An Adaptation Portfolio Approach to Managing Climate Risk
Managing Climate Risk

• Identifying the risk

• A framework for considering change

• Spreading the risk with a portfolio of strategies

• Making it spatial
What are we concerned about?

- Loss of biodiversity?
- Loss of ecosystem services?
- Loss of the legacy of a century of conservation?
- The benefits of wildland ecosystems.
What makes a wildland wild?

From Section 2(c) of the Wilderness Act:

A wilderness…is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in the Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which…generally appears to have been affected primarily by the forces of nature…
<table>
<thead>
<tr>
<th>Wildland Qualities</th>
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<tbody>
<tr>
<td>Earth and its community of life</td>
</tr>
<tr>
<td>Primeval character</td>
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<tr>
<td>Natural conditions</td>
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Wildland Qualities

Earth and its community of life
Primeval character
Natural conditions

= Ecological condition
(Wholeness or “historical fidelity”)

Untrammeled by man
Primeval influence
Affected primarily by the forces of nature
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<td><strong>Freedom from human control</strong></td>
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# Dimensions of Wildness

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<tr>
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<th>Ecological Condition</th>
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<tbody>
<tr>
<td>Controlled</td>
<td>Novel</td>
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<tr>
<td></td>
<td>Downtown</td>
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<tr>
<td>“Self-willed”</td>
<td>Controlled</td>
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<tr>
<td></td>
<td>Vacant Lot</td>
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<td>Fire-excluded Ponderosa Pine Forest</td>
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<td></td>
<td>Pine Plantation</td>
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<td>Curtis Prairie</td>
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<td>Arctic Refuge</td>
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<td>Chesapeake Bay</td>
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<td>C&amp;O Canal</td>
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<td>Everglades</td>
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</tbody>
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- Pristine
- Novel
- Controlled
- “Self-willed”
“Directions” of Management

Ecological Condition

Freedom from Control

“Self-willed”

Controlled

Drift

Recovery

Transformation

Restoration

Novel

Pristine

Ecological Condition
Global Change: The End of Recovery?

Pressure of Global Change:
- Warming
- Invasives
- Fragmentation

Ecological Condition

Freedom from Control
- "Self-willed"

Controlled

Accept Change

Guide Change

Resist Change

“Novel”

Pristine
Choices in the face of climate change

Accept change: Observation only

Resist change: Restoration

Guide change: Innovation and experimentation
“We might feel confident of broad-scale future environmental changes (such as global mean temperature increases), but we cannot routinely predict even the direction of change at local and regional scales (such as increasing or decreasing precipitation).”

Millar et al. (2007)
“Managing in the face of uncertainty will require a portfolio of approaches, including short-term and long-term strategies, that focus on enhancing ecosystem resistance and resilience…as climates and environments continue to shift.”

Millar et al. (2007)

“A portfolio of adaptation and mitigation measures can diminish the risks associated with climate change.”

IPCC Adaptation Report
An Experimental Landscape Approach: Making It Spatial

Observation only in some places (both treatment and control)

Restoration in some places ("Keeping all the parts")

Innovation in some places (novel conservation)

Integrated across the landscape in a cohesive experiment
Principles of Allocation

- Representation
- Connectivity across gradients
- Configuration
An illustration
Spatial Logic Model

Graphic from a Conservation Biology Institute presentation
Multi-Criteria and Multi-Objective Decision Analysis
How does that affect us today?

1) Crosswalking your adaptation strategies
   1) Does it map well with one, two, or all three zones?

2) Geographic Considerations
   1) What data would you combine to map your strategy?
   2) What strategies are incompatible?
   3) What strategies are synergistic?
Shareable and Customizable

Choose Study Area of Analysis (in this .gdb)
D:\GIS\Projects\LandAdvisor\LandAdvisor_SierraNevada

When choosing the study area, select from the areas in
\Inputs_to_Run\study_and_reference_areas.gdb

Analysis Cell Size
1000

- Geocoding Tools
- Geostatistical Analyst Tools
- LandAdvisor_SierraNevada
  - Pre-Processing
    - Pieces
      - a0004-make-folders
      - a0005-make-geodatabases
      - a0010-copy-data-to-inputs-source-from-USFS-Library
      - a0020-copy-non-USFS-allocation-data-to-inputs-source
      - a0030-make-layers-out-of-fields
      - a0035-make-angular-boundary-files
      - a0037-make-planning-units
      - a0040-make-rasters-out-of-shapefiles
      - a0050-Clip-to-Study-Area
Opportunity for “Collaborative GIS”

Data and Model Sharing Repositories

- Climate Adaptation Portfolio SDSS
- Forest Planning SDSS
- Forest Management SDSS
- Other SDSS

- Vulnerability Assessments / Adaptation Strategies
- Allocations Analysis
- Ecological Condition (e.g. NRV)
- Ecosystem Service Analyses
- Fire Management Zones
- Other Analyses

Multiple sub-Attributes

Conclusion

Spatial allocation of adaptation strategies and philosophies
Resilience: all three zones
Minimize interference, maximize synergy
  – Large contiguous zones
  – Connected across climate gradients
GIS synthesis approach
Data and model sharing repository
Take home:
  – Crosswalking your Adaptation Strategies
  – Geographic considerations
Spatial
Not placed willy nilly
But rather clumped in management approaches that are compatible with each other.
  – Minimize counter impacts.
  – Minimize edge effects
  – Minimize unanticipated consequences

Working a on a way
Clearly distinguish the three zones
Request: Crosswalk
Intro: GIS synthesis approach
Request: Data and model sharing repository
GIS Screengrabs

parameters

- Multi-scale Analysis
  - Multi planning unit
  - Multi-resolution
  - Multi-extent