Pursuit of an integrated ecological and energy assessment framework

Presentation to the 2012 ESIP Winter Meeting – Dynamic Decision Tools and Catalog Community of Practice

Sky Bristol and Ben Wheeler

Integrated science has been the overarching pursuit of the U.S. Geological Survey (USGS) for the past decade and more. The organization has realized both the strengths and shortcomings of scientific balkanization within its programs; the necessity for continued reductionist research in some areas along with attendant problems in applying combined knowledge to major problems effectively. The current USGS Science Strategy, published in 2007, created a vision for leveraging the vast potential of the organization's combined scientific knowledge and expertise across so many disciplines toward major societal challenges from changing climate to increasing demands for energy and environmental and human health. The USGS reorganized its programs toward this vision and is pursuing a wide range of initiatives to apply its scientific data, information, and knowledge to these challenges in an integrated way.

Two initiatives in the West deal with integrating ecological and energy assessments, areas that have historically been addressed separately but require integrated understanding to support decisions by resource managers and policy makers. The Wyoming Landscape Conservation Initiative (WLCI) is a long-term sciencebased effort to assess and enhance aquatic and terrestrial habitats at a landscape scale in Southwest Wyoming, while facilitating responsible development through local collaboration and partnerships. A central pursuit of the WLCI has been a basin-wide integrated assessment examining over 80 different factors, from habitats to resource development potential, needed to create a usable index for decision analysis. The Energy and Environment in the Rocky Mountain Area (EERMA) initiative is synthesizing information and pursuing comprehensive tools to promote understanding tradeoffs of energy development, including oil and gas (including shale gas and coal-bed methane), uranium, geothermal, wind, and solar. Both of these efforts and others are contributing to a third synthesis project through the John Wesley Powell Center for Scientific Analysis and Synthesis that is working to craft an integrated framework for conducting comprehensive analysis as a matter of course in support of decision making.

Coordinated and facilitated activity across multiple organizations and communities of practice well beyond the USGS will be needed to carry forward, sustain, and further evolve methods, tools, and data developed through these and other initiatives. The most critical element learned through both the WLCI and EERMA cases is the need for comprehensive and sustainable frameworks, methods, and institutional will for decision making stakeholders to be engaged throughout the scientific knowledge lifecycle. Along with this, the decision tools and process requires institutional commitment from data owners to keeping data platforms and services as close to state of the art and as open as possible.

Pursuit of an integrated ecological and energy assessment framework

ESIP Energy and Climate Cluster Workshop

Dynamic Decision Tools Catalog and Community of Practice

January 2012

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For discussion

- USGS Science Strategy context
- Powell Center
- Wyoming Landscape Conservation Initiative
- Energy and Environment in the Rocky Mountain Area
- Need for growth and sustainability of decision support capacity

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USGS Science Strategy

2007 – Science Strategy focused on major societal challenges and the role of USGS integrated science to inform decisions in those areas

2011 – USGS reorganized its science programs to better address those challenges and launched detailed 10-year planning teams in 7 mission areas

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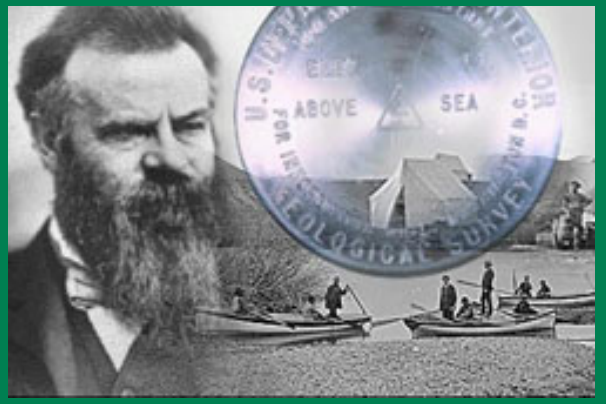
Scientific Synthesis

- One of the outcomes from the 2007 Science Strategy was the formation of the *John Wesley Powell Center for Scientific Analysis and Synthesis*
- Proposal-derived working groups pursue a broad range of integrated science questions



http://powellcenter.usgs.gov/

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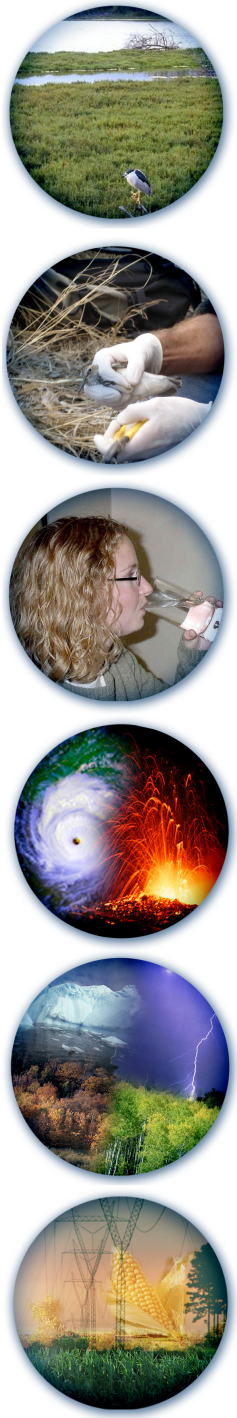
Integrated Assessment Framework

Principal Investigators:
Jay Diffendorfer and Seth Haines

- One Powell Center working group (publishing in 2012) is developing an integrated ecological and resource assessment framework
  - Expands existing assessment methods to include environmental and human-health impacts of resource extraction and use
  - Evaluates and understands multi-resource dependencies and conflicts



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Wyoming Landscape Conservation Initiative

- Part of the DOI Healthy Lands Initiative
- Long-term sciencebased effort to assess and enhance aquatic and terrestrial habitats at a landscape scale in Southwest Wyoming, while facilitating responsible development through local collaboration and partnerships

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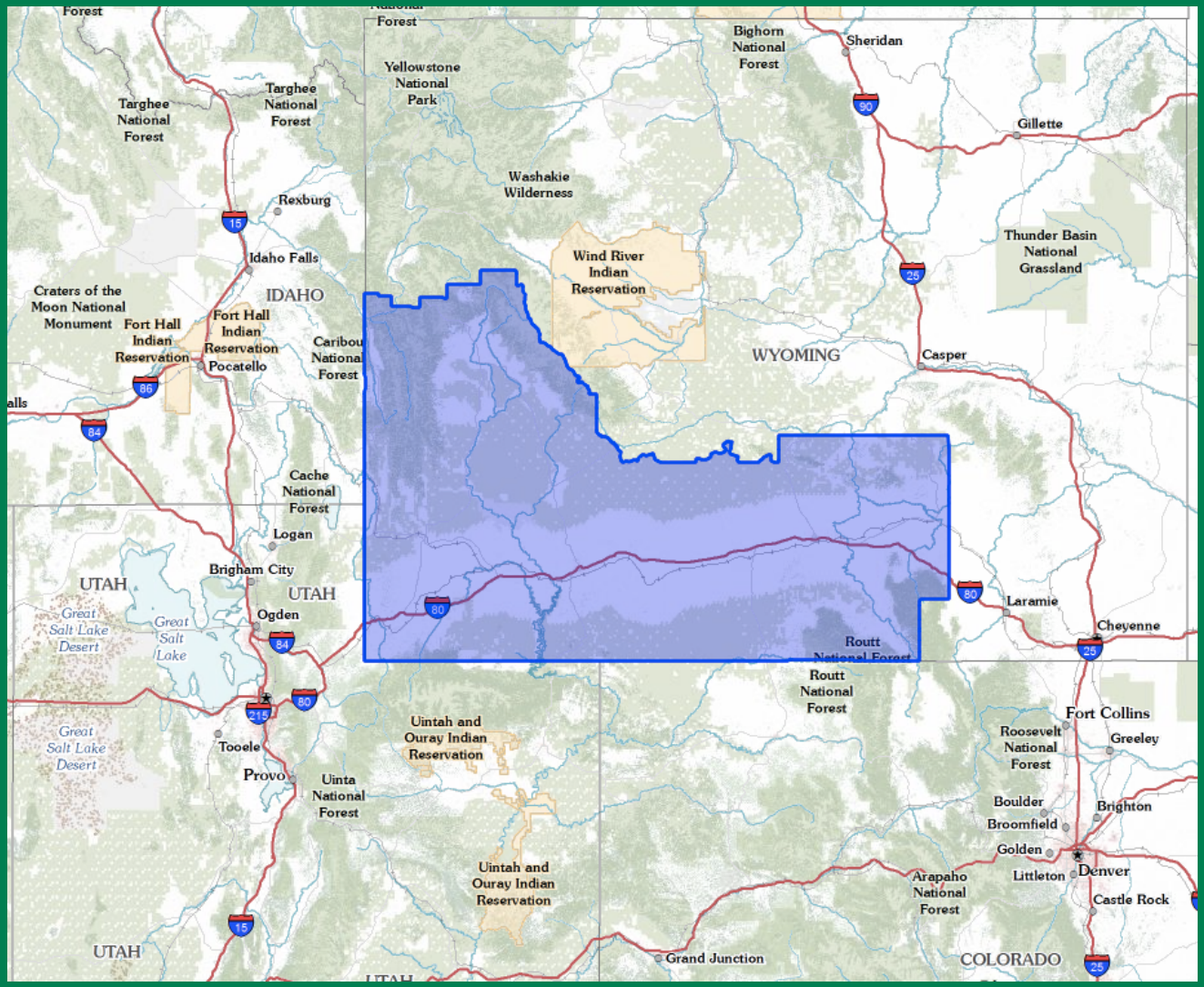
http://www.wlci.gov/



15 million acres

Size of Connecticut, Delaware, Massachusetts, and New Hampshire combined

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World Class Resources

- 4 million homes that could be heated annually by natural gas production
  - Estimated volume of recoverable natural gas in cubic feet: 83 trillion
- Over 750 wind turbines and growing with major new projects on public lands
- World-class wildlife
  - Estimated 100,000 deer and 100,000 pronghorn antelope
  - 40,000 elk; 8,000 moose; and 1,400 big horn sheep
  - 151 non-game species of greatest conservation need

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WLCI Partnership

Federal, State, and Local Governments
Nongovernmental Organizations
Landowners and other private citizens

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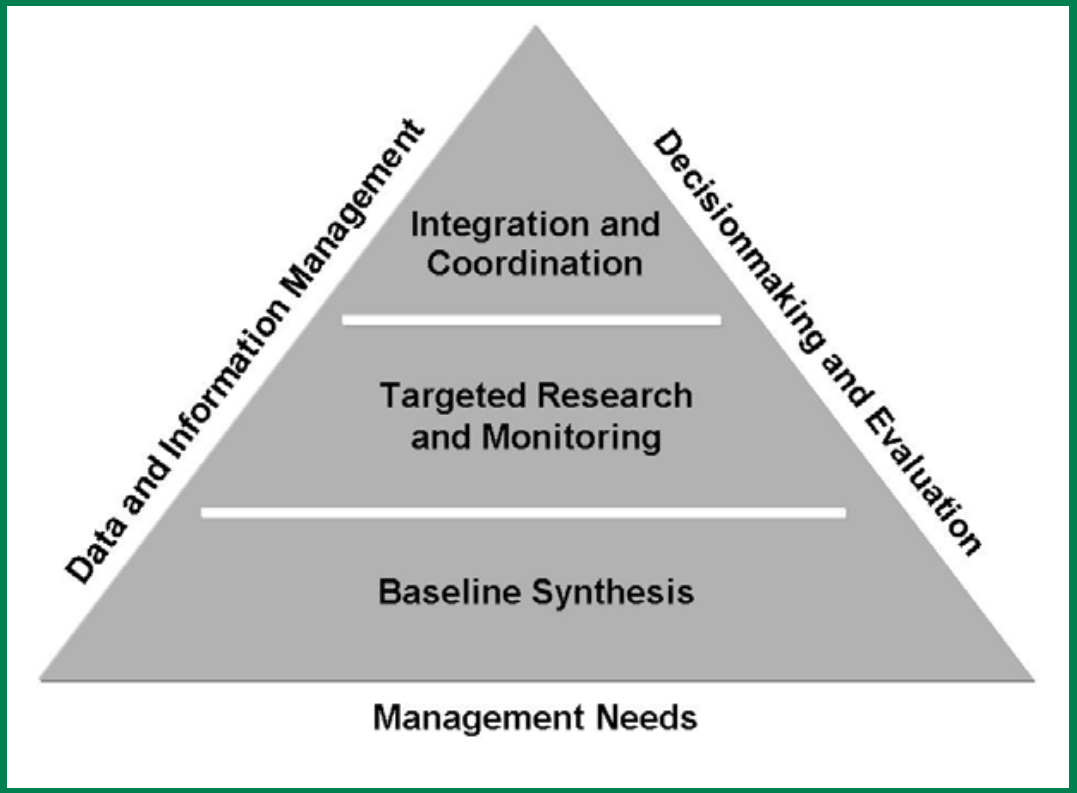
Role for USGS Science



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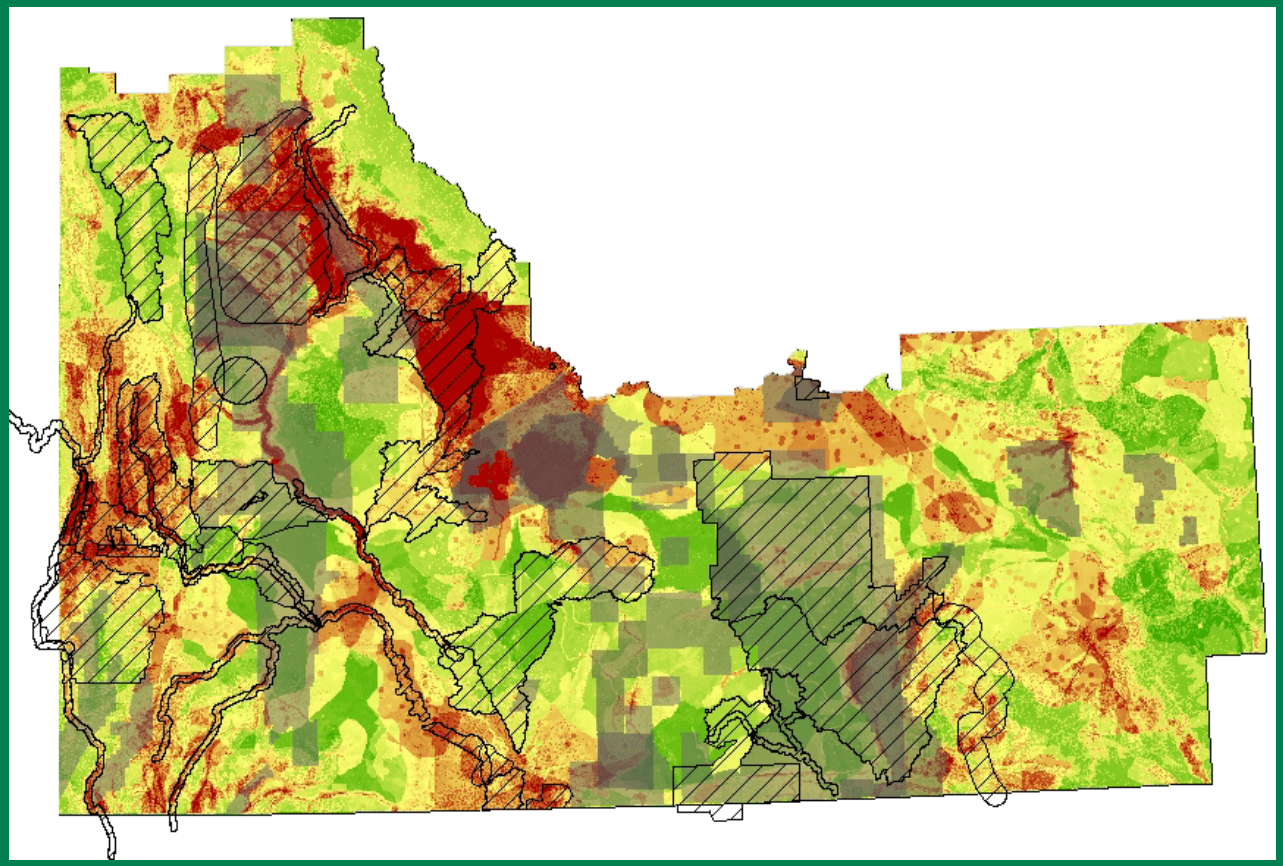
Role for USGS Science



areas of high resource value (red) and low potential for oil and gas development (no gray)
Assal, T. (USGS)

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Role for USGS Science

Science-assisted 5-year strategic habitat conservation planning for the WLCI area

"It's a whole lot more about scientists sitting down at a table with resource managers than it is about a fancy, whiz-bang tool."

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Habitat Projects

A [Diamond H Ranch Conservation Easement](#) - More Info »
Project: ScienceBase Project
Purchase a conservation easement on approximately 3,008 acres of private land classified as crucial...

B [Continental Peak Riparian Exclosure/Oregon Slough](#) - More Info »
Project: ScienceBase Project
Provides for reconstruction of a fence exclosure to enhance riparian and sensitive plant species habitat...

C [Baggs Juniper Treatments](#) - More Info »
Project: ScienceBase Project
Remove 100 acres of juniper.

D [Chicken Springs Archeology](#) - More Info »
Project: ScienceBase Project
Restoration and management of a large archaeological complex surrounding Chicken Springs/wetlands.

E [Continental Peak Riparian Exclosure/Pacific Creek](#) - More Info »
Project: ScienceBase Project
Provides for the reconstruction of an existing exclosure to improve riparian habitat along Pacific Creek...

F [Green River Riparian Corridor Cottonwood Restoration](#) - More Info »
Project: ScienceBase Project
Restoration and rehabilitation

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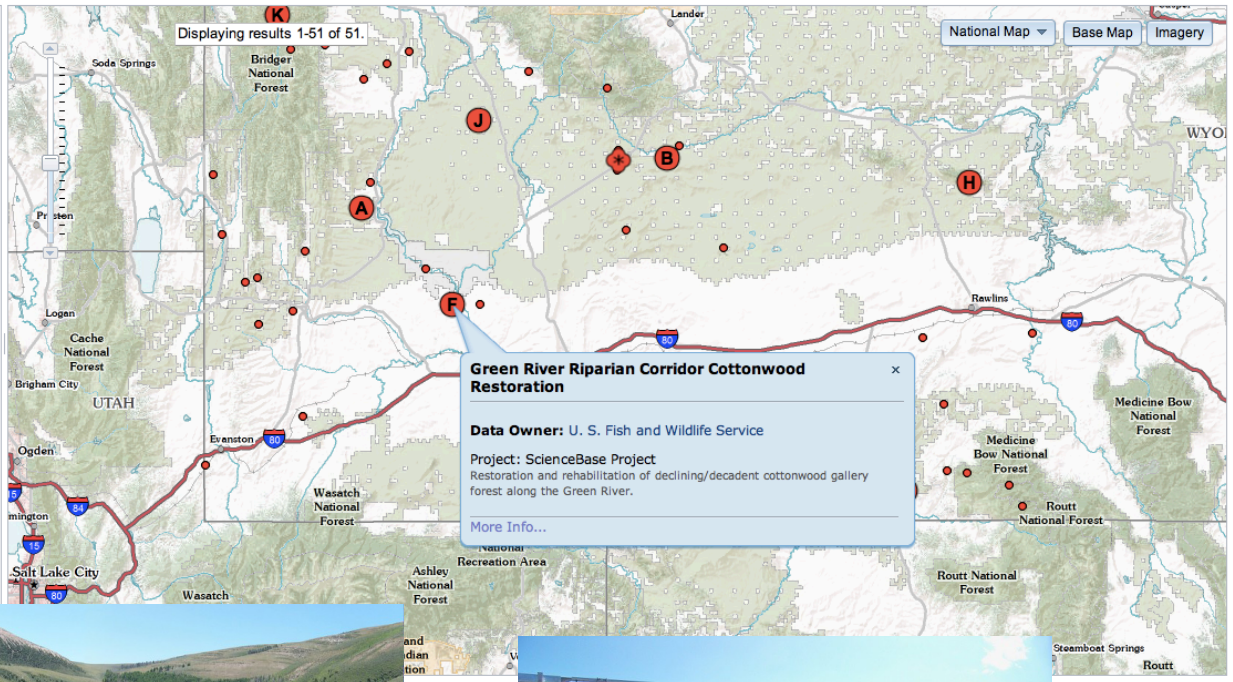

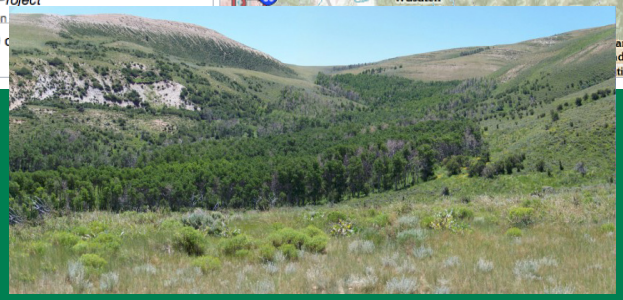

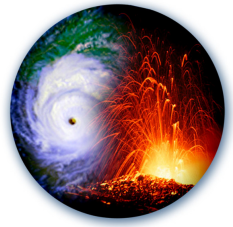

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Science Projects

A [Data and Information Management](#) - More Info »
Project: ScienceBase Project
Develop a data and information management framework, enabling researchers, decision makers, and the...

B [Terrestrial Monitoring - Sagebrush vegetation](#) - More Info »
Project: ScienceBase Project
Developing remote sensing protocols to allow spatial predictions of continuous cover estimates for...

C [Baseline Synthesis - Social and Economic Evaluation Supporting A...](#) - More Info »
Project: ScienceBase Project
Compile a basic social and economic assessment to provide a common context for the other issues...

D [Baseline Synthesis - Modeling Effects of Energy Development and ...](#) - More Info »
Project: ScienceBase Project
Create a useful set of conceptual models that will be used for 1) planning all subsequent inventory and...

E [Effectiveness Monitoring - Retrospective Vegetation/Cover Change](#) - More Info »
Project: ScienceBase Project
Mapping vegetation productivity from satellite imagery to determine effectiveness of vegetation...

F [Effectiveness Monitoring of Past Habitat Treatments](#) - More Info »

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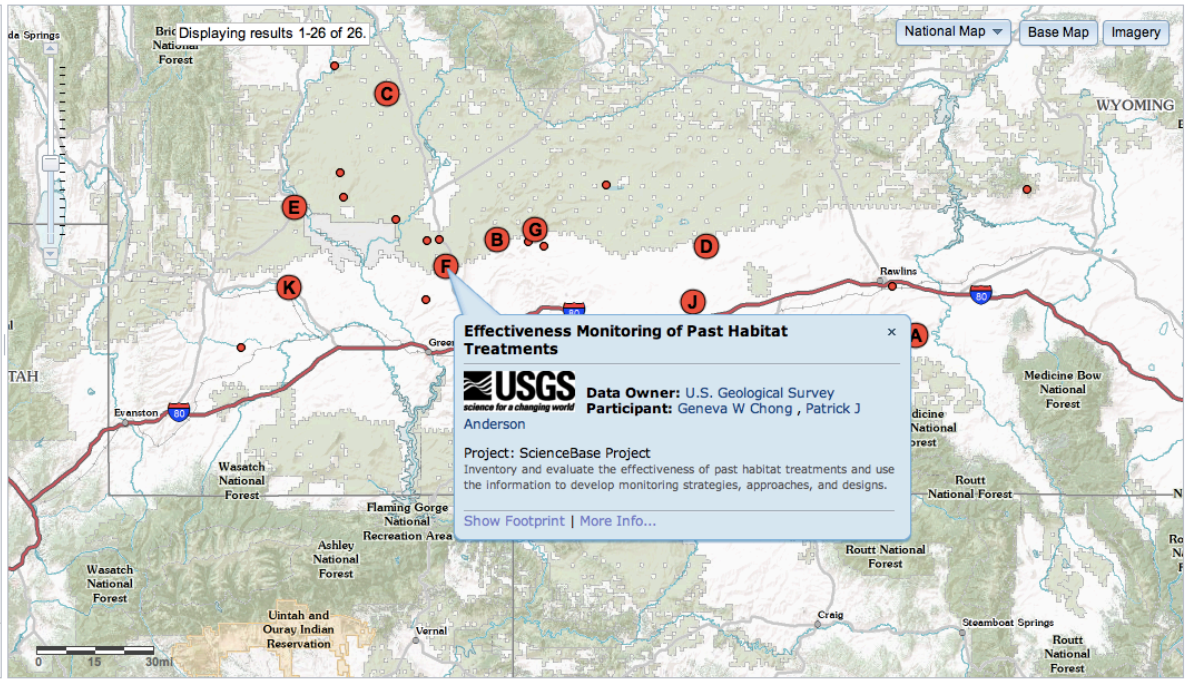

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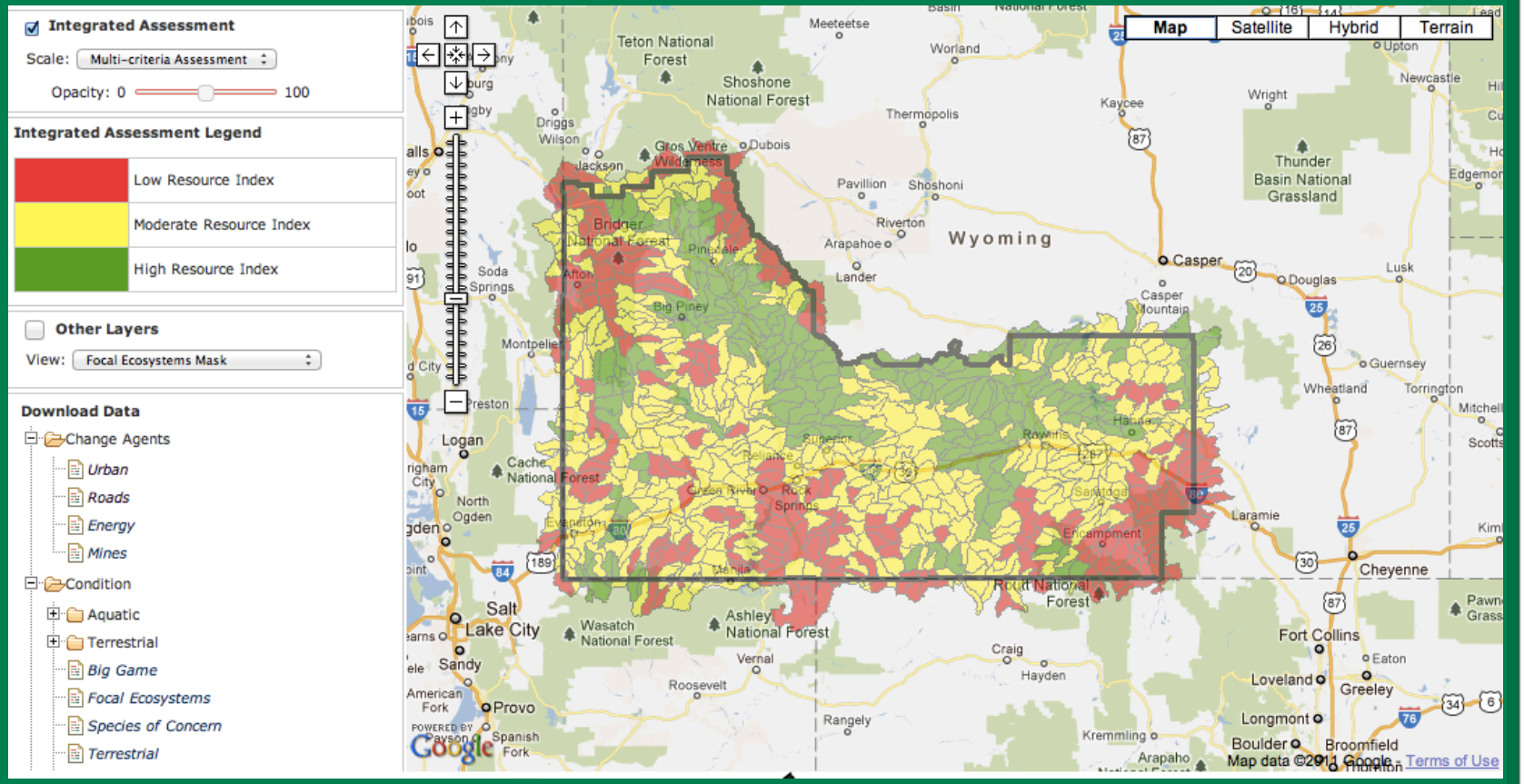
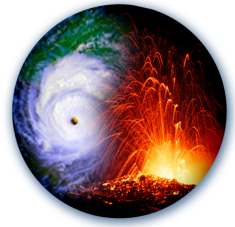
Integrated Assessment Tool





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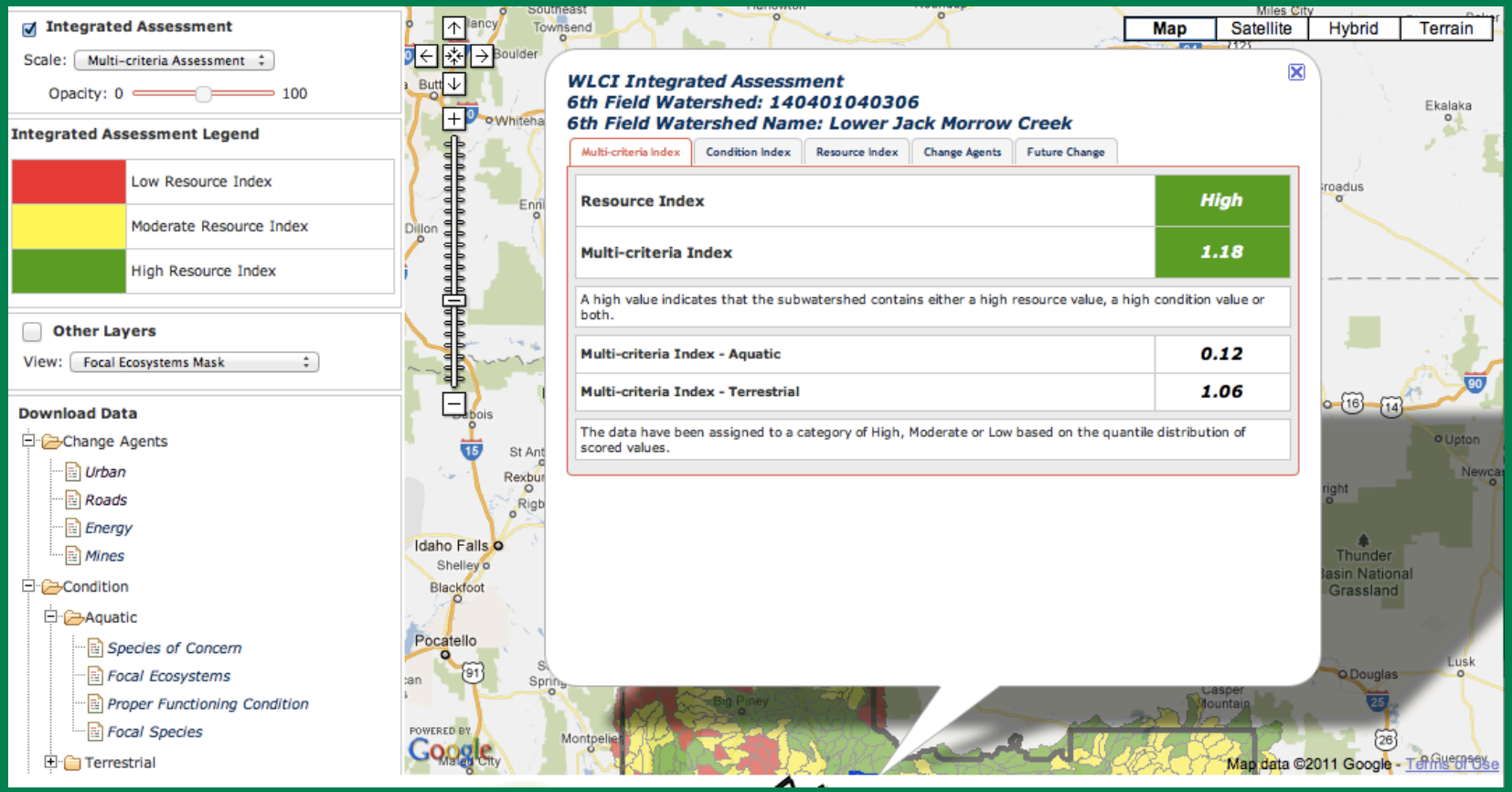

Multi-criteria index
Condition index
Resource index (combined energy, minerals, and habitat)
Change agents
Modeled future change

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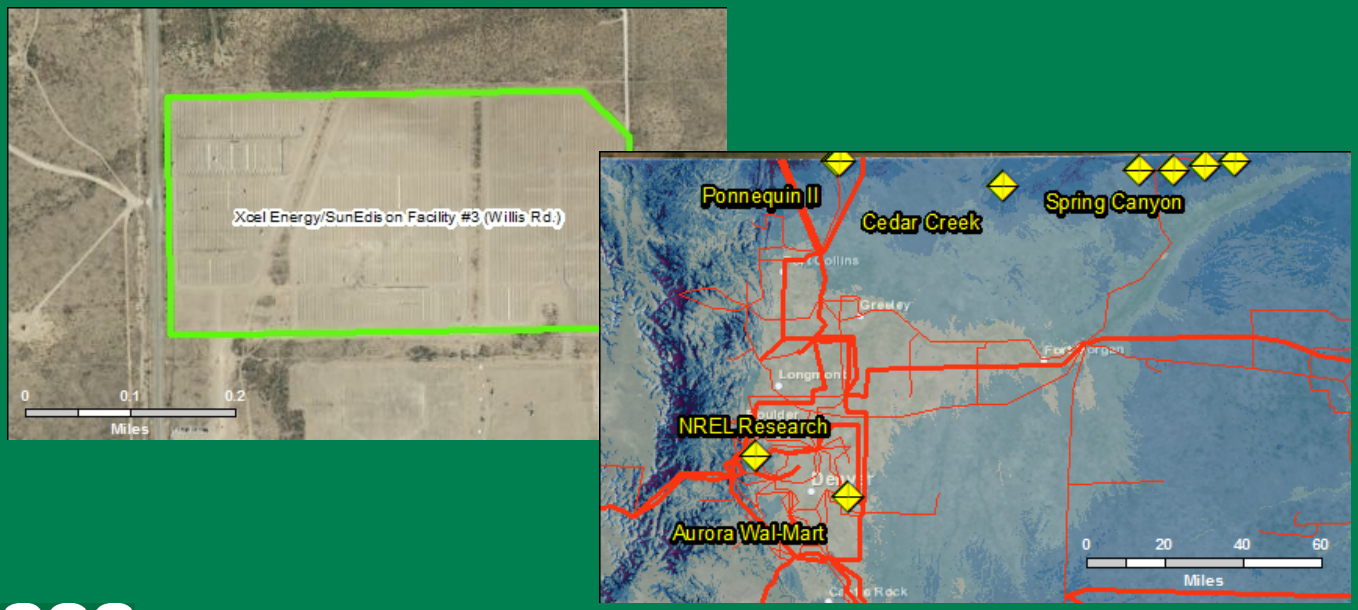
Energy and Environment in the Rocky Mountain Area

EERMA
Energy and Environment in the Rocky Mountain Area

Synthesized information and comprehensive tools to promote understanding tradeoffs of energy development - oil and gas (including shale gas and coal-bed methane), uranium, geothermal, wind, and solar



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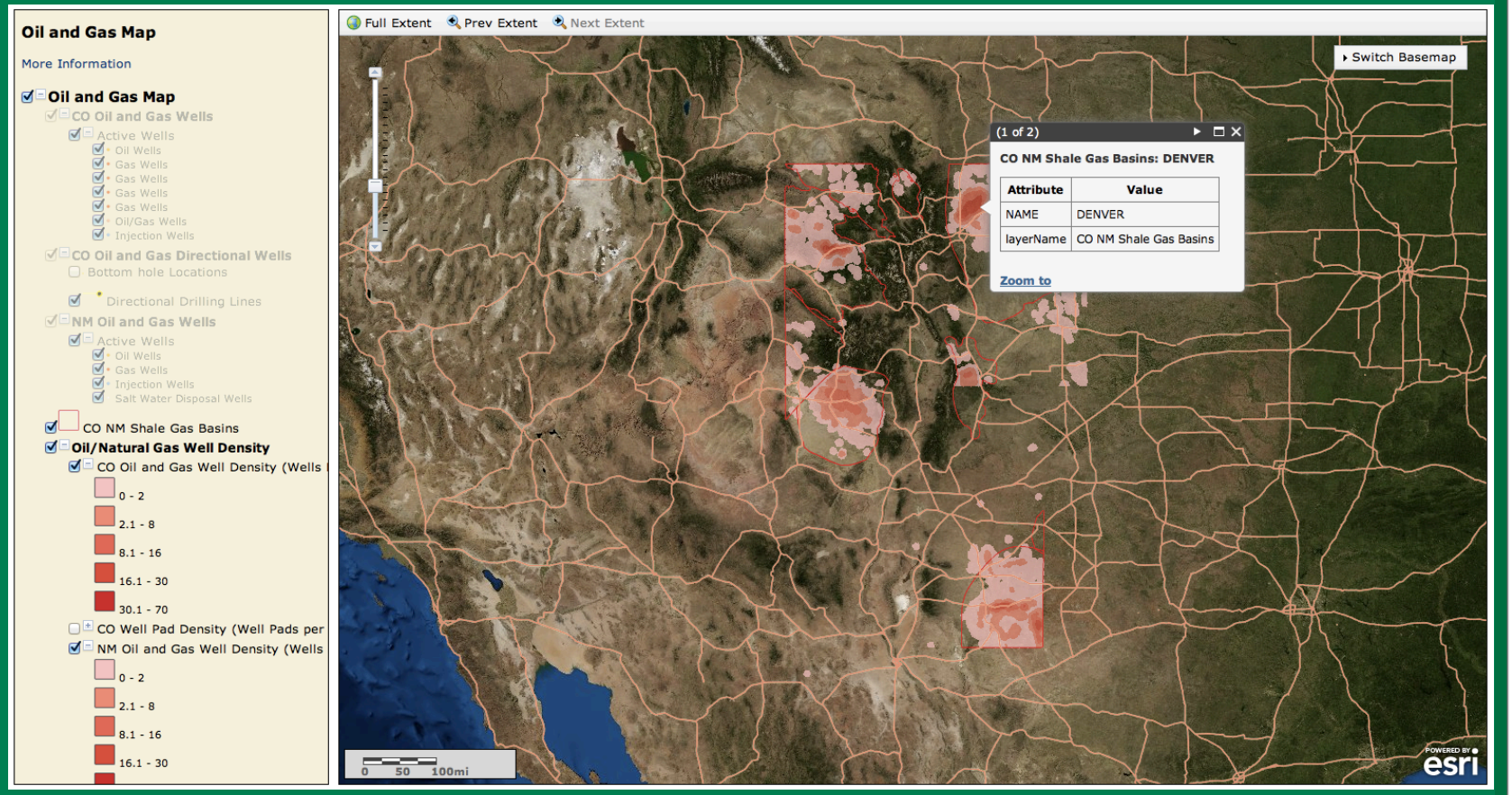
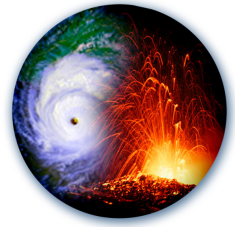
Interactive Energy Atlas





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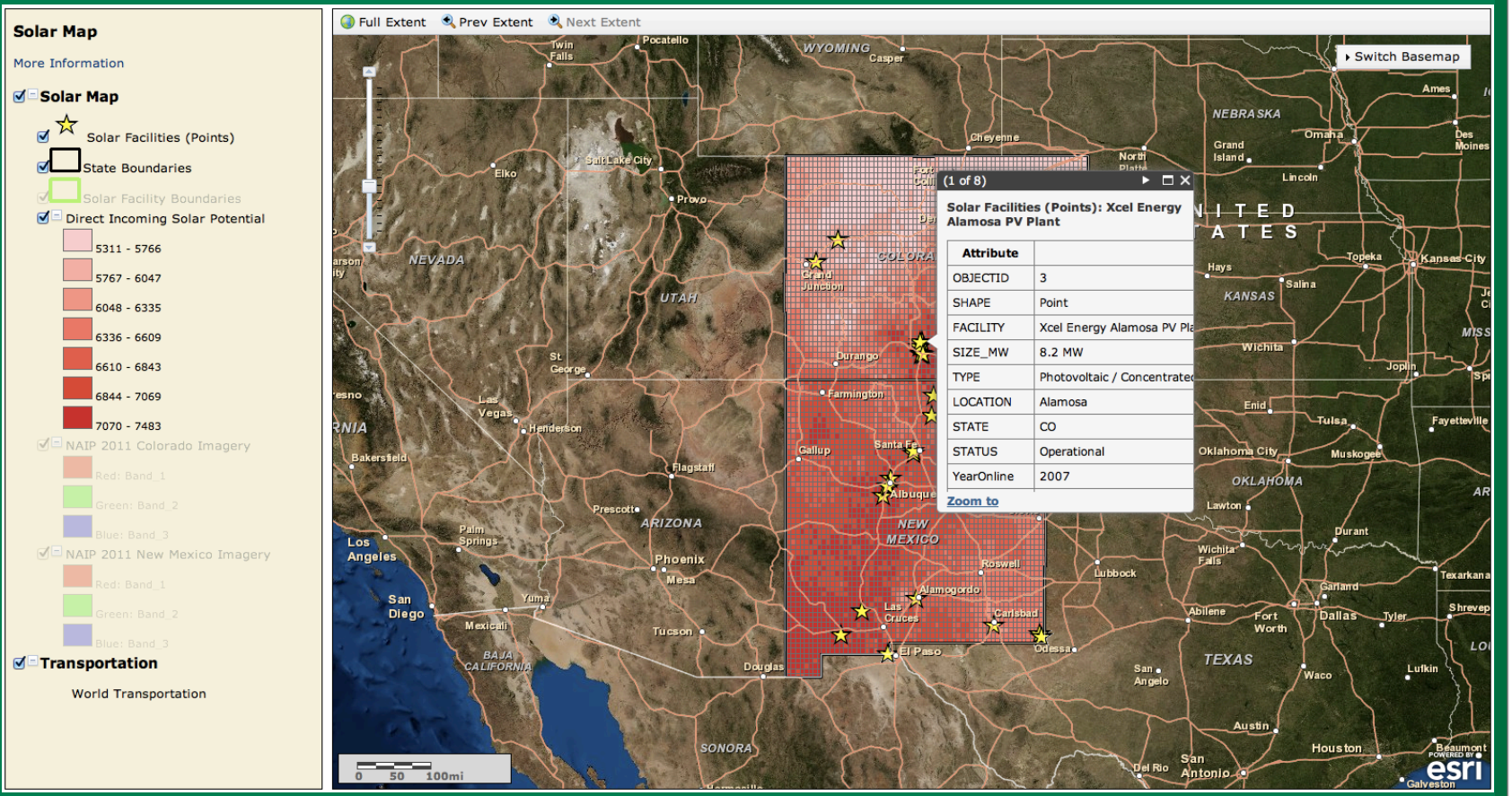

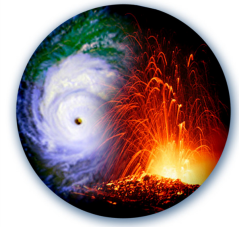

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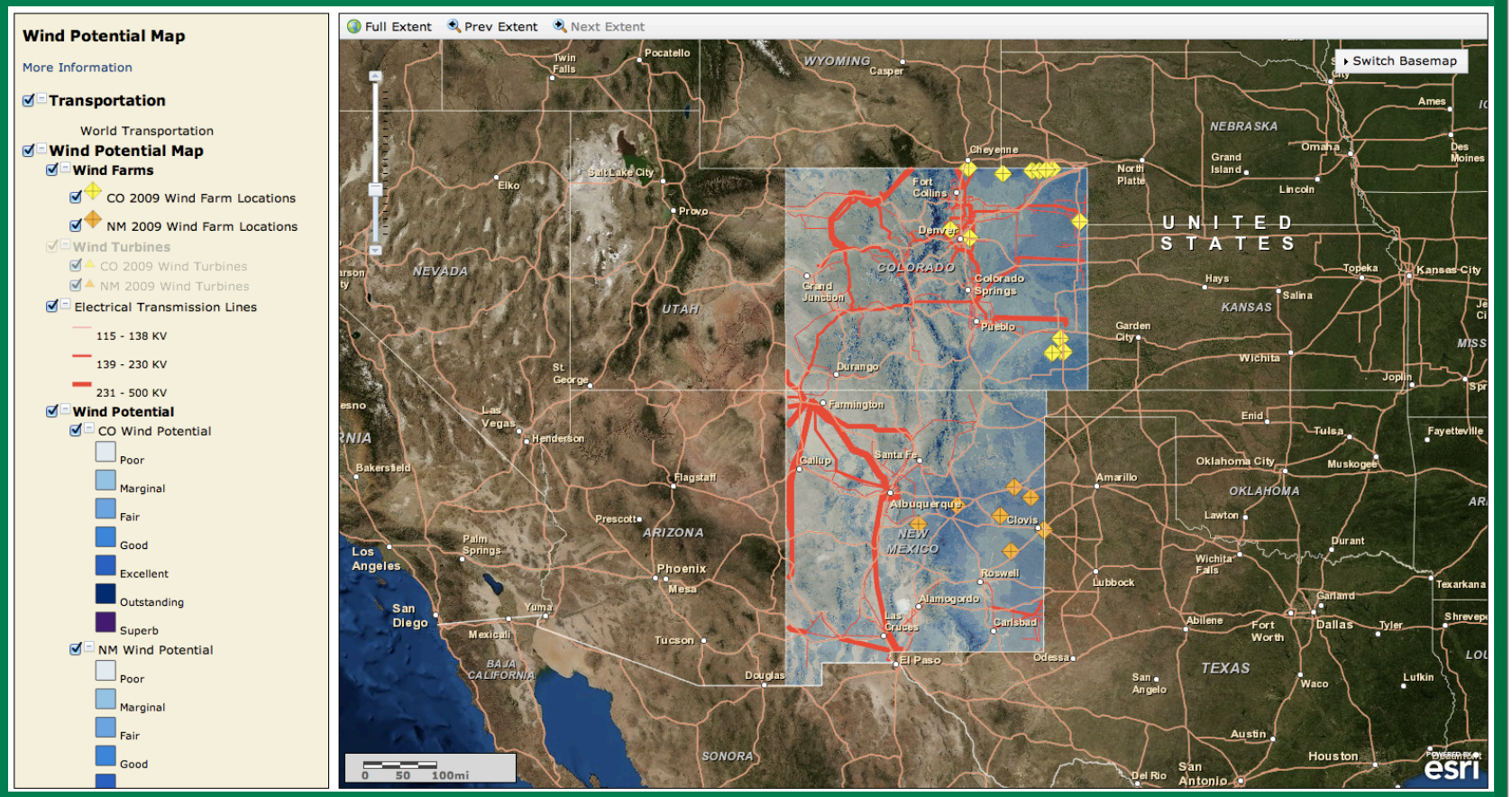

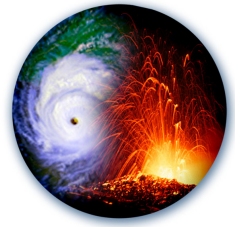

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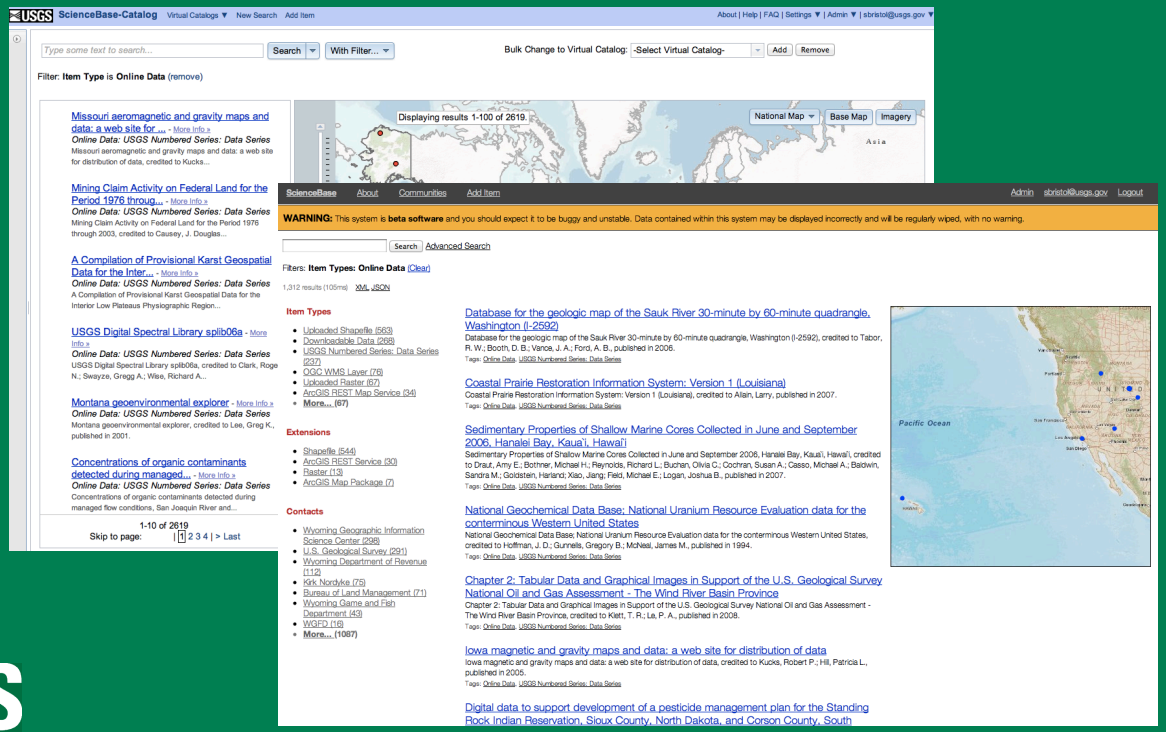
Powered by…

ScienceBase is an evolving scientific data and information management and web services platform for both data and data documentation across a broad range of resources. The diverse applications demonstrated here are powered by data services provided through ScienceBase.

http://www.sciencebase.gov/



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Greatest Needs for Progress and Sustainability

- Comprehensive and sustainable frameworks, methods, and institutional will for decision making stakeholders to be engaged throughout the "scientific knowledge lifecycle"
- Institutional commitment from data owners to keeping our data platforms and services as close to **state of the art** and as **open** as possible

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A few tech thoughts

- Consistent national grid for assessment criteria
- Scientific software engineering consistently in the global open source software marketplace
- Decision making application development out of the gray literature and published in some fashion

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Discussion

USGS Core Science Systems

Applied Earth Systems Informatics Research

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