ARE FEDERAL LAND MANAGERS READY AND SET FOR STEWARDING ECOLOGICAL TRANSFORMATION?

April 24, 2019
POST-IT NOTE ACTIVITY

Ecological Transformation is…

Or

My question about directing ecological change is...

Let us know your thoughts:
1. Write one idea per sticky note
2. Post your sticky note under the associated question
3. Use as many notes and ideas as you’d like
WORKSHOP PLAN AND AGENDA

PURPOSE

● Present critical thinking around Navigating Ecological Transformation (NET)
● Solicit Your Input Regarding Key Concepts, Issues and Assumptions

AGENDA

● Presentation and Framing of NET
● Interactive Table Discussions – 3 Questions
● Summary and Next Steps – Integrate Science, develop resources for federal agencies and capacity building
NET TEAM MEMBERS
Navigating Ecological Transformation on Federal Lands

We need to figure out how to transition from Jonathan’s opening slide, which includes the original workshop name from the NAF proposal.
Who we are

Things are changing....transformation and tipping points

Grounding the discussion: Case studies

Manage for change, and not just persistence is not new

But, management paradigms and guidance are still strongly resistance-oriented

Change is hard.... **Shifting management paradigms**

The FedNET working group

How our approach fits into existing natural resource planning & decision making
Who we are....a short history

• We are a group of Federal land managers and adaptation specialists seeing ecological transformations on lands our agencies manage.
Who we are….a short history

• We are a group of Federal land managers and adaptation specialists seeing ecological transformations on lands our agencies manage.

• We have been discussing what directional change and ecological transformation mean for Federal land management for a couple of years.
Who we are… a short history

NAF 2017
ET Symposium

WHEN RESISTANCE IS FUTILE: ADAPTATION IN THE FACE OF SYSTEM TRANSFORMATION (Meeting Room 5)
Symposium Organizer: Bruce Stein, National Wildlife Federation

Accelerating climate change is already beginning to transform the structure, composition and function of ecosystems, with attendant consequences for the services and benefits these systems provide to people. Unfortunately, much of the climate adaptation currently underway still focuses on efforts to resist change as a means of retaining the persistence of current conditions. Natural resource managers increasingly will be confronted by situations where such persistence-oriented approaches are untenable: in other words, when resistance is futile. This symposium will focus on adaptation in the context of change management, and specifically the challenges of preparing for and adapting to system realignments and transformations. The session will address the conceptual basis for transformation-oriented adaptation, including the challenges of identifying ecological thresholds and tipping points, and the cyclical nature of managing for persistence and change. Symposia talks will also review the historical context for ecosystem transformation, drawing lessons from the paleo record and major ecological transitions in the past. Finally, the symposium will focus on a system undergoing major ecological transformations, and explore various management options for responding to, or even facilitating, such transitions, along with policy issues that may constrain or promote such change-oriented responses.
Who we are….a short history

NAF 2017 ET Symposium

Post-NAF planning

2017 2018 2019 2020
Who we are....a short history

- NAF 2017 ET Symposium
- Post-NAF planning
- FedNET workshop
- Fed NET group work

Years:
- 2017
- 2018
- 2019
- 2020
Who we are....a short history

- NAF 2017 ET Symposium
- Post-NAF planning
- FedNET workshop
- Fed NET group work
- NAF 2019 ET Workshop
Who we are…a short history

- Federal “sounding boards”
- Practitioner’s handbook
- Training
- Science products
Who we are….a short history

• We are a group of Federal land managers and adaptation specialists seeing ecological transformations on lands our agencies manage.

• We have been discussing what directional change and ecological transformation mean for Federal land management for a couple of years.

• We are grappling with how to manage for change (and not just persistence), and how to understand the who, what, when, where, and how of addressing ecological transformation.
### Who we are….a short history

<table>
<thead>
<tr>
<th>Last</th>
<th>First</th>
<th>Agency/Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole</td>
<td>David</td>
<td>Leopold Wilderness Center (ret.)</td>
</tr>
<tr>
<td>Covington</td>
<td>Scott</td>
<td>FWS</td>
</tr>
<tr>
<td>Crausby</td>
<td>Shelley</td>
<td>NC Climate Adaptation Science Center</td>
</tr>
<tr>
<td>Cravens</td>
<td>Amanda</td>
<td>USGS - Fort Collins</td>
</tr>
<tr>
<td>Hawkins Hoffman</td>
<td>Cat</td>
<td>NPS Climate Change Response Program</td>
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<td>Hoang</td>
<td>Linh</td>
<td>USFS</td>
</tr>
<tr>
<td>Lawrence</td>
<td>Dave</td>
<td>NPS Climate Change Response Program</td>
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<td>Magness</td>
<td>Dawn</td>
<td>FWS</td>
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<tr>
<td>Morton</td>
<td>John</td>
<td>FWS</td>
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<tr>
<td>O'Malley</td>
<td>Robin</td>
<td>USGS - Boulder</td>
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<tr>
<td>Prentice</td>
<td>Karen</td>
<td>BLM</td>
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<tr>
<td>Ross-Winslow</td>
<td>Danielle</td>
<td>FWS Social Science</td>
</tr>
<tr>
<td>Schuurman</td>
<td>Gregor</td>
<td>NPS Climate Change Response Program</td>
</tr>
</tbody>
</table>
Who we are....a short history

Note the name change

Stewarding Ecological Transformation (SET)

Federal Navigating Ecological Transformation (FedNET)
Who we are (now) ....The Federal Navigating Ecological Transformation (FedNET) working group

**NAVIGATING ECOLOGICAL TRANSFORMATION ON FEDERAL LANDS (NET)**

EXPLORE THE SCIENCE, BEST PRACTICES, AND POTENTIAL OUTCOMES associated with options for managing systems in a rapidly changing environment.

DEVELOP A SHARED, SCIENCE-BASED SOCIAL-ECOLOGICAL FRAMEWORK as a tool that can support managers in considering appropriate responses to directional and potentially transformative ecological change.

HONOR OUR RESPECTIVE MISSIONS, VALUES, GOALS, DESIRED OUTCOMES, AND OPPORTUNITIES in collaborating to advance our collective ability to steward natural resources and ecological systems to maximize landscape values, benefits, and services.

**SCIENCE FOR ECOLOGICAL TRANSFORMATION ON FEDERAL LANDS (SET)**

FOSTER ECOLOGICAL & SOCIAL SCIENCE – NEW OR SYNTHESIZED – FOCUSED ON ECOLOGICAL TRANSFORMATION to help navigate ecological transformation.

SUPPORT ECOLOGICAL TRANSFORMATION-CONSCIOUS NATURAL RESOURCE MANAGEMENT

- CHARACTERIZE PROBABILITIES OF ECOLOGICAL TRANSFORMATION to inform vulnerability assessments.
- PROVIDE SCENARIOS OF PLAUSIBLE ECOLOGICAL FUTURES to inform review/revision of goals and objectives.
- DETERMINE POTENTIAL EFFICACY of resisting or directing ecological transformation, to help identify possible adaptation options.
- ASSESS PLAUSIBLE ECOLOGICAL FUTURES and the potential outcomes of possible adaptation options in the context of social values, socio-economics, and agency missions, values, and goals.
Managers are increasingly confronting the limits of resilience and the prospect of ecological transformation.
Things are changing...transformation and tipping points

Managers are increasingly confronting the limits of resilience and the prospect of ecological transformation


USGS/Craig Allen
Climate change is not the only relevant driver, but has a unique place in the discussion

- Pervasive
Climate change is not the only relevant driver, but has a unique place in the discussion

- Pervasive and persistent
Climate change is not the only relevant driver, but has a unique place in the discussion

- Pervasive and persistent
- Offers the possibility of alternative ecological states that may be socially acceptable
Climate change is not the only relevant driver, but has a unique place in the discussion

- Pervasive and persistent
- Offers the possibility of alternative ecological states that may be socially acceptable
- Presents both directional change in mean conditions and often more frequent/intense disturbance -- with either one or both together capable of pushing species or systems beyond resilience

Things are changing…transformation and tipping points

Resilience, directional change, and ecological transformation in context

Resilience, directional change, and ecological transformation in context

Resilience, directional change, and ecological transformation in context

Things are changing...transformation and tipping points

Resilience, directional change, and ecological transformation in context


Directional Change – beyond precedent – in climate/weather, a key driver of ecological condition
Things are changing...transformation and tipping points

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Resilience, directional change, and ecological transformation in context

Directional Change – beyond precedent – in climate/weather, a key driver of ecological condition

Ecological Transformation – “a dramatic, persistent, and statistically ‘extreme’ shift in multiple ecological characteristics, the basis of which is dramatic changes in species composition” can arise from population declines & extirpations like this.

Things are changing…transformation and tipping points

Resilience, directional change, and ecological transformation in context

Crausbay et al. 2017. Ecology
Tipping Points occur when small shifts in human pressures or environmental conditions bring about large, sometimes abrupt changes in a system – whether in a human society, a physical system, an ecosystem or our planet’s climate.
“Manage for change, and not just persistence” is not new

When Resistance is Futile: Adaptation in the Face of System Transformation

Meeting Room 5

Symposium Organizer: Bruce Stein, National Wildlife Federation

Accelerating climate change is already beginning to transform the structure, composition and function of ecosystems, with attendant consequences for the services and benefits these systems provide to people. Unfortunately, much of the climate adaptation currently underway still focuses on efforts to resist change as a means of retaining the persistence of current conditions. Natural resource managers increasingly will be confronted by situations where such persistence-oriented approaches are untenable: in other words, when resistance is futile. This symposium will focus on adaptation in the context of change management, and specifically the challenges of preparing for and adapting to system realignments and transformations. The session will address the conceptual basis for transformation-oriented adaptation, including the challenges of identifying ecological thresholds and tipping points, and the cyclical nature of managing for persistence and change. Symposium talks will also review the historical context for ecosystem transformation, drawing lessons from the paleo record and major ecological transitions in the past. Finally, the symposium will focus on a system undergoing major ecological transformations, and explore various management options for responding to, or even facilitating, such transitions, along with policy issues that may constrain or promote such change-oriented responses.
“Manage for change, and not just persistence” is not new

Manage for change, not just persistence.
In the face of current rapid climatic shifts, change is likely to be the only constant. Accordingly, conservationists will need to learn how to respond to and manage inevitable changes, rather than assume they can forever be resisted. Increasingly, we will be faced with managing system transformations, and may need to focus on sustaining ecological functions, rather than historical assemblages of plants and animals. In practice, managers may often be faced with simultaneously carrying out persistence and change-oriented strategies, and even cycling between the two based on changing conditions.

Reconsider goals, not just strategies.
As conditions change, many of our current conservation goals and management objectives may no longer be feasible.
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http://www.nwf.org/pdf/Climate-Smart-Conservation/NWF-Climate-Smart-Conservation_5-08-14.pdf
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### Adaptation spectrum

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<td>TWS/AFS ET Group</td>
<td></td>
<td>Resist</td>
<td>Accept</td>
<td>Guide</td>
<td>Refugia</td>
<td>Ecosystem maintenance</td>
<td>Natural adaptation</td>
<td>Facilitate transitions</td>
<td>Anticipatory</td>
<td>Reactive</td>
<td>Persistence (of current conditions)</td>
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"Manage for change, and not just persistence" is not new: Resist, Accept, and Direct – imagining a range of management response

### Adaptation spectrum

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<td>Resilience</td>
<td>Response</td>
<td>Millar et al. 2007</td>
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<td>Aplet &amp; Cole 2010</td>
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<td>Stein et al. 2014</td>
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**Adaptation Strategy Spectrum**

- **Persistence Change**
- **Resist Resilience Response**
- **Resist Accept Guide**
- **Restraint Resilience Resistance Realignment**
- **Refugia Ecosystem maintenance Natural adaptation Facilitate transitions**
- **Anticipatory Reactive**

**Source**

- Stein et al. 2014
- Millar et al. 2007
- Aplet & Cole 2010
- Stephenson & Millar 2011
- Magness et al. 2011
- Stein et al. 2014
- Fisichelli et al. 2016
- Aplet & McKinley 2017
- TWS/AFS ET Group
- FedNET
"Manage for change, and not just persistence" is not new: Resist, Accept, and Direct – imagining a range of management response

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<tr>
<th>RESIST</th>
<th>ACCEPT</th>
<th>DIRECT</th>
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<tbody>
<tr>
<td>Many changes will be <strong>RESISTED</strong> by managers, to maintain ecosystem processes, function, and composition using a <strong>historical baseline</strong></td>
<td>Many changes will be <strong>ACCEPTED</strong> by managers, perhaps because...</td>
<td>Some changes will be <strong>DIRECTED</strong> by managers toward a specific <strong>future state</strong>...</td>
</tr>
<tr>
<td></td>
<td>these changes cannot feasibly be managed, they are not sufficiently impactful to warrant a response, they are acceptable to (and even desirable by) stakeholders or society, they are unknowingly occurring, or there is a lack of will or impetus despite sufficient knowledge or resources</td>
<td>because the change is so dramatic that resisting change is untenable and there is a feasible opportunity to steward change towards a more desirable outcome than what would be achieved with acceptance</td>
</tr>
</tbody>
</table>
Navigating ecological change and responding to ecological transformation by resisting, accepting or directing change
Responses of three National Wildlife Refuges to the same directional change (sea-level rise)
Responses of three National Wildlife Refuges to the same directional change (sea-level rise)
$1.4 million project to use thin-layer deposition to keep Spartina patens saltmarsh in situ

3,000 bags of clam and oyster shells to sediment and water on the marsh platform

Amphibious excavator to disperse sediment
After 6 decades of maintaining artificial dunes, the island will be allowed to overwash during storm events and migrate in response to long-shore current.

Since 2003, increasing storm damage to infrastructure (visitor center, roads, parking lots) has cost $3.5 million.

NPS beach facilities have been moved inland and two refuge waterfowl impoundments will be allowed to deteriorate.
Even as 2,000 ha of tidal wetlands were converted to open water since 1938, 1,100 ha of new marsh were created by upslope migration.

A partnered $475,000 demonstration project on adjacent private lands to facilitate marsh migration by extending the head of a tidal creek with a low-ground-pressure excavator (DIRECT).

Thin-layer deposition to hold some marsh in situ (RESIST)
Potential responses to ecological transformation on the Kenai National Wildlife Refuge

- Warming, drying climate.
- Regional, epidemic beetle outbreak.
- Stand-level mortality, Forest canopy loss.
- Grass cover increased. Spruce recruitment decreased.
- New spring fires.

Lutz Spruce forest

Bluejoint grassland
Potential responses to ecological transformation on the Kenai National Wildlife Refuge
Potential responses to ecological transformation on the Kenai National Wildlife Refuge

- 1900 - 68 cm, 2.3° C
- 1980 - 73 cm, 3.3° C
- 2090 - 84 cm, 6.8° C

Potential responses to ecological transformation on the Kenai National Wildlife Refuge

1900 - 68 cm, 2.3° C
1980 - 73 cm, 3.3 ° C
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Potential responses to ecological transformation on the Kenai National Wildlife Refuge


Trailing edge of boreal forest

What can fill the opening climate niche?

- Some species restricted by peninsular geography and proximity of analog grassland climate
- Some species facilitated by human vectors (invasives and transplants)

1900 - 68 cm, 2.3° C
1980 - 73 cm, 3.3 ° C
2090 - 84 cm, 6.8 ° C

Potential responses to ecological transformation on the Kenai National Wildlife Refuge

Accept

CURRENT TRAJECTORY (ACCEPT)

Depauparate grassland?

Biodiversity

TIME

Kenai National Wildlife Refuge purpose is “to conserve fish and wildlife populations and habitats in their natural diversity”
Potential responses to ecological transformation on the Kenai National Wildlife Refuge

Resist

- Plant beetle and drought resistant spruce and boreal deciduous

Biodiversity

Current Trajectory (Accept)

Time
Potential responses to ecological transformation on the Kenai National Wildlife Refuge

Could this novel system be stewarded towards one that is more diverse?
Potential responses to ecological transformation on the Kenai National Wildlife Refuge

Direct

DECREASING UNCERTAINTY BUT REDUCED OPPORTUNITY TO STEWARD THE OUTCOME

CURRENT TRAJECTORY (ACCEPT)

BIODIVERSITY

TIME

FOREST

GRASS

LODGEPOLE PINE

BLACK-TAILED DEER

INTRODUCED GRAZERS

PRESERVED FIRE
But, management paradigms and guidance are still strongly resistance-oriented
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WHEN RESISTANCE IS FUTILE: ADAPTATION IN THE FACE OF SYSTEM TRANSFORMATION (Meeting Room 5)

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But, management paradigms and guidance are still strongly resistance-oriented.
But, management paradigms and guidance are still strongly resistance-oriented... even though we know resistance can become costly/impossible/paradoxical.

“Resisting climatic and other environmental changes...may require intensive intervention, accelerating efforts and investments over time, and a recognition that eventually these efforts may fail as conditions change cumulatively.”

- Millar et al. 2007
But, management paradigms and guidance are still strongly resistance-oriented... even though we know resistance can become costly/impossible/paradoxical.

Scalable?

Natural?
Change is hard...shifting management paradigms
Change is hard...shifting management paradigms

*Cultural cognition* refers to the tendency of individuals to conform their beliefs about disputed matters of fact to values that define their cultural identities. (The Cultural Cognition Project at Yale Law School)
Change is hard...shifting management paradigms

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Conservation Beliefs Run Deep!
We need to change as individuals and in our agency culture....and some conservation beliefs and values are enshrined in law and policy.
Change is hard...shifting management paradigms

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Conservation Beliefs Run Deep!
We need to change as individuals and in our agency culture....and some conservation beliefs and values are enshrined in law and policy.

Like finding a new religion....
PS: this bullseye figure came from a website dedicated to helping missionaries (equipper.gci.org)
## Change is hard...shifting management paradigms

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<thead>
<tr>
<th>Ecological worldview (What is Real)</th>
<th>Current/historical paradigm</th>
<th>NET paradigm</th>
</tr>
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<tbody>
<tr>
<td>• Stable climate (familiar range of variability)</td>
<td>• Rapid, directional climate change</td>
<td></td>
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<tr>
<td>• Ecosystems separate from humans</td>
<td>• Coupled social-ecological systems</td>
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<tr>
<th>Understanding of ecological dynamics &amp; restoration potential (What is True)</th>
<th>Current/historical paradigm</th>
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<tbody>
<tr>
<td>• Ecosystems predictable (familiar range of variability)</td>
<td>• Ecosystems increasingly exhibit directional change &amp; transformation (tipping points are real)</td>
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<tr>
<td>• Restoration of historical conditions in degraded ecosystems is (often) possible</td>
<td>• Restoration of historical conditions increasingly unrealistic</td>
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<th>Guiding management concepts (What We “Value”)</th>
<th>Current/historical paradigm</th>
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<tr>
<td>• Historical condition, naturalness</td>
<td>• Manage for continuous change</td>
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<tr>
<td>• Ecological integrity</td>
<td>• Functioning ecosystems</td>
<td></td>
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<tr>
<td>• Maintain future opportunity</td>
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<th>Behavior (What We Do)</th>
<th>Current/historical paradigm</th>
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<tbody>
<tr>
<td>• Restore historical conditions</td>
<td>• “Restore forward”</td>
<td></td>
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<tr>
<td>• Conserve biodiversity in place</td>
<td>• Climate velocity-aware conservation</td>
<td></td>
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<tr>
<td>• Manage based on historical baselines and “pristine” referents</td>
<td>• Manage for emerging and projected conditions</td>
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<tr>
<td>• Forecast-based management (single future)</td>
<td>• Scenario planning-based management</td>
<td></td>
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<tr>
<td>• Independent science</td>
<td>• Science coproduction</td>
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</tbody>
</table>
Change is hard…shifting management paradigms
Lessons so far:

We are in an Ecological Transformation “zeitgeist moment”
Change is hard...shifting management paradigms

Lessons so far:

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This paradigm shift stuff isn’t easy
Change is hard...shifting management paradigms
Lessons so far:

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This paradigm shift stuff isn’t easy
• recursive discussions (i.e., wandering around in circles)
Change is hard...shifting management paradigms
Lessons so far:

We are in an Ecological Transformation “zeitgeist moment”

This paradigm shift stuff isn’t easy
• recursive discussions (i.e., wandering around in circles)
• Constantly evolving concepts and terminology (i.e., can’t make up our minds)
• “animated discussions” (i.e., frustration and yelling)
The Federal Navigating Ecological Transformation (FedNET) working group… how can we help?

• Broadening paradigms & supporting managers in navigating directional and potentially transformative ecological change will require engagement, tools, and training.
The Federal Navigating Ecological Transformation (FedNET) working group… how can we help?

- Broadening paradigms & supporting managers in navigating directional and potentially transformative ecological change will require engagement, tools, and training.

- Managers need guidance regarding when/where/how to seek to resist vs. accept or even direct ecological change.
• Broadening paradigms & supporting managers in navigating directional and potentially transformative ecological change will require engagement, tools, and training.

• Managers need guidance regarding when/where/how to seek to resist vs. accept or even direct ecological change.

• But such guidance does not exist.

The Federal Navigating Ecological Transformation (FedNET) working group... how can we help?
The Federal Navigating Ecological Transformation (FedNET) working group

Navigating Ecological Transformation on Federal Lands (NET)

Explore the science, best practices, and potential outcomes associated with options for managing systems in a rapidly changing environment.

Develop a shared, science-based social-ecological framework as a tool that can support managers in considering appropriate responses to directional and potentially transformative ecological change.

Honor our respective missions, values, goals, desired outcomes, and opportunities in collaborating to advance our collective ability to steward natural resources and ecological systems to maximize landscape values, benefits, and services.

Science for Ecological Transformation on Federal Lands (SET)

 Foster ecological & social science – new or synthesized – focused on ecological transformation to help navigate ecological transformation.

Support ecological transformation-conscious natural resource management

- Characterize probabilities of ecological transformation to inform vulnerability assessments.
- Provide scenarios of plausible ecological futures to inform review/revision of goals and objectives.
- Determine potential efficacy of resisting or directing ecological transformation, to help identify possible adaptation options.
- Assess plausible ecological futures and the potential outcomes of possible adaptation options in the context of social values, socio-economics, and agency missions, values, and goals.
The Federal Navigating Ecological Transformation (FedNET) working group

FedNET

Linking the science of ecological transformation to RAD decisions
Right after the break!
11:00 – Hall of Ideas E

Synthesizing paleo-transformations to map today’s transformation risk
Shelley Crausby, Conservation Science Partners

Early Warnings of Ecosystem Transitions
Steve Carpenter, University of Wisconsin-Madison

Anticipating and managing 21st century transformations in dryland ecosystems
John Bradford, USGS Southwest Biological Science Center

State-and-transition models as tools to navigate social-ecological transformation
Brandon Bestelmeyer, USDA Agricultural Resource Service

Panel-audience discussion: Linking science on ecological transformation to RAD decisions
Robin O’Malley, North Central Climate Adaptation Science Center

SCIENCE FOR ECOLOGICAL TRANSFORMATION ON FEDERAL LANDS (SET)

FOSTER ECOLOGICAL & SOCIAL SCIENCE – NEW OR SYNTHESIZED – FOCUSED ON ECOLOGICAL TRANSFORMATION to help navigate ecological transformation.

SUPPORT ECOLOGICAL TRANSFORMATION-CONSCIOUS NATURAL RESOURCE MANAGEMENT

- CHARACTERIZE PROBABILITIES OF ECOLOGICAL TRANSFORMATION to inform vulnerability assessments.
- PROVIDE SCENARIOS OF PLAUSIBLE ECOLOGICAL FUTURES to inform review/revision of goals and objectives.
- DETERMINE POTENTIAL EFFICACY of resisting or directing ecological transformation, to help identify possible adaptation options.
- ASSESS PLAUSIBLE ECOLOGICAL FUTURES and the potential outcomes of possible adaptation options in the context of social values, socio-economics, and agency missions, values, and goals.
The Federal Navigating Ecological Transformation (FedNET) working group
How our approach fits into existing natural resource planning & decision making

Adaptive management planning cycle

http://www.nfw.org/pdf/Climate-Smart-Conservation/NWF-Climate-Smart-Conservation_5-08-14.pdf
How our approach fits into existing natural resource planning & decision making

Adaptive management planning cycle
How our approach fits into existing natural resource planning & decision making

Adaptive management planning cycle

Prompt Consideration of Ecological Transformation
Explicit assessment of the plausibility/likelihood of ecological transformation encouraged in the vulnerability assessment.
How our approach fits into existing natural resource planning & decision making

Adaptive management planning cycle

Prompt Consideration of Ecological Transformation

Explicit assessment of the plausibility/likelihood of ecological transformation encouraged in the vulnerability assessment.

(In theory a VA should do this, but psychological shortcuts, habits of thought, and current management paradigms can be barriers best overcome with explicit encouragement.)
How our approach fits into existing natural resource planning & decision making

Adaptive management planning cycle

1. Define planning purpose and scope
2. Assess climate impacts and vulnerabilities
3. Review/revise conservation goals and objectives
4. Identify possible adaptation actions
5. Evaluate and select adaptation actions
6. Implement priority adaptation actions
7. Track action effectiveness and ecological response

Revisit planning as needed

Recursive process – using tools & frameworks including the RAD framework that help develop diverse goals and actions and understand likely outcomes – by:
1) considering a broader suite of goals and objectives than was likely conceived of in the past (step 3),
2) ID’ing actions to advance each potential goal (step 4), and
3) returning to step 3 as necessary

Prompt Consideration of Ecological Transformation

Explicit assessment of the plausibility/likelihood of ecological transformation encouraged in the vulnerability assessment.
(In theory a VA should do this, but psychological shortcuts, habits of thought, and current management paradigms can be barriers best overcome with explicit encouragement.)
How our approach fits into existing natural resource planning & decision making

Adaptive management planning cycle

Selector

Select Goal & Actions
Our group’s ecological transformation-oriented evaluation tools/frameworks used here (alongside other evaluation frameworks) to assess alternative futures (i.e., goals) and corresponding actions in terms of social, political, and economic implications, and choose how to proceed.

Generator

Generate Potential Goals/Actions
Recursive process – using tools & frameworks including the RAD framework that help develop diverse goals and actions and understand likely outcomes – by:
1) considering a broader suite of goals and objectives than was likely conceived of in the past (step 3),
2) ID’ing actions to advance each potential goal (step 4), and
3) returning to step 3 as necessary

Prompter

Prompt Consideration of Ecological Transformation
Explicit assessment of the plausibility/likelihood of ecological transformation encouraged in the vulnerability assessment.
(In theory a VA should do this, but psychological shortcuts, habits of thought, and current management paradigms can be barriers best overcome with explicit encouragement.)
Contact Info and Key Links

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CLARIFYING QUESTIONS

POST-IT NOTE THEMES
1. RAD Framework
   Examine RAD conceptual model, definitions

2. Directional Change, ET, and Directing
   What does directional change mean for land management? Transformation?

3. Scaling Up; Coordinating Responses at a Landscape Level Scale
   How should landscapes be defined? Factors to consider? Who determines direction? Considerations for managing?
Go to one of three tables for 25 minutes each.
Discuss key issues and questions and provide your input to NET team members.
When prompted, move to next table. Stay with your group as you rotate.
Slides beyond this slide are things we will likely delete in the end; just holding for now in case.....
The Federal Navigating Ecological Transformation (FedNET) working group

FedNET Navigation Projects

- Practitioner's Handbook (*Navigating Ecological Change*)
- Navigating Ecological Change Training
FedNET Science Projects

- **Paleo Transformation**
  - PI: S. Crausby

- **Pinyon-Juniper Recruitment**
  - PI: J. Bradford

- **Transformational Drought**
  - PI: S. Crausby

- **Remotely Sensed Transformation**
  - PI: J. Barch

- **Wildfire-driven Conversion**
  - PI: J. Coop
## Change is hard…shifting management paradigms

<table>
<thead>
<tr>
<th></th>
<th>The good old days of Federal management</th>
<th>NET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worldview (What is Real)</strong></td>
<td>Stable climate. Ecosystems separate from humans</td>
<td>Rapid climate change. Coupled social-ecological systems.</td>
</tr>
<tr>
<td><strong>Beliefs (What is True)</strong></td>
<td>Ecosystems are predictable. Humans degrade ecosystems. Ecosystems can be restored</td>
<td>Ecosystems dynamic. Tipping points are real.</td>
</tr>
<tr>
<td><strong>Values (What is Good)</strong></td>
<td>Historical condition, naturalness, wildness, ecological integrity, maximizing productivity, system control</td>
<td>Human dignity and choice, functioning ecosystems, maintain future opportunity</td>
</tr>
<tr>
<td><strong>Behavior (What We Do)</strong></td>
<td>Efficient management, objective science, restoration, conserve biodiversity in place, use historical baseline</td>
<td>Stay nimble, bet hedge, involve stakeholders, science coproduction, multiple futures possible, conserve biodiversity and geodiversity as global opportunity</td>
</tr>
</tbody>
</table>