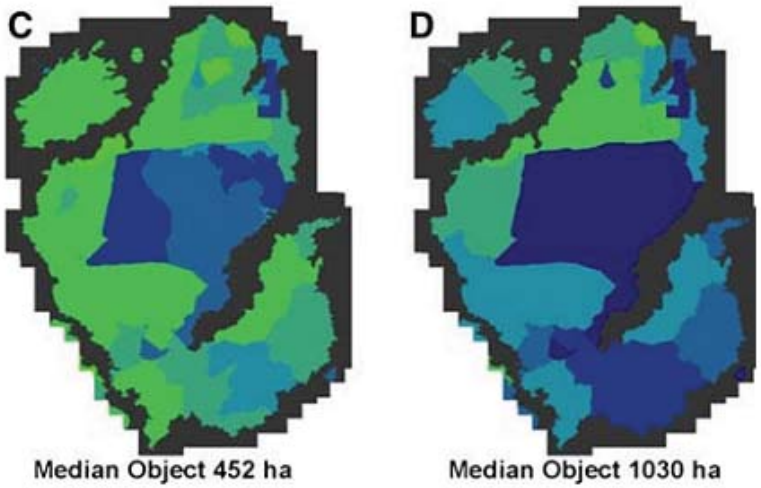
The Landscape Toolbox

- Umbrella for guiding research and organizing results
- Scale and context matter!
  - Create a structure where it becomes possible to know when/where to use different tools, techniques, knowledge
  - Within a multi-scale, ecological site framework
- Research focused on
  - Identifying appropriate scales of analysis
  - Determining where tools/techniques work and why they fail

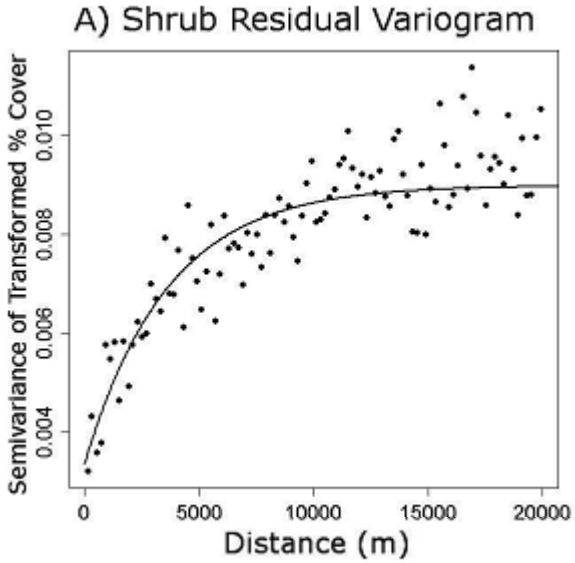
Selecting Appropriate Scales

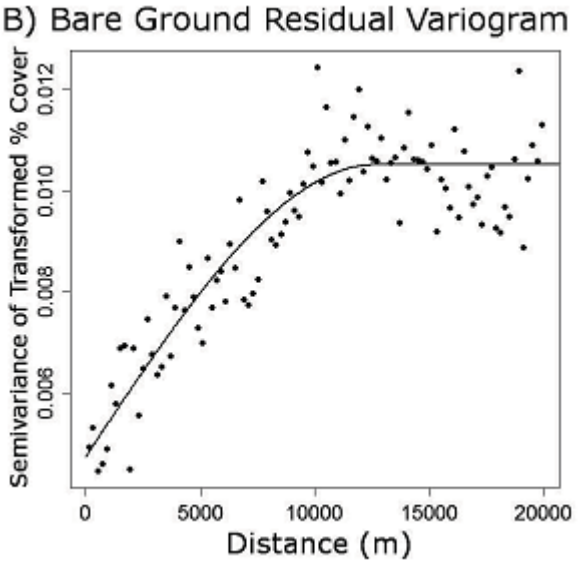






Selecting Scales – Linking to Processes





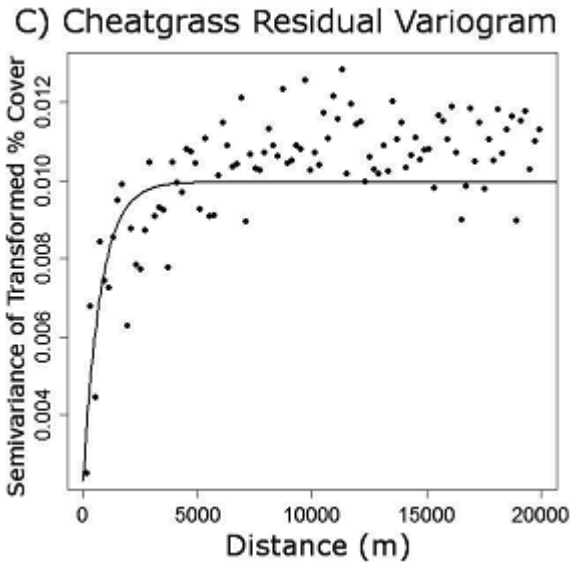

Spatial Predictions of Cover Attributes of Rangeland Ecosystems Using Regression Kriging and Remote Sensing

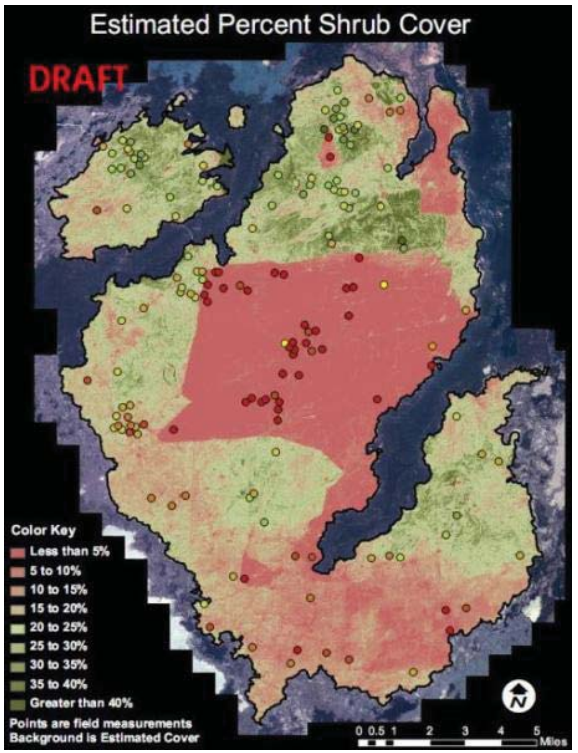
Jason W. Karl

Abstract

Resumen

INTRODUCTION





NRI/CEAP *Integrated Field and Remote Sensing Monitoring*

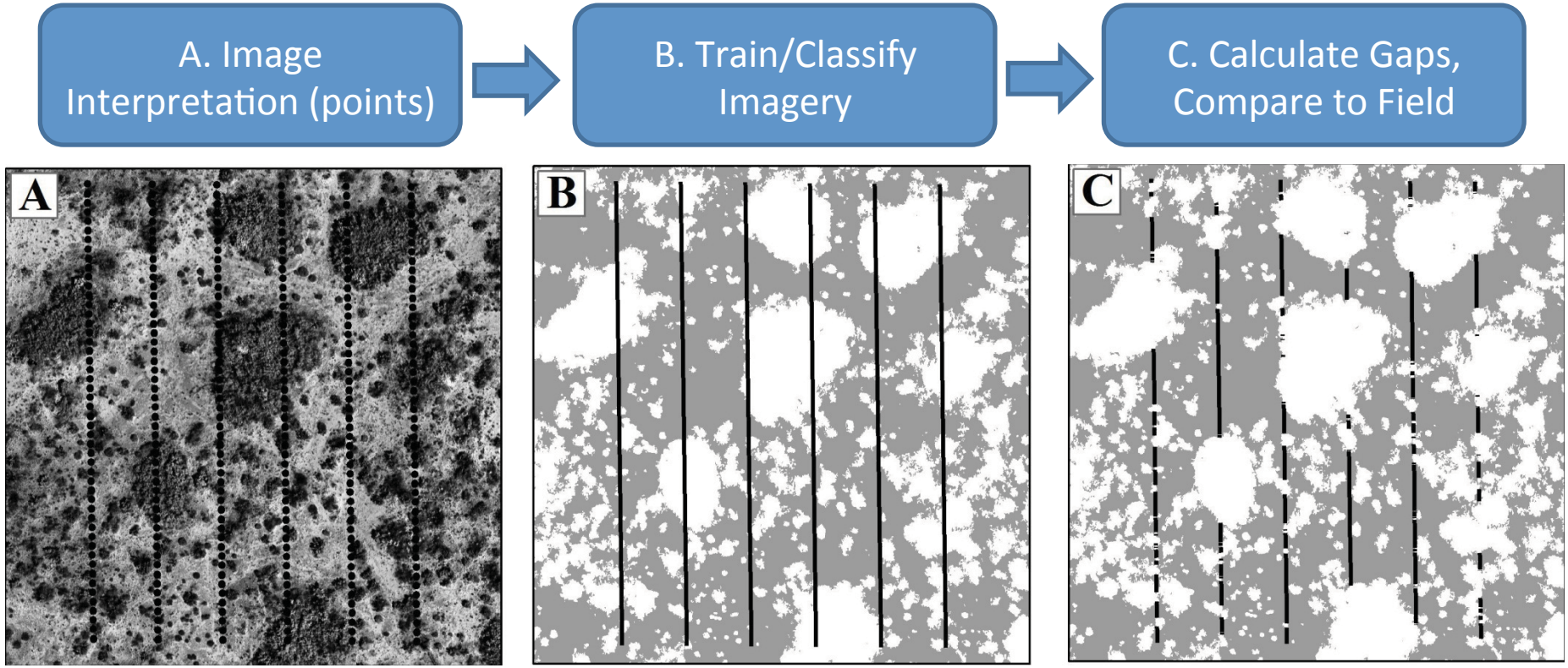
- High-res imagery (<2cm pixels) can be used for monitoring
- How to incorporate into robust monitoring programs like NRI?
  - Training, calibration, repeatability
- What indicators can be derived reliably and where?
- Can we tell *a priori* when technique will not work?

NM Mesquite Duneland

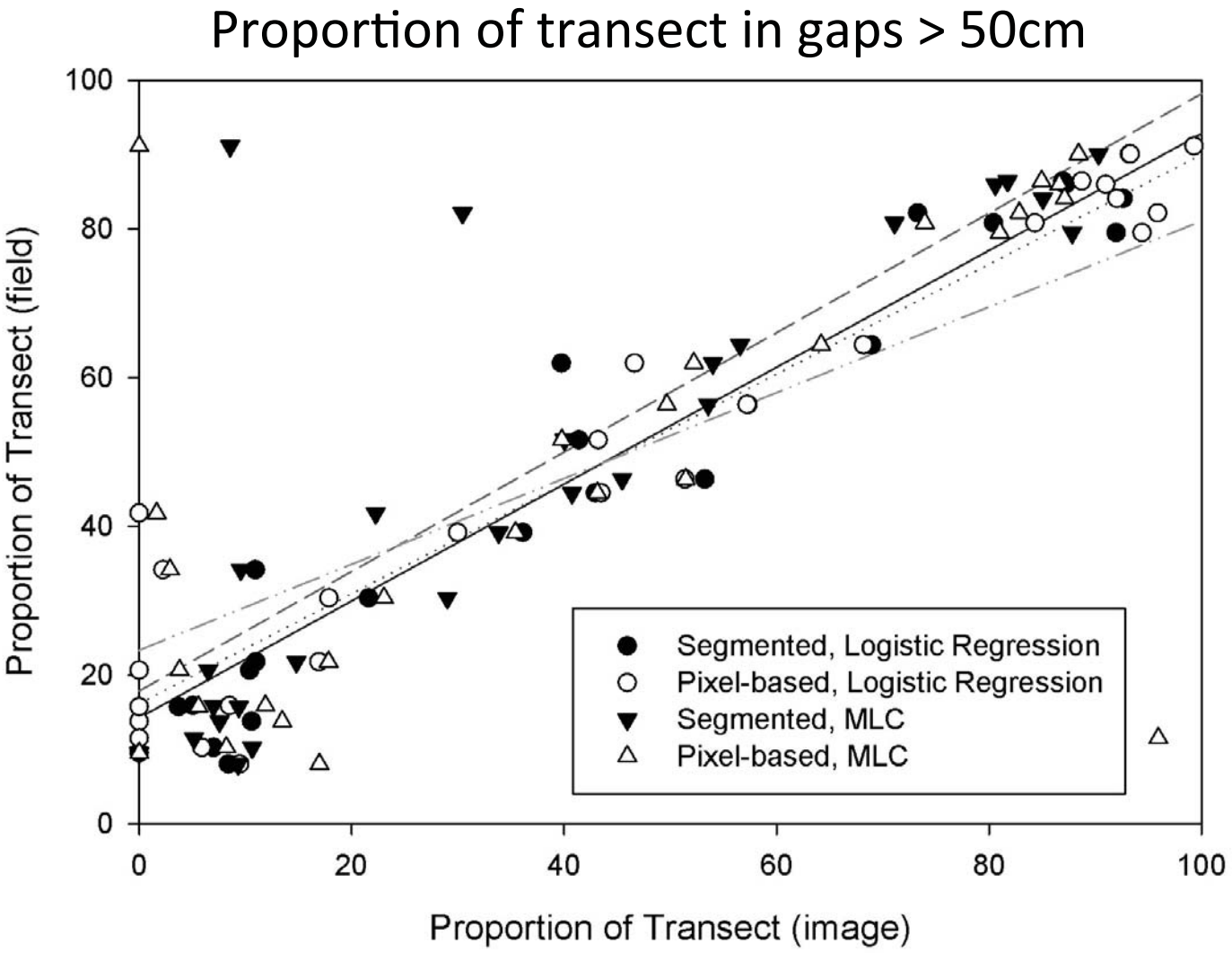
ID Sagebrush/Annual Grass

Estimating Canopy Gaps - Methods

- Data
  - High res. (3cm GSD) aerial photographs interpreted and classified
  - Field measures of canopy gap compared to image estimates
- Analysis
  - Linear relationship between field/image estimates

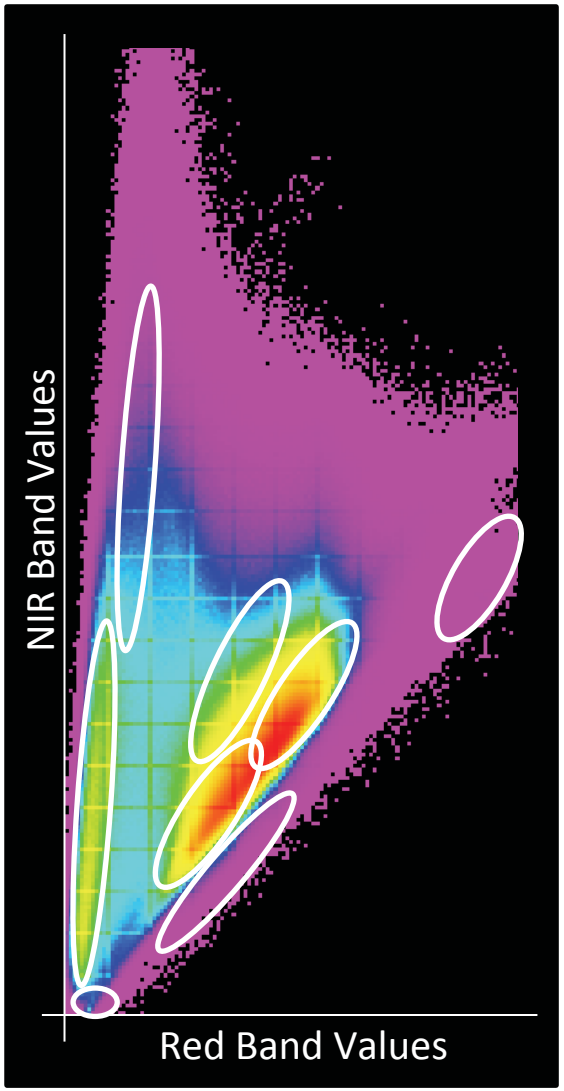


Field vs. Image Canopy Gaps



Coefficients of Agreement

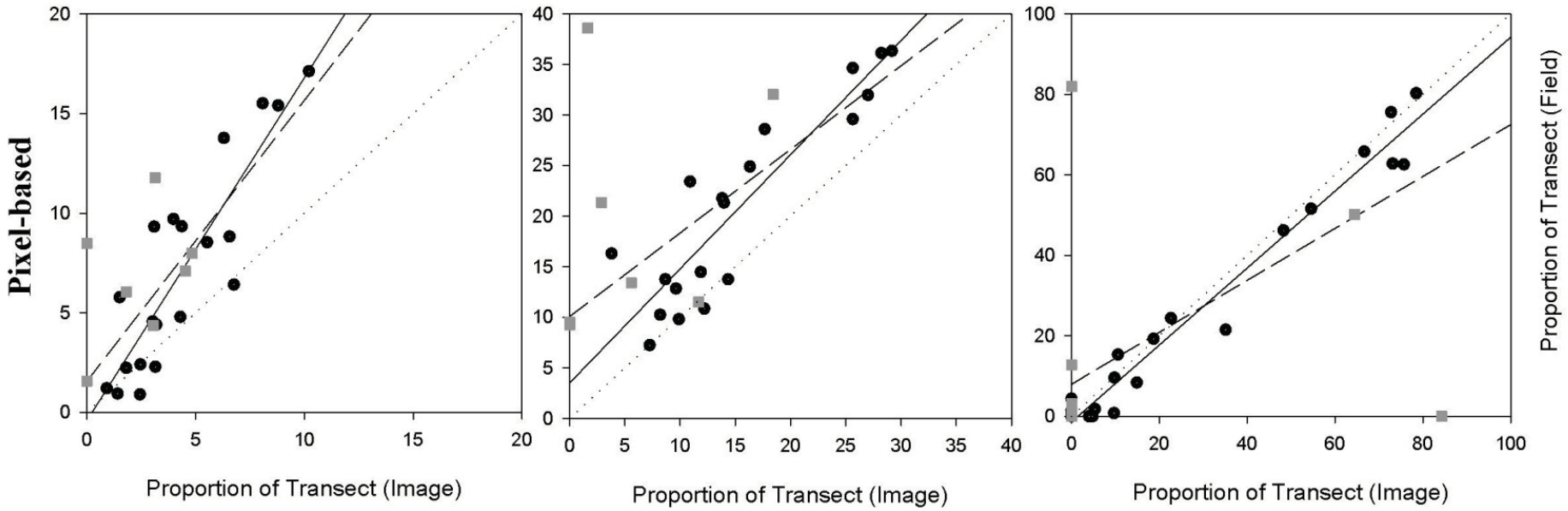
- Measure of agreement between two classifications
  - Comparison of interpreted point values and image classification
    - No field data
  - How distinct classes are?
- Strongly correlated with accuracy of canopy-gap and cover estimates
  - High agreement coefficient = easily distinguished classes = robust estimates
- Suggests coefficients of agreement can be an a priori measure of how a technique will perform



Results by Canopy Gap Size

Gap size	r^2 all sites	r^2 kappa > 0.5	Coef.
25 to 50cm	0.607	0.772	1.721
50 to 200cm	0.330	0.845	1.129
> 200cm	0.474	0.966	0.956

25 to 50cm Gaps **50 to 200cm Gaps** **> 200cm Gaps**



Canopy Gap Size Estimation

- Like other indicators, canopy gaps can be estimated from VHR imagery (*in many cases*)
- Research suggested an a priori measure of if/ when image-based estimates would succeed.
- To be used in monitoring programs, need to know more about when/where image-based techniques likely to succeed

Special Issue Manuscript

Using Very-Large-Scale Aerial Imagery for Rangeland Monitoring and Assessment: Some Statistical Considerations

Jason W. Karl, Michael C. Duniway, Sarah M. Nusser, Jean D. Opsomer, and Robert S. Unnasch

A Technique for Estimating Rangeland Canopy-Gap Size Distributions From High-Resolution Digital Imagery

Jason W. Karl, Michael C. Duniway, and T. Scott Schrader

Abstract

Resumen

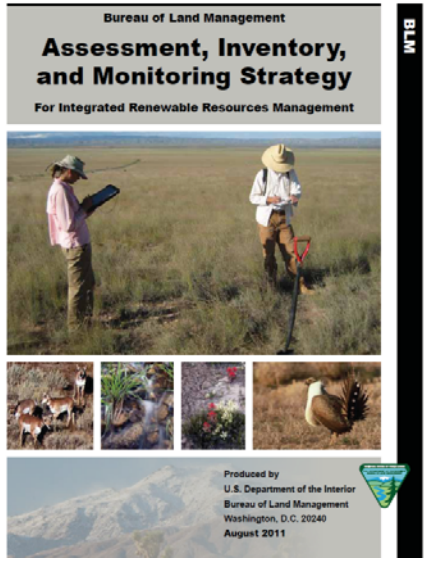
Key Words: digital aerial photography, image classification, photo interpretation, remote sensing

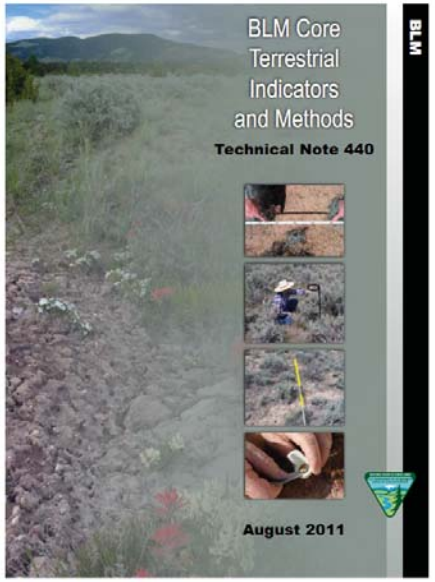
RANGELAND ECOLOGY & MANAGEMENT 65(2) March 2012

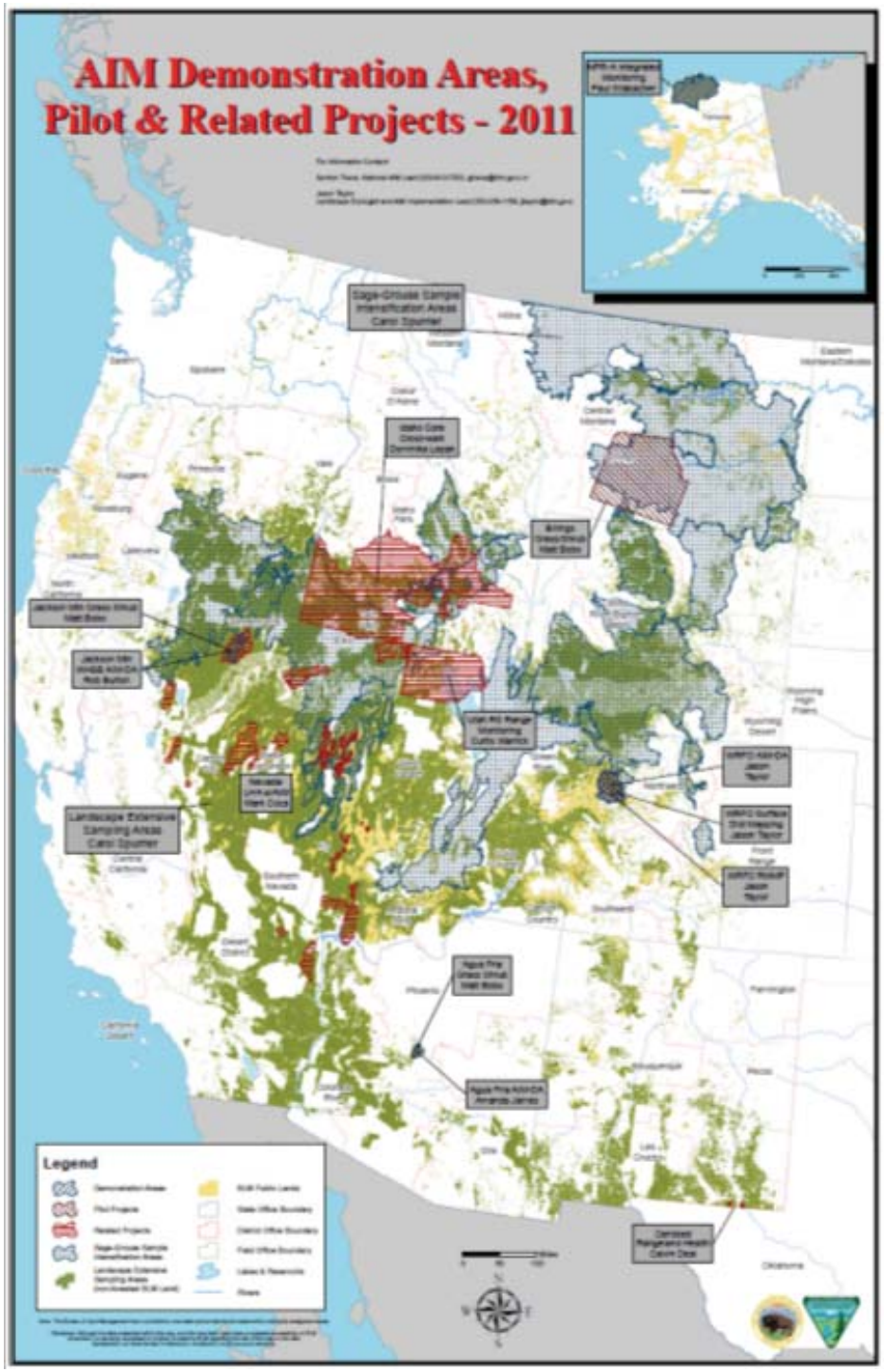
196

BLM's AIM Strategy

- Agency-wide standard suite of indicators (what to measure), methods (how to measure), and sample design (where to measure)
- Can be supplemented with additional indicators as needed
- Provide quantitative data to address cross-program management needs
- Consistent with other large-scale monitoring efforts (e.g., NRI)

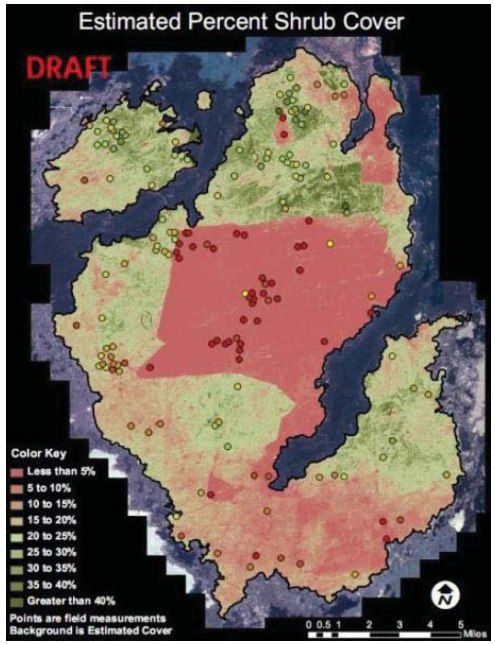


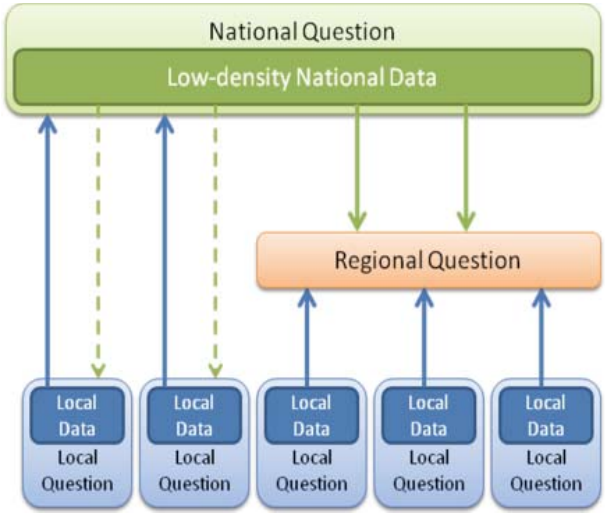




BLM AIM

- Application of Jornada/ ARS research & products
  - Sample design software
  - DIMA
  - Training
  - Analysis/Reporting tools
- Project design, implementation support and data analysis for > 10 demonstration projects





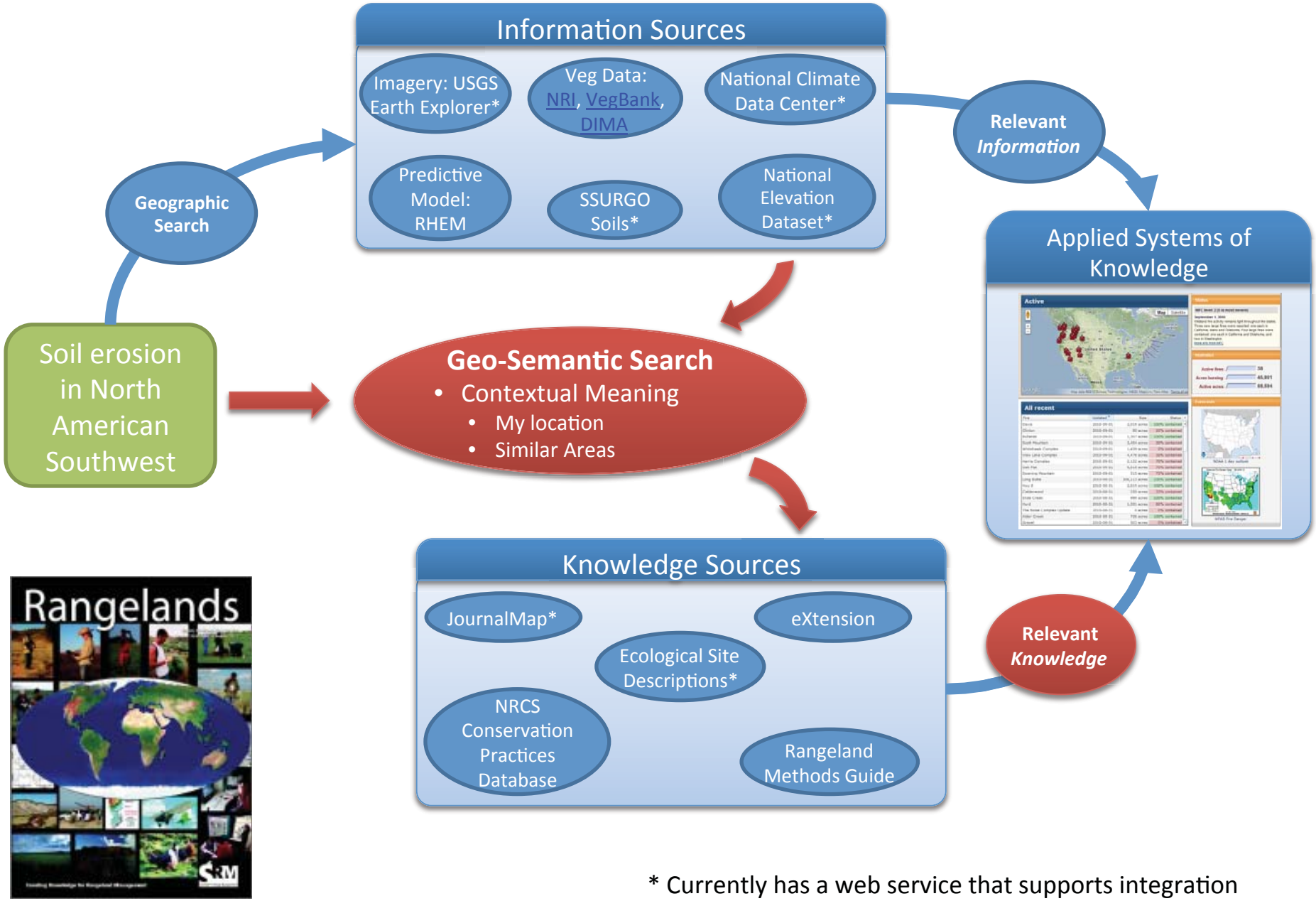
BLM AIM – Research Aspects

- Integration of field and remote sensing data*
  - Qualitative vs. quantitative data for training image-based products
  - Scaling up field measures to landscape-level indicators
- Statistical sample design†
  - Integrating local-level data into national-scope monitoring
  - Making use of legacy data in a statistical sampling framework
  - Using HR aerial imagery in monitoring programs (Karl et al. 2012).

* In cooperation with BLM,

† In cooperation with Iowa State, Colorado State Universities

Building Knowledge Systems



* Currently has a web service that supports integration

Building Knowledge Systems: JournalMap

- Find relevant knowledge
  - Spatial & thematic context
- Support ESD development & use

In Development

- Cooperate with NAL
- Work with societies/ publishers

http://www.journalmap.org

www.landscapetoolbox.org