Genies in the Bottle: Tools to Assess Landscape Health & Predict Benefits of Conservation Strategies

LANDFIRE Tools, Remote Sensing, Predictive Models & Cost-Benefit Assessment

Enhanced Conservation Action Planning

- **Identify Conservation Targets**: Map ecological systems across the landscape, using satellite imagery and remote sensing.
- **Assess Viability**: Use landscape level measures of ecological condition – to evaluate ecological condition:
  - Departure of each ecosystem from its natural range of variability
  - “High risk” vegetation classes
- **Assess Future Threats**: Use predictive ecological models to assess potential future impairment
- **Develop Conservation Strategies**:
  - Develop alternative management strategies to improve ecological condition and abate future threats
  - Run computer simulations to test if strategies achieve desired results
  - Evaluate which scenarios achieve the highest return on investment

Benefits & Constraints

- Works for large, relatively unfragmented landscapes ~100,000 to 1,000,000+ acres
- Only as good as the data; often requires investment in remote sensing to interpret LANDSAT or other satellite imagery
- Works for terrestrial and wetland ecosystems; aquatic systems require supplementary assessment
- Complements existing public agency land management plans
- Provides solid science foundation for federal agency NEPA assessments and funding requests

Bodie Hills & Mono Basin, California

“If you had a dollar to spend on conserving your public lands, where would you invest it first?”

TNC staff are posing this question to public land managers in the Great Basin and Mojave Desert. Land managers at the Bureau of Land Management’s Bishop Field Office wanted the answers for a 200,000 acre project area in California’s Bodie Hills and Mono Lake basin.

To answer the question, CAP Coaches Greg Low and Susan Abele, working with Dr. Louis Provencher, TNC-Nevada’s Director of Conservation Ecology, deploy their “Enhanced Conservation Action Planning” toolbox. A case study of their work with BLM and local partners is described on the back side.

Susan, Greg and Louis report that the National Park Service is now contracting with TNC to apply the Enhanced CAP tools for Great Basin National Park, which encompasses desert floor to alpine habitats... as are the U.S. Forest Service and BLM for 200,000 acres of “basin and range” lands in eastern Nevada. The U.S. Fish & Wildlife Service has also expressed interest for the 1.5 million acre Desert National Wildlife Refuge, the largest wildlife refuge in the lower 48 states.
CASE STUDY: Bodie Hills Conservation Action Plan

- The current condition of the ecological systems varies widely in terms of their departure from their natural range of variability.

<table>
<thead>
<tr>
<th>Ecological System</th>
<th>Ecological Condition: Departure from NRV</th>
<th>Relative % of High Risk Vegetation Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpine</td>
<td>Very Slight</td>
<td>n/a</td>
</tr>
<tr>
<td>Tobacco Brush</td>
<td>Very Slight</td>
<td>n/a</td>
</tr>
<tr>
<td>Montane-Subalpine Riparian</td>
<td>Slight</td>
<td>Very Low</td>
</tr>
<tr>
<td>Mountain Mahogany</td>
<td>Slight</td>
<td>Very Low</td>
</tr>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>Slight</td>
<td>Moderate</td>
</tr>
<tr>
<td>Juniper Savanna</td>
<td>Moderate</td>
<td>n/a</td>
</tr>
<tr>
<td>Low Sagebrush</td>
<td>Moderate</td>
<td>Very Low</td>
</tr>
<tr>
<td>Mountain Shrub</td>
<td>Moderate</td>
<td>Very Low</td>
</tr>
<tr>
<td>Stable Aspen</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Wet Meadow</td>
<td>Moderate</td>
<td>Very Low</td>
</tr>
<tr>
<td>Basin Wildrye-Big Sagebrush</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Montane Sagebrush Steppe</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Seral Aspen</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Wyoming Big Sagebrush-Loamy</td>
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</tr>
<tr>
<td>Wyoming Big Sagebrush-Sandy</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Condition of Bodie Hills-Mono Lake Basin ecological systems as measured by departure from natural range of variability -- using LANDFIRE methodology and ecological models, and % cover in high risk vegetation classes (e.g. invasive species).

- Several ecological systems are predicted to become further impaired over the next 20 years without good management.

Predictive ecological models indicate that about half of the ecological systems will become further departed from their natural range of variability, and several systems will have substantial increases in “high risk” vegetation classes, such as cheatgrass and invasive weeds.

- Alternative strategies were tested using state-and-transition models to predict future outcomes.

Shown below is a Strategy Worksheet with actions, acres and costs for restoring the Montane sagebrush steppe, the matrix ecosystem in the Bodie Hills landscape.

- Somewhat surprisingly, the predicted climate change impacts generally had nominal effects.

The key factor explaining these results was that increased adverse effects of CO2 enrichment (e.g. “fertilizer” for cheatgrass) were cancelled out by decreased soil moisture due to predicted increased droughts.

- Using a combination of ecological benefits and acres impacted, the basin wildrye, aspen, montane sagebrush, wet meadows and riparian ecological systems accrued the highest “return on investment.”

To help prioritize resource allocation, metrics were used to show which management scenarios achieved the greatest ecological benefits per dollar invested, as compared to minimal management.

Group formed to study Bodie Hills

By Ken Koerner

Computer modeling, evidence of drought patterns from Middle Ages and other data to help plan for area’s eco-management.

Inyo Register, July 19, 2008

“People appreciate the opportunity to come and participate in an open dialogue on such projects. It increases the public’s comprehension of the variety of land management issues our agency must consider.”

Dale Johnson,

Vegetation Management Planner
BLM, Bishop Field Office