IMPROVING FEDERAL ENERGY DEVELOPMENT DECISIONS: THE USE OF ECOSYSTEM SERVICE VALUATION

ROBERT WINTHROP
SOCIOECONOMICS PROGRAM
USDI BUREAU OF LAND MANAGEMENT, WASHINGTON, DC.

INTEGRATING ECOSYSTEM SERVICES INTO ENERGY DEVELOPMENT PLANNING AND MITIGATION
ACES AND ECOSYSTEM MARKETS 2012
NATIONAL SYSTEM OF PUBLIC LANDS

Public Lands Managed by the Bureau of Land Management (BLM)

The Bureau of Land Management (BLM) manages 249.7 million acres of surface and subsurface mineral estate, and over 300 National Monuments, National Conservation Areas, and other resources.

In the Eastern United States, the BLM manages 39.7 million acres of surface and subsurface mineral estate, and over 300 National Monuments, National Conservation Areas, and other resources.
Public Lands, On-Shore Federal and Indian Minerals* in Lands of the U.S.
Responsibilities of Bureau of Land Management - Lower 48 States

- Of the approximately 700 million acres of Federal mineral estate, about 165 million acres have been withdrawn from mineral entry, leasing and sale, except for valid existing rights.
- Salable minerals e.g. sand and gravel basically are the responsibility of each Federal surface management agency.
- The map depicts only Indian reservations at least 25,000 acres in size, not all Indian trust lands.

Categories of Lands
- BLM - Surface and Minerals (261 million ac)
- Other Federal Lands - Minerals (300 million ac)
- Non-Federal Surface (includes 58 million ac of Split - Estate Federal Minerals)
- Indian Trust Lands (56 million ac) except Mineral Operations for Osage Minerals
- BLM Administration Boundaries

No warranty is made as to the accuracy, reliability, or completeness of these data, or as to the result to be obtained by their use.

Produced By:
WO-270, Leonard Gore, Jr. (Graphics)
WOC-550, Mei Ling Oning (Data)
Documentation available in the September 2003
BUILDING INSTITUTIONAL CAPACITY TO USE ECOSYSTEM SERVICES INFORMATION

- Technical capacity to assess and value ecosystem services in routine decision-making
  - BLM-USGS ecosystem services pilot studies
- Consistent metrics, models, and tools for the use of ecosystem services information
  - National Ecosystem Services Partnership activities
- Landscape-scale data analysis and planning
  - BLM’s Rapid Ecoregional Assessments
- A decision framework for energy development which includes regional assessment and offsite mitigation
  - BLM Solar Regional Mitigation Planning
BLM-USGS ECOSYSTEM SERVICES PILOT STUDIES

- Phase I: Comparative assessment of ecosystem services valuation methods and tools
  - Focus: feasibility
  - Setting: San Pedro watershed, SE Arizona

- Phase 2: Estimation of ecosystem services flows and values for a complex resource planning decision
  - Focus: usefulness for decision-making
  - Setting: Moab, Utah Master Leasing Plan
PROJECT DESIGN (PHASE 1 – SAN PEDRO)

Services:
- Carbon
- Water
- Biodiversity
- Cultural

Tools:
- InVEST
- ARIES
- Other Methods

Scenarios:
- Mesquite Removal
- Urban Growth
- Water Augmentation
**San Pedro Study Area**

- 2,800 sq mi headwater of Lower Colorado River Basin: undammed, perennial flow
- Substantial previous research
- Ecologically important
- Well organized stakeholders
- Environmental concerns
- The study is only intended to inform BLM decisions, not governance of the whole watershed.
InVEST: Integrated Evaluation of Ecosystem Services and Tradeoffs

- InVEST is a family of free tools to map and value ecosystem goods and services
- Runs in ArcGIS
- Developed by the Natural Capital Project (WWF, TNC, Stanford University, and University of Minnesota)
ARIES: ARTIFICIAL INTELLIGENCE FOR ECOSYSTEM SERVICES

- ARIES is a free application for mapping and valuing ecosystem services
- Web-based application
- Incorporates probability estimates and maps flows of services
- Funded by NSF; developed by a consortium including UNEP, University of Vermont, and Conservation International
CRITERIA FOR EVALUATING TOOLS/METHODS

1. Does it measure ecosystem services or ecological processes?
2. Time requirements?
3. Open source?
4. Current level of development?
5. Scalable & generalizable?
6. Ability to incorporate multiple valuation perspectives?
7. Responsive to scenarios of potential change?
RESULTS: ARIES & InVEST Models

InVEST
- Carbon storage (tons)
- Combined surface and groundwater
- Biodiversity
- No uncertainty measure

ARIES
- Carbon storage ($)
- Surface water only
- No biodiversity model
- Includes uncertainty measures
SCENARIO RESULTS: MESQUITE MANAGEMENT

InVEST

Change in carbon storage

Change in water yield

Change in habitat quality

Water yield (cubic meters)

Habitat quality (relative...
CONCLUSIONS

- The methods and tools varied greatly in the time required for analysis.
- Well-defined scenarios and appropriate datasets are essential for models to produce useful results.
- Significant opportunities exist to reduce project-by-project time and data requirements.
- The capabilities and usability of ecosystem services tools, including ARIES and InVEST, are rapidly improving.
# Key Variable: Time Requirements vs. Added Information

<table>
<thead>
<tr>
<th>Method/Tool</th>
<th>Est. hours, pilot study</th>
<th>Est. hours with high-quality data</th>
<th>Relative amt. of information provided</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesis of past primary valuation</td>
<td>60</td>
<td>20</td>
<td>Moderate</td>
<td>Time needed for review and synthesis of the literature; could be greater in areas where more studies have been completed (for example, Pacific Northwest).</td>
</tr>
<tr>
<td>Value transfer</td>
<td>10</td>
<td>10</td>
<td>Low</td>
<td>Estimate for the Wildlife Habitat Benefits Estimation Toolkit. Time requirements would be substantially greater to build new transfer functions, particularly if using a Bayesian approach.</td>
</tr>
<tr>
<td>Ecosystem Services Review</td>
<td>10</td>
<td>10</td>
<td>Low</td>
<td>Can be completed quite quickly but does not provide quantitative results; time to completion could be several times greater if a large number of stakeholders are involved.</td>
</tr>
<tr>
<td>InVEST (3 ecosystem services)</td>
<td>250</td>
<td>40</td>
<td>High</td>
<td>Time to complete could be drastically reduced with system for sharing data and underlying model assumptions.</td>
</tr>
<tr>
<td>ARIES (4 ecosystem services)</td>
<td>800</td>
<td>40</td>
<td>Highest</td>
<td>Included time to customize and extensively debug models, which will not be necessary for future applications. Spatial data management system reduces data input needs in future applications.</td>
</tr>
</tbody>
</table>

No tool performs perfectly against all 7 evaluative criteria; suggests a time and place for different tools.
**BLM-wide Outcomes**

<table>
<thead>
<tr>
<th>Feasible for immediate agency-wide use</th>
<th>• Ecosystem Services Review, Wildlife Habitat Benefits Estimation Toolkit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasible for agency-wide use given development of supporting databases</td>
<td>• Primary Valuation, Point Transfer, Function Transfer, InVEST</td>
</tr>
<tr>
<td>Feasible for agency-wide use given pending development of global models or expanded underlying datasets</td>
<td>• ARIES, EcoServ, SolVES</td>
</tr>
<tr>
<td>Proprietary tools, feasible for use in high-profile cases where contracting with consultants is possible</td>
<td>• EcoAIM, EcoMetrix, ESV Value, NAIS</td>
</tr>
<tr>
<td>Place-specific tools that require extensive developer support</td>
<td>• Ecosystem Portfolio Model, Envision, MEASURES, MIMES</td>
</tr>
</tbody>
</table>
BLM-USGS Pilot Project Phase 2

- Emphasis on assessing the usefulness of ecosystem service valuation for BLM’s resource management decisions.
- Project focus: the Moab (Utah) Master Leasing Plan EIS.
- Contending uses include oil and gas development, potash mining, recreation, and scenic values.
- Ecosystem services in study: ground water and scenic values.
- Project is characterized by very high scenic and recreational values, and a sensitive policy context.
The partnership is developing a work program with federal agencies to collaboratively develop guidance to make the use of ecosystem services more routine and tractable for resource managers.

The objective is to develop a framework with methods and metrics –
- that are transparent, consistent and comparable at a national level,
- can also be applied at local and regional scales with relevant region-specific information.
BLM’s Rapid Ecoregional Assessments

- REAs look across an ecoregion to more fully understand:
  - ecological conditions and trends;
  - natural and human influences; and
  - opportunities for resource conservation, restoration, and development.
- REAs assess at a landscape scale: the current REAs range from 11 to 91 million acres.
- REAs describe and map *conservation elements*, areas of high ecological value.
- REAs gauge the potential of these habitats to be affected by environmental *change agents*.
- REAs also help identify areas that do not provide essential habitat and are not ecologically intact or readily restorable.
Rapid Ecoregional Assessments

The BLM launched seven REAs in 2010. This map shows the general outlines of the ecoregions being assessed.

1. Middle Rockies
2. Northwestern Glaciated Plains-Northwestern Great Plains
3. Central Basin and Range
4. Colorado Plateau
5. Mojave Basin and Range
6. Sonoran Desert
7. Seward Peninsula-Nulato Hills-Kotzebue Lowlands
MOJAVE BASIN & RANGE REA
50,000 SQUARE MILES; 14 BLM FIELD OFFICES
Mohave Basin & Range REA: Management Questions

- Native Plant Communities (4)
- Terrestrial Sites of High Biodiversity (3)
- Aquatic Sites of High Biodiversity (3)
- Specially Designated Areas of Ecological Value (1)
- Grazing, Wild Horses and Burros (7)
- Soils (3)
- Surface and Subsurface Water Availability (6)
- Aquatic Ecological Function and Structure (2)
- Fire History (2)
- Fire Potential (2)
MANAGEMENT QUESTIONS (2)

- Invasive Species (5)
- Urban and Roads Development (5)
- Oil, Gas, and Mining Development (6)
- Renewable Energy Development (4)
- Groundwater Extraction and Transportation (5)
- Surface Water Consumption and Diversion (5)
- Climate Change: Terrestrial Resource Issues (6)
- Climate Change: Aquatic Resource Issues (5)
- Military Constrained Areas (3)
- Atmospheric Deposition (1)
FRAMEWORK FOR MANAGING OFFSITE MITIGATION

- BLM’s policy on offsite mitigation (Instruction Memorandum 2008-204)
- Solar Programmatic Environmental impact Statement (six southwestern states)
- Solar Regional Mitigation Planning
  - Intended to mitigate unavoidable adverse impacts associated with developing and operating utility-scale solar power generation facilities on public lands
Summary of Participant Feedback [. . .]

- In addition to ensuring that the SRMP process continues to provide incentives for development in SEZs (and, conversely, doesn’t create any disincentives), BLM should establish metrics for measuring this outcome.
CONTACT INFORMATION

Rob Winthrop, Senior Social Scientist, Division of Decision Support, Planning, and NEPA, USDIF Bureau of Land Management, Washington, DC.
Phone: 202-912-7287;
email: rwinthro@blm.gov.
THANK YOU!

QUESTIONS?