Riverside East Monitoring and Adaptive Management Pilot Webinar

May 28, 2014; 10:00am-12:30pm Pacific
Participant Dial-In: 1-888-850-4523; Passcode 876166
Webinar URL: http://anl.adobeconnect.com/riversideeast/

Agenda and documents posted at:
http://www.blm.gov/ca/st/en/fo/palmsprings/Solar_Projects/Riverside_East_Monitoring.html

Call-In Instructions:

- ***Please mute phone and computer when you are not speaking***

- ***Group discussion and Q&A periods will be included after each presentation***

- ***If you have a question, please click on "Raise Hand" under the Set Status icon (on status bar at top of web page)***

- ***You will be called on to state your name, organization, question/comment. When you have finished speaking, please lower your hand and re-mute your phone***

Agenda

- 10:00- Introduction, progress to date
- 10:40- Development of indicators
- 11:15- Screening of monitoring objectives
- 11:55- Monitoring plan outline
- 12:15- Next steps

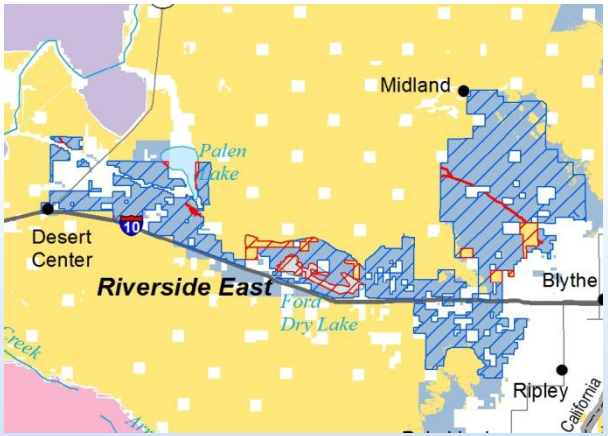
Why we're doing this – A reminder

Large scale solar is relatively new; public lands are at the forefront

- Larger footprint than typical public land development
- New potential impacts

Solar Programmatic EIS

- Identified Solar Energy Zones for prioritizing solar energy development
- Recognized need for monitoring to continually improve decisionmaking
- Monitoring and adaptive management strategy piloted in Riverside East Solar Energy Zone

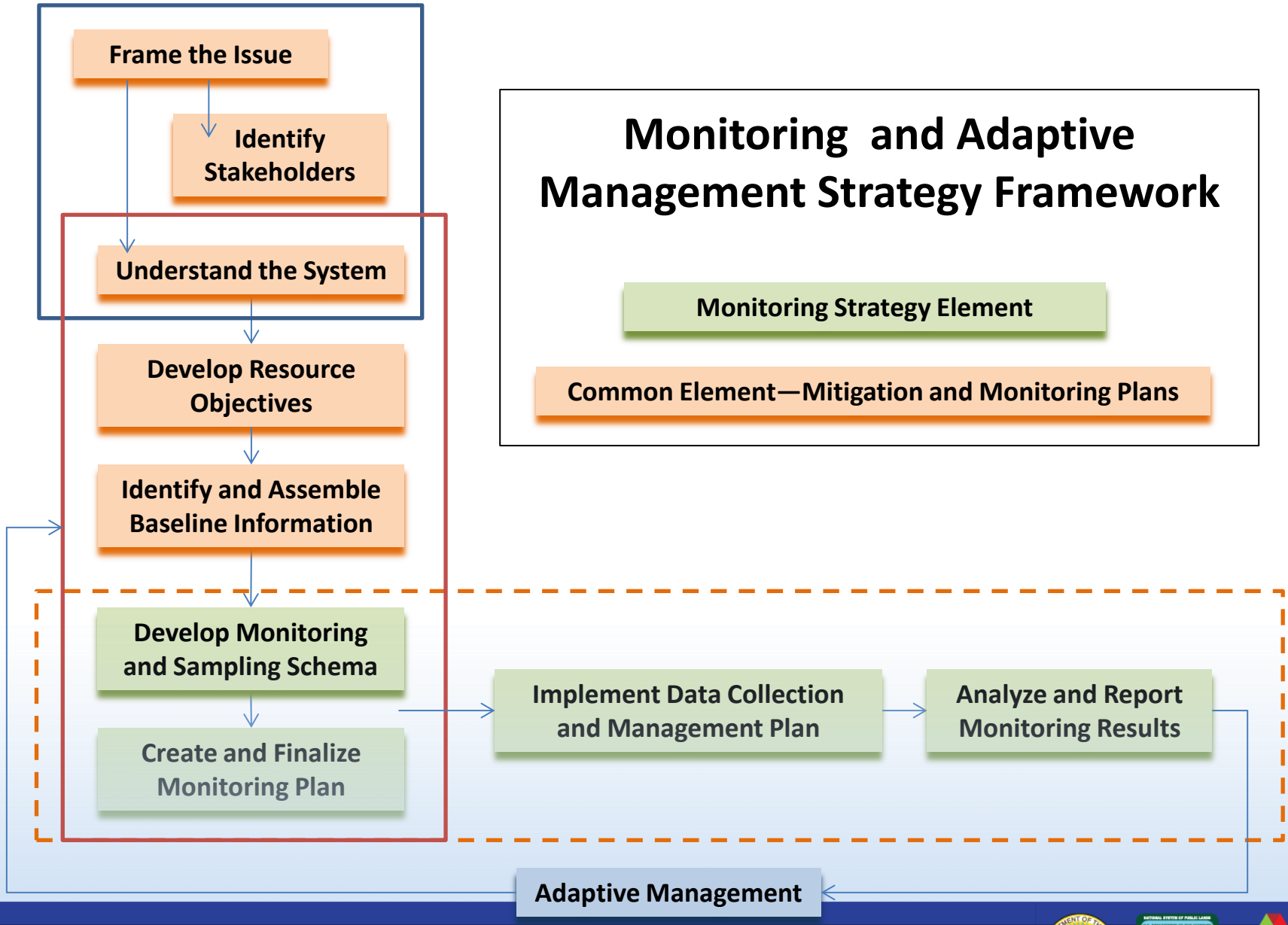


Riverside East monitoring pilot

- Transparent process with public engagement
- Lessons from this process to inform future solar monitoring strategies
- Monitoring strategy should:
  - Be regional in scale, rather than project-by project
  - Inform status and trend of key resources and ecological processes
  - Leverage existing BLM/partner data collection
  - Provide timely information to inform future decisions
  - Be consistent with the BLM AIM Strategy

Riverside East monitoring pilot

- Prioritization is key
  - Can't monitor everything all the time
  - Long-term funding may be variable
- Should be complimentary with existing monitoring
  - Will incorporate, but not duplicate, project-specific compliance monitoring


Frame the Issue
Identify Stakeholders
Understand the System
Develop Resource Objectives
Identify and Assemble Baseline Information
Develop Monitoring and Sampling Schema
Create and Finalize Monitoring Plan
Implement Data Collection and Management Plan
Analyze and Report Monitoring Results
Adaptive Management
Monitoring and Adaptive Management Strategy Framework
Monitoring Strategy Element
Common Element—Mitigation and Monitoring Plans

Outcome

Final strategy will cover:

- Management questions
- Monitoring objectives
- Indicators
- Sampling framework
- Data collection and management
- Funding mechanism
- Lessons learned

Photo courtesy of NextEra

December 2013 Workshop

- Presentations covering:
  - Resources/uses in the Solar Energy Zone
  - Potential solar impacts
  - Proposed management questions
  - Proposed monitoring objectives
- Feedback incorporated into project documents

Monitoring Objectives Added Based on December Meeting Input

Physical

- Detect regional changes in ozone of greater than XX Dobson Units
- Detect changes in sand transport rate of XX%.
- Detect carbon releases of X ppm from disturbed areas
- Detect changes in particulate matter (PM) within all Class I areas of XX %

Monitoring Objectives Added Based on December Meeting Input

Ecology

- Detect decreases in the amount or quality of habitat for migratory birds of more than X% at X scale
- Detect changes in habitat use by migratory birds of ≥X% relative to control sites
- Determine the position of solar developments in relation to migratory bird pathways
- Detect changes ≥X% in plant pollination and seed dispersal
- Detect changes in indicator species populations of ≥X% relative to control sites (or maintain populations within historical ranges)
    - Can include birds, aerial insects, pollinators ,and seed dispersing animals

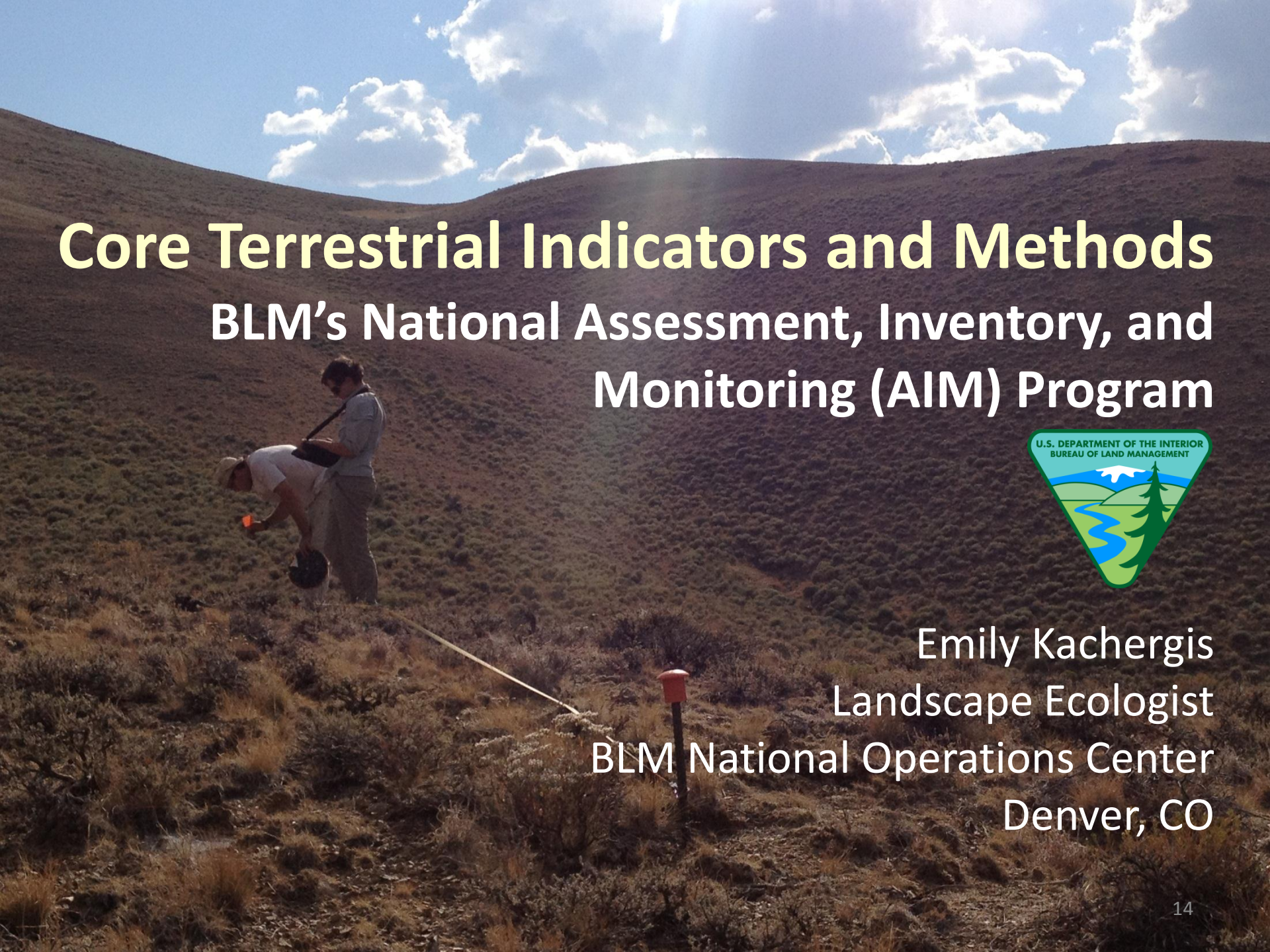
Monitoring Objectives Added Based on December Meeting Input

Human Elements

- Detect cumulative impacts to military uses
- Detect changes in the visual character of the landscape including night sky
- Detect ≥ X% change in the number of authorized and unauthorized uses in Specially Designated Areas (SDAs) and lands with wilderness characteristics, as well as disturbances and restoration
- Added multiple indicators of visual impacts to wilderness areas

May 28 Webinar

- Revised management questions and monitoring objectives based on December feedback
- Proposed indicators to achieve monitoring objectives
- Methodology for prioritizing monitoring objectives
- Proposed prioritized list of monitoring objectives
- Monitoring plan outline



Core Terrestrial Indicators and Methods

BLM's National Assessment, Inventory, and Monitoring (AIM) Program

Emily Kachergis
Landscape Ecologist
BLM National Operations Center
Denver, CO

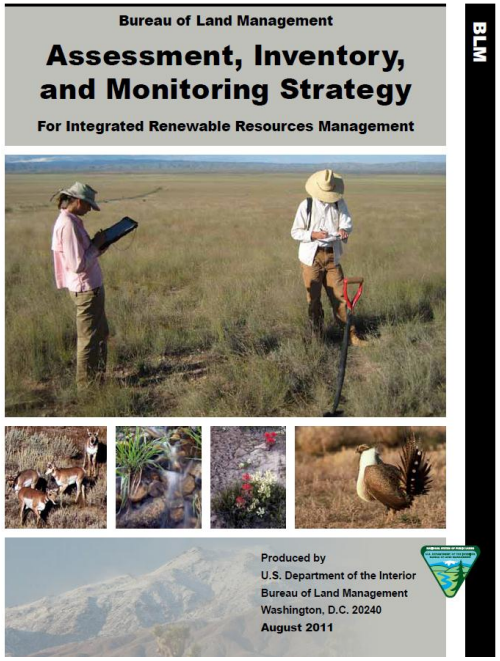
Indicators vs. Methods

Indicator – a characteristic of a system that is used as an index of an attribute that is too difficult or expensive to measure directly

Method – technique for measuring an indicator

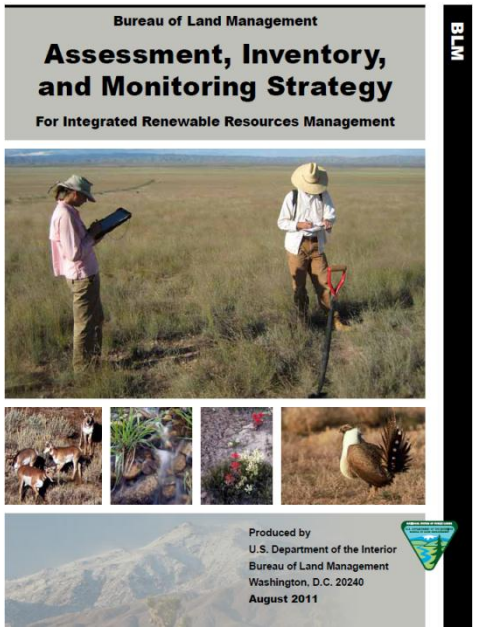
Car Temperature Gauge

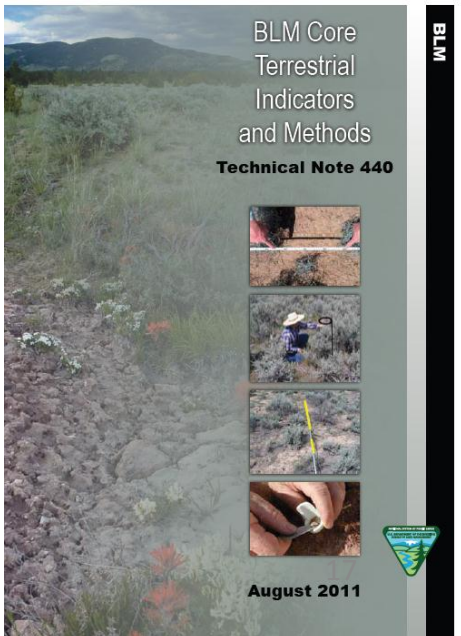
The goal of the BLM AIM Strategy is to report on the status and trends of public rangelands at multiple scales of inquiry, to report on the effectiveness of management actions, and to provide the information necessary to implement adaptive management.



Choosing AIM Core Terrestrial Indicators

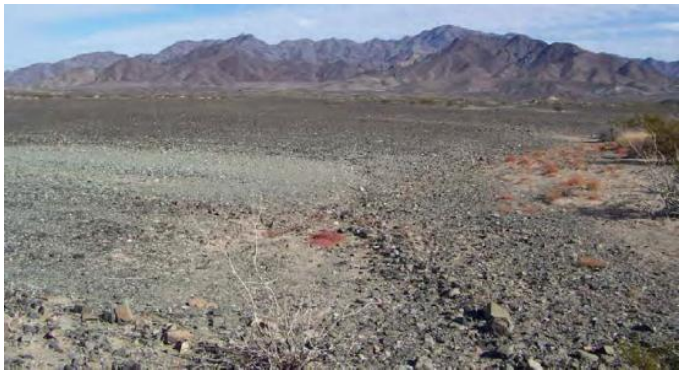
- Review of national monitoring programs
  - NRCS National Rangeland Inventory (NRI)
  - USFS Forest Inventory and Analysis (FIA)
- Survey of natural resource experts
- External peer review





Attributes of Terrestrial Ecosystem Health

Soil and Site Stability



Biotic Integrity

Hydrologic Function

Landscape Metrics

AIM Core Terrestrial Indicators

Bare Ground

Example: 35% Bare Ground Cover

Vegetation Composition

Example: 10% Grass Cover; 20% Shrub Cover

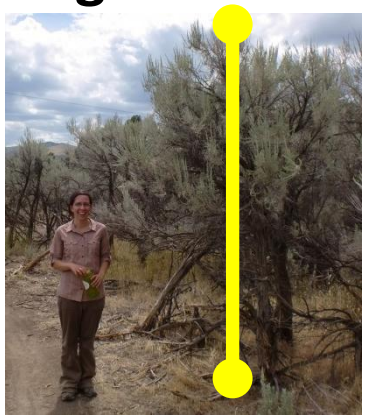
Plant Species of Mgmt. Concern

Example: Special Status Species is present

Nonnative Invasive Species

Example: 10% Cover of nonnative invasive species

Vegetation Height

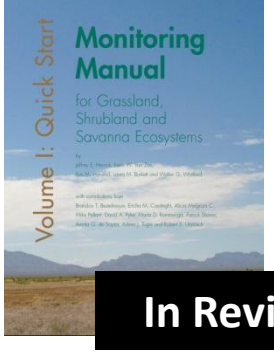


Example: Sagebrush is 180 cm tall

Canopy Gaps

Example: 20% Cover of Canopy Gaps >20 cm

Methods: How to Measure Core Indicators



In Revision

Line Point Intercept…

Bare Ground

Vegetation Composition

Plants of Mgmt. Concern

Nonnative Invasive Sp.

…with Height

Height

Gap Intercept

Canopy Gaps

AIM Core Terrestrial Indicators help answer questions about:

Erosion potential

Evaporation potential

Wildlife habitat

- Forage
- Cover

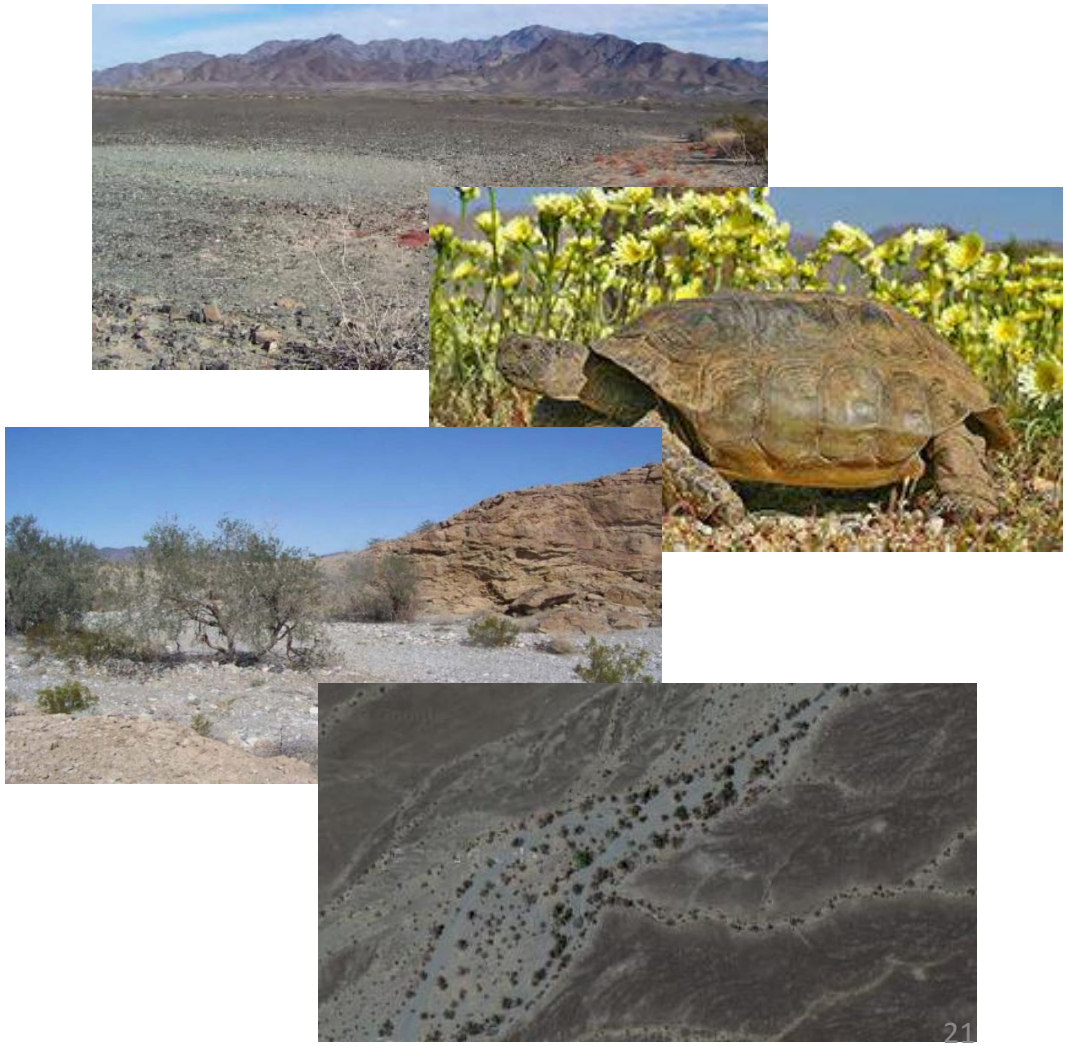
Plant community

Indicator species

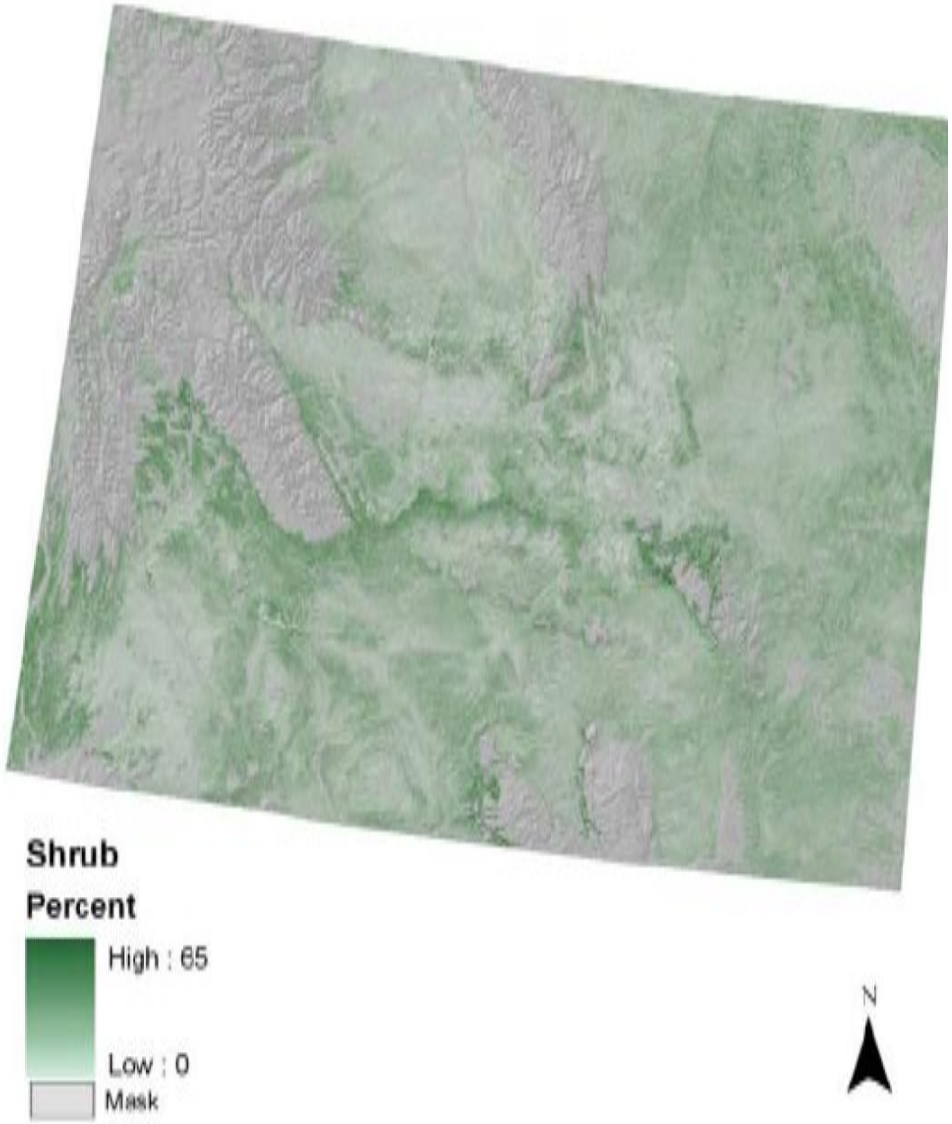
Plant invasion

Productivity

Hydrologic function



Link to Remote Sensing



Mapping Vegetation Composition in Wyoming

Core indicators address many goals and objectives for Riverside East

Management Goals	Monitoring Objectives	Indicators
GEP2: Maintain vegetation communities, especially those that depend on groundwater or function as important habitats	Detect changes ≥X% of high priority vegetation communities with in a XX mi buffer of the SEZ	• Vegetation composition • Non-native invasive plant species • Plant species of management concern • Bare ground • Vegetation height • Proportion of soil surface in large intercanopy gaps

Questions?

AIM Website:
http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach/Monitoring_for_Adaptive_Management.html

Technical Note 445:
http://www.blm.gov/style/medialib/blm/wo/blm_library/tech_notes.Par.24137.File.dat/TN_445.pdf

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Supplemental Monitoring Indicators

Monitoring Indicators

Management Goals	Monitoring Objectives	Indicators
Physical Processes-Soil Resources		
Minimize soil erosion on and offsite. Control fugitive dust to minimize airborne particulates	Detect increases in soil erosion rates within X mi of the SEZ of XX% Detect changes in off-site dust of greater than XX%	• Soil aggregate stability (numerical rating) • Remote sensing of land cover area types • Soil texture (particle size distribution) • Soil depth (cm) • Total dust (grams/unit time downwind)
Physical Processes-Hydrology		
Maintain offsite surface water flow volumes and patterns in intermittent and perennial water bodies.	Detect XX% deviations from baseline surface hydrology in intermittent wetland, stream and lacustrine habitat	• Number of rills (count) • Stream discharge (cfs) • Residual pool depth (m) • Surface water dissolved oxygen (mg/L) • Channel location • Channel depth (m)

Monitoring Indicators

Management Goals	Monitoring Objectives	Indicators
Ecological Resources – Plants		
Maintain vegetation communities, especially those that depend on groundwater	Detect ≥X% changes in plant phenology with in a XX mi buffer of the SEZ	• Remotely sensing metrics (multiple phenological measures)
Minimize impacts to biological soil crusts	Detect increases in basin-scale losses of biological soil crust of XX%	• Remote sensing or field measurements of biological crusts (acres)
Ecological Resources – Wildlife		
Maintain suitable habitats and habitat connectivity	Detect decreases in habitat connectivity that are more than X% at X scale	• Corridor stability (quantified using remote sensing)

Monitoring Indicators

Management Goals	Monitoring Objectives	Indicators
Human Elements		
Protect cultural and paleontogical resources from solar related impacts	Detect changes in the contextual integrity of cultural sites (regional)	• Remote sensing of changes in physical characteristics of areas containing cultural and paleontological sites • Number of incidents of theft , vandalism, damage, and destruction of cultural and fossil resources • Number of incidents of eroded cultural and paleontological resources
Preserve visual resource inventory class to landscapes /scenic values	Detect changes in the visual character of the landscape including night sky	• Night time Illumination (Night sky) • Glare glint measurements • Reports of aviation or human health issues related to glare/glint • Record viewer response to the introduced contrasts • Visual Resource Inventory score • Visual contrast metrics (form, line, color, and texture)
Ensure changes to the local economy and environment related to solar development do not disproportionately affect minority populations	Detect changes in the income and employment of low-income and minority populations	• Minority income, employment, poverty rates • Minority Employment in the energy sector • Regional poverty rates • Housing costs

Riverside East Monitoring and Adaptive Management Pilot

Monitoring Objectives Prioritization

Monitoring Objectives

The “what to monitor” step in the AIM Strategy.

- Ex: Detect changes in particulate matter of X%...

Until now, we have been very inclusive of monitoring objectives.

Cannot monitoring everything all the time – monitoring objectives must be prioritized.

Prioritizing Monitoring Objectives

Screened monitoring objectives against criteria of:

- Importance for decision making (should we monitor it)
- Feasibility (can we monitor it)

Accepted methodology used by BLM, National Park Service, etc.

Prioritizing Monitoring Objectives

First step toward focusing in on key elements of monitoring plan

- Public input at this stage is critical
- Are we using the right criteria for prioritizing?
- Should the criteria be applied differently to produce a different outcome?

METHODS

Example Criteria for Prioritizing Monitoring Objectives - What SHOULD we monitor?

- Achieving the monitoring objective will produce results about indicators that BLM managers and the general public clearly understand and from which implications for adaptive management actions are apparent.

- The monitoring objective addresses a resource and/or impact that drives processes in the conceptual model of the system and/or is of high concern based on stakeholder input, BLM Resource Management Plans (e.g., NECO Plan), and the Solar Programmatic EIS.

- The monitoring objective addresses a resource with a legal or policy requirement for monitoring.

- The monitoring objective addresses potential impacts specifically related to solar energy development.

METHODS

Example Criteria for Prioritizing Monitoring Objectives – Is it FEASIBLE to Monitor?

- The monitoring objective can be achieved using existing data sources.
- The monitoring objective can be achieved through cost-sharing partnerships with other agencies, universities, or private organizations to obtain data.
- Appropriate control sites are available to achieve the monitoring objective
- Based on the indicator(s) and baseline data required to achieve the objective, the monitoring objective is realistic to achieve given the constraints of sample size, manpower, and time.

METHODS

- Each Monitoring Objective was evaluated on each of the criteria by BLM and Argonne team members
- Monitoring Objectives that ranked highest on the “should we monitor” criteria were given highest priority
- The feasibility of these monitoring objectives was also considered
- The results in the handout represent a tentative list of Monitoring Objectives ranked from highest to lower priority

RESULTS

Example High Priority Monitoring Objectives - Physical

- Detect changes in off-site dust of greater than XX%
- Detect increases in soil erosion rates within X mi of the SEZ of XX%
- Detect decreases in groundwater surface elevations of XX ft in monitoring wells on or near projects

RESULTS

Example Medium Priority Monitoring Objectives - Physical

- Detect changes in soil aggregate stability greater than X%
- Detect increases in basin-scale losses of desert pavement of XX%
- Detect carbon releases of X ppm from disturbed areas

RESULTS

Example Lower Priority Monitoring Objectives - Physical

- Detect changes to sand penetrability, surface coarseness, and surface stabilization downwind of solar facilities of XX%.
- Detect regional changes in ozone of greater than XX DU

RESULTS

Example High Priority Monitoring Objectives - Ecological

- Detect increases or introductions of ≥X% in invasive plant species in and surrounding the SEZ relative to control site
- Detect changes of ≥X% in bare ground cover, ≥X% in total plant cover, and >X% of intercanopy gaps, and >X% in woody plant height within a XX mi buffer of SEZ
- Detect changes in habitat use by migratory birds of ≥X% relative to control sites
- Detect reductions in habitat quality and connectivity for special status species of ≥X% within X mi of SEZ (Can make this objective specific to individual or groups of habitat characteristic variables)

RESULTS

Example Medium Priority Monitoring Objectives - Ecological

- Determine the position of solar developments in relation to migratory bird pathways
- For a wildlife indicator species, detect decreases in the amount or quality of habitat more than X% at X scale
- Detect increases in basin-scale losses of biological soil crust of X%

RESULTS

Example Lower Priority Monitoring Objectives - Ecological

- Detect local to regional changes in plant litter
- Detect occurrence and spread of canine distemper virus across the eastern Riverside County area.
- Detect changes ≥X% in plant pollination

RESULTS

Example High Priority Monitoring Objectives – Human Elements

- Detect changes in the contextual integrity of cultural and paleontological sites
- Detect changes in the visual character of the landscape including night sky
- Detect changes in scenic value of ≥ X% for locations of scenic value that include solar facilities within their viewsheds.

RESULTS

Example Medium Priority Monitoring Objectives - Human Elements

- Detect changes in human health (Suit of indicators)
- Detect increase in noise levels ≥ X% dBA within a XX mi radius of project
- Detect ≥X% increased traffic and access

RESULTS

Example Lower Priority Monitoring Objectives - Human Elements

- Detect changes in the income and employment of low-income and minority populations

- Detect changes ≥X% in number of visitors at the LTVA and Joshua Tree NP

RESULTS

- Full list of prioritized Monitoring Objectives are in the handout
- This prioritization is tentative
- Please provide feedback on the prioritization thus far

- Questions?

Monitoring Plan for Environmental and Societal Impacts

RIVERSIDE EAST SOLAR ENERGY ZONE AND VICINITY

Monitoring Protocol Elements

- Indicators
- Sampling Units
- Sample Size
- Stratification by Key Factors

  Vegetation Type - Land Form
- Randomization Method
- Field Method or GIS Algorithm
- Statistical Analyses

Design: Indicators

- Relation of a Change Agent to the Indicator is Unambiguous
- Appropriateness of the Indicator
  - Sensitivity to Detection
  - Maximize Certainty
  - Minimize Cost
  - Technical Feasibility

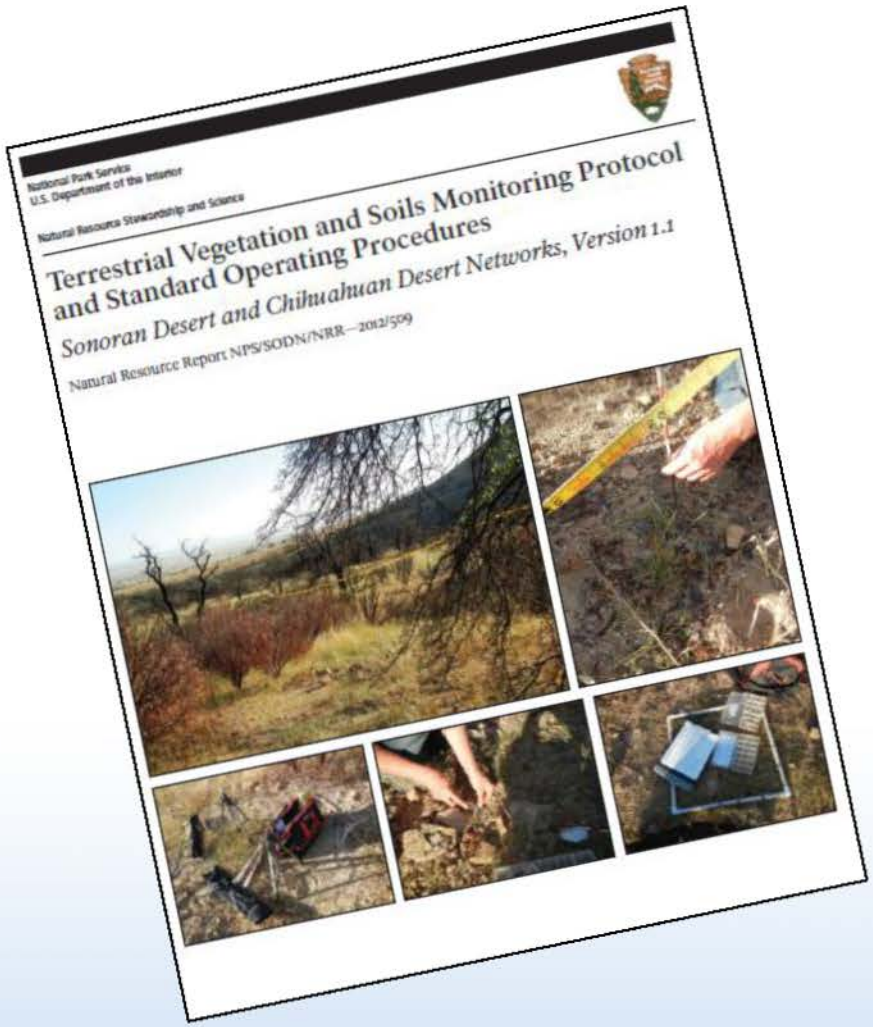
CAVEAT:

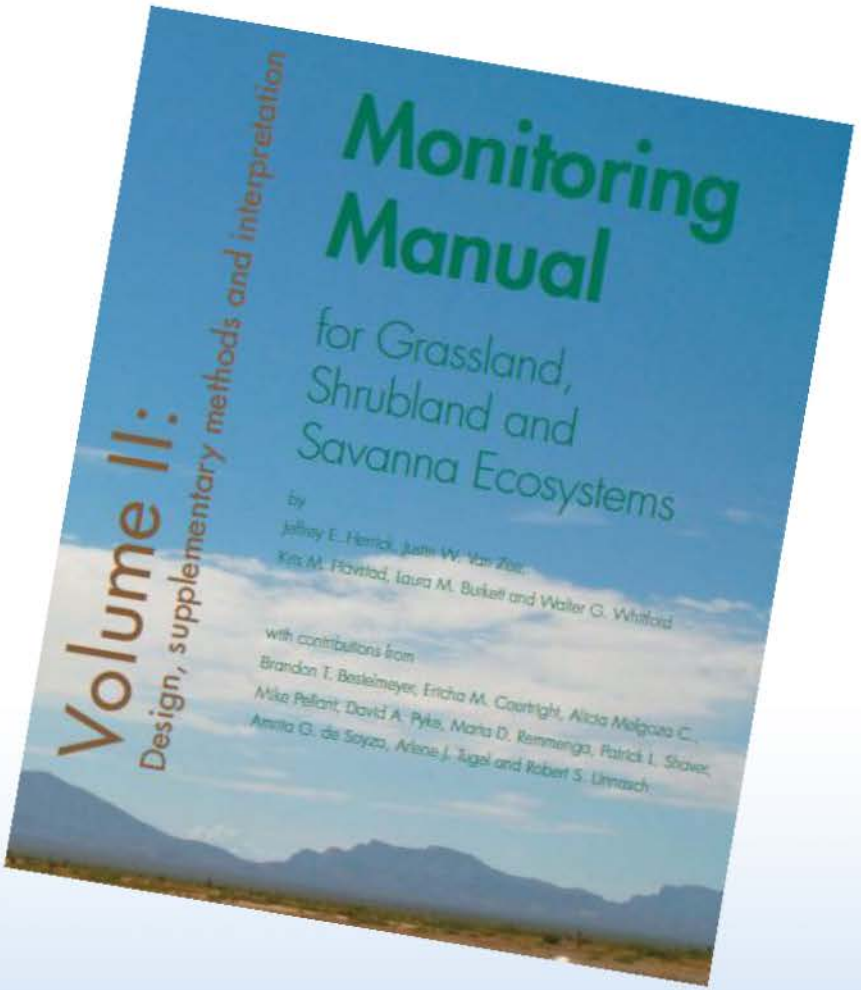
Limited Capacity to Determine Cause and Effect

Design: Protocol Selection

- Review of Protocols
  - Data Collection Methods - Statistical Analyses
- Environmental Constraints
  - Aridity – Heat – Wind
- Technical Feasibility
- Cost
- Program Priorities for Efficiency
  - Apply results from existing monitoring programs
  - Use existing satellite / aircraft imagery and hyperspectral data
  - Emphasize ground-based remotely sensed data (e.g., air quality, noise)

Existing Monitoring Resources





Design: Temporal Considerations

- Seasonality
- Time of Day
- Frequency
- Travel Time

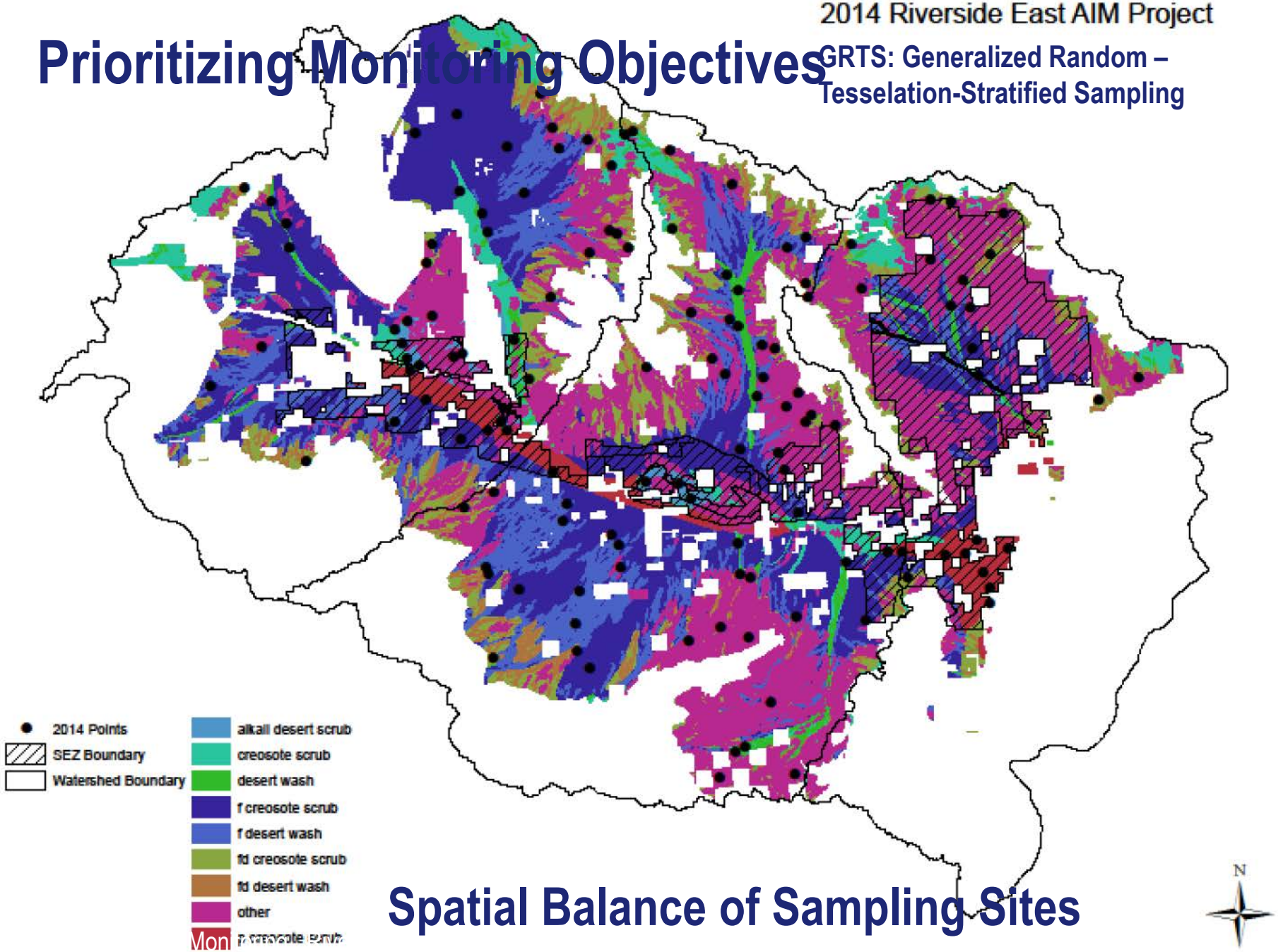
: Spatial Considerations

- Physical Access
- Safety
- Buffer Zone
- Land Ownership
- Scale for Sampling: Region - SEZ Landscape -Watershed - Project

Prioritizing Monitoring Objectives

2014 Riverside East AIM Project

GRTS: Generalized Random – Tesselation-Stratified Sampling

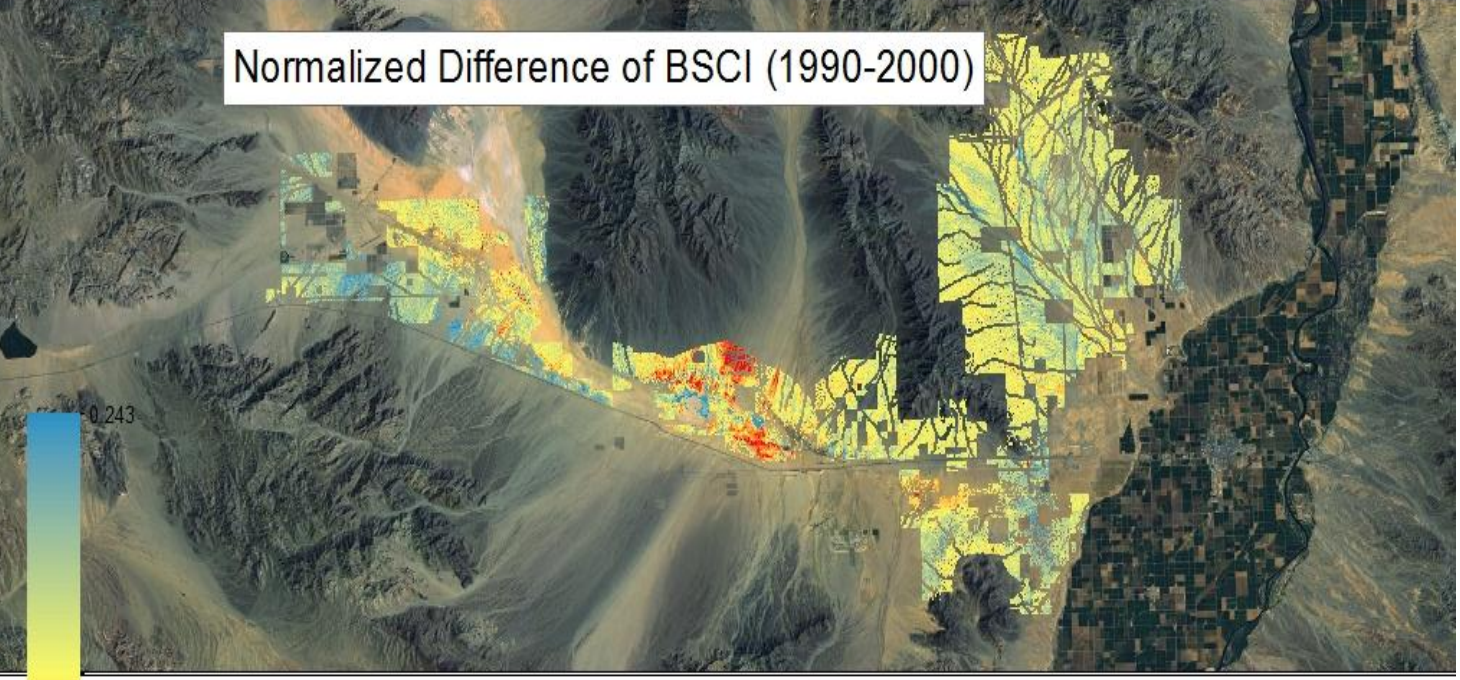


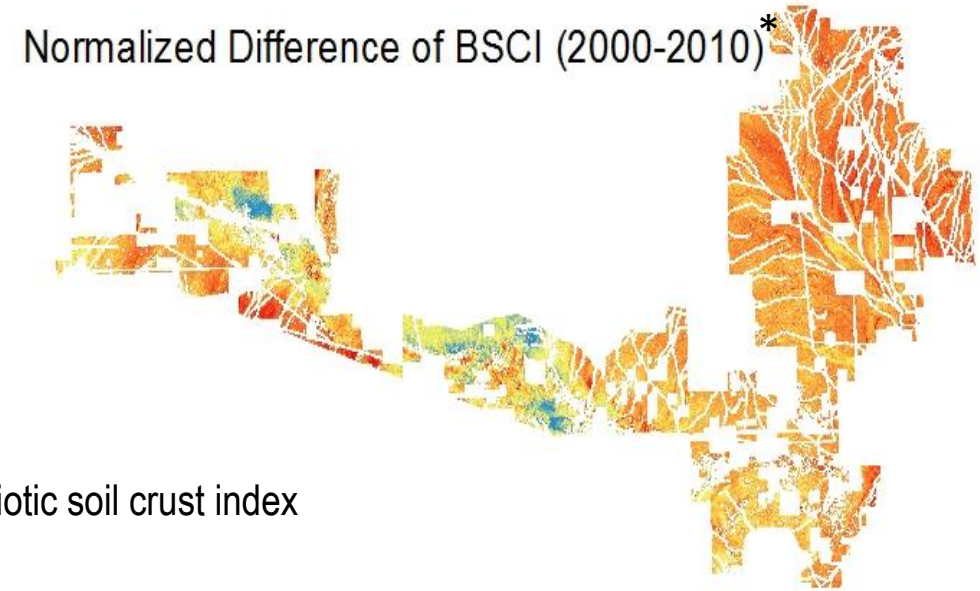
Spatial Balance of Sampling Sites

Existing Imagery and Hyperspectral Data

- **USDA** National Agricultural Imagery Program (NAIP)
- **NASA/USGS** Landsat Program – 1990 to present
- **JAXA** Phased Array Type L-band Synthetic Aperture (PALSAR) Radar - 2010
- **DOE-Argonne** Flights at Riverside East SEZ – 2013
- **NASA** Airborne Visual and Infrared Imaging Spectrometer (AVIRIS) Data – 2013

Landsat Data Analysis





*BSCI = biotic soil crust index

Other Monitoring Elements

- Equipment
- Budget
- Training
- Data Quality Control
- Data Management
- BMPs for Human Safety
- BMPs for Low-Impact Field Monitoring

Procedural Considerations

- Creating the Ideal Monitoring Plan
- Developing the Affordable Monitoring Plan
- Scientific Peer Review
- Partnerships
  - Great Basin Institute
  - NASA Jet Propulsion Lab and Ames Research Lab
  - USDA La Jornada Research Station

Riverside East Monitoring and Adaptive Management Pilot

Next Steps

Commenting on handouts

- Please send comments to lfox@anl.gov
- Deadline: June 30

Next Steps

- Next major milestone: draft monitoring plan
- Workshop in fall to present draft plan for public input
- In the meantime, webinar on funding tentative for summer