Using Ecosystem Services Frameworks to Increase Forest Value and Enhance Forest Health

Robert Deal, USDA Forest Service, Pacific Northwest Research Station, Portland, OR
Outline of Presentation

- Working definition for ecosystem services
- Ecosystem services (E.S.) values on public lands
- How US Forest Service is using the ES concept in planning, performance and partnerships
- Forest health and human health - an example
- Summary: Connecting E.S. and forest health
Ecosystem Services

The benefits people receive from nature

Clean air and water
Mitigation of fire and floods
Climate regulation
Fish and wildlife habitat
Recreation opportunities
Economic benefits

are often undervalued or unrecognized
Ecosystem Services

The benefits people obtain from ecosystems

**PROVISIONING**
- Water (quantity)
- Fuelwood
- Energy and Minerals
- Food and Medicines
- Fiber
- Forage
- Timber
- Range
- Fish and Wildlife

**REGULATING**
- Carbon sequestration
- Climate regulation
- Soil stabilization
- Watershed services (water quality and flood control)

**SUPPORTING**
- Soil formation
- Seed dispersal
- Pollination
- Nutrient cycling

**CULTURAL**
- Aesthetic values
- Educational values
- Spiritual values
- Cultural heritage
- Recreation
Emerging markets for Ecosystem Services

- Water quality trading
- Wetland mitigation
- Species conservation banking
- Carbon credits
- Biodiversity and voluntary markets
Ecosystem Services on Public Lands
More than just markets
Ecosystem Services on Public Lands

- 2012 Forest Service Planning Rule
- Ecosystem Services into Federal Decision Making (OMB, CEQ Directive)
- NESST- National Ecosystem Services Strategy Team
## Natural resource legislation and federal agency responses and applications of ecosystem services.

<table>
<thead>
<tr>
<th>Legislation</th>
<th>Intent of Legislation</th>
<th>Federal Agencies</th>
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</thead>
<tbody>
<tr>
<td><strong>Multiple Use Sustained Yield Act (1960)</strong></td>
<td>Sustainable management of natural resources</td>
<td>USFS and BLM</td>
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<tr>
<td><strong>National Environmental Policy Act (1969)</strong></td>
<td>Impacts of people and the environment and understanding of the connection between ecological systems and management actions</td>
<td>Any federal project that used federal funding</td>
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<td><strong>National Forest Management Act (1976)</strong></td>
<td>Establishes policy of inventory and planning in accordance with MUSYA</td>
<td>USFS and BLM</td>
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<td><strong>National Forest System Land Management Planning Rule (2012)</strong></td>
<td>USFS regulation to implement planning from NFMA</td>
<td>Rule explicitly requires managers to address ecosystem services in planning</td>
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<tr>
<td><strong>Presidential Memorandum: Ecosystem Services into Federal Decision Making (2015)</strong></td>
<td>Directs federal agencies to incorporate ES into decision frameworks</td>
<td>NOAA, NRCS, USFWS, USFS, EPA, BLM, USGS</td>
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USFS Planning Rule

- Ecosystem services and multiple uses “considering a full range of resources, uses and benefits”
- MUSYA- timber, water, recreation, range, wildlife & fish.
- Early adopter forests are using Planning Rule for forest plan revisions and assessments.
- 2015 Directives state the N.F. should include “key ecosystem services” in forest plan revisions.
- E.S. also includes cultural heritage values, and other services not directly included in multiple uses.
NESST- National Ecosystem Services Strategy Team

Robert Deal, Nikola Smith, Jonas Epstein, Emily Weidner, Mary Snieckus, Lisa Fong, Tommie Herbert, Tania Ellersick, Greg Arthaud, Claire Harper, many others
NESST Purpose

“The National Ecosystem Services Strategy Team was established to collaboratively develop national strategy and policy around ecosystem services and integrate it into Forest Service programs and operations.”
• Introduction
• Ecosystem Services and USFS
• Elements of an Ecosystem Services Approach
  • Decision-Making and Analysis
  • Measuring, Reporting, Communicating
  • Partnerships and shared investments in ES
• Synthesis
  • Common Needs
• Next Steps

The Opportunities

- **Planning:** Consider a broad suite of ecosystem services in decision-making and priority-setting

- **Performance:** Quantify and communicate in terms of benefits to people through measurement and reporting

- **Partnerships:** Connect providers and beneficiaries of ecosystem services through partnerships and investments
Planning

Considering the full suite of objectives in analysis, decision-making and priority-setting

- Forest Planning
- Project Level Planning
- State Forest Action Plans
- Prioritizing Restoration Activities
Ecosystem Services Identified in Assessments

between 7-22 services per assessment
Increasing focus on **geospatial tools** to quantify benefits delivered to the public

Characterization of threats and **justification** for targeted restoration

**Forest Contributions to Water Supplies**

**Forests to Faucets Project**
Assessing Drinking Water Importance and Threats

Percent of Annual Streamflow from National Forests

- **Legend**
  - Percent of annual streamflow from National Forests:
    - 0% - 5%
    - 5% - 10%
    - 10% - 20%
    - 20% - 35%
    - 35% - 50%
    - 50% - 75%
    - 75% - 100%

- **Average annual flow (km/yr)**
  - 1 to 50
  - 50 to 100
  - 100 to 250
  - greater than 250

**National Forest Contributions to Stream Flow**
Rocky Mountain Research Station, Luce et al. 2016
Performance

*Quantifying and communicating the value of resources and impacts of management actions in terms of benefits to people*

- National Assessments
- Performance Management
- Inventory Monitoring & Assessment
Performance Reporting

Creating standardized metrics & indicators that enhance national reporting, program management, and encourage third-party investment.
Partnerships

Connecting providers and beneficiaries of ecosystem services through partnerships and shared investments.

- Incentives for Private Landowners
- Damage Assessments
- Environmental Markets
Leveraging Conservation Finance Opportunities

From 2004 to 2015, the private sector channeled $8.2 billion of private capital into investments seeking measurable environmental benefits in addition to financial return

- Watershed investments
- Compensatory mitigation
- Corporate social responsibility
- Voluntary and regulatory carbon
- Voter initiatives
Private Sector Partnerships:
Brewshed Investments
Deschutes National Forest, Oregon

GoodLife Brewing Company

Brewshed
Session Ale

Sustainable Session Series

We owe a ton to our wild, forested watersheds. They’re the backdrop to endless GoodLife adventure. They’re also our natural born purifiers, transforming snow and rain into fresh, crystalline water. Water that makes seriously tasty and distinctly Bend beer. The Pacific Northwest is home to some of Earth’s finest water, and to salute the source, we’re donating a portion of this ale’s sales to the Oregon Brewshed® Alliance and Washington Brewshed® Alliance, two crews committed to defending and protecting the wilds and its mighty watersheds. Because great beer in the great outdoors means going with the flow.

GREAT BEER begins with CLEAN WATER

Oregon Brewshed Alliance
WATER FROM CALIFORNIA NATIONAL FORESTS & ITS BENEFITS

≈50% of California's total water supply, or about 34 million acre-feet annually, comes from National Forest lands.

Equating to:

11+ trillion gallons of water
7.5x the volume of Shasta Lake
≈17 million Olympic-sized swimming pools
Enough water for 84+ million households
952 years' worth of drinking water for the entire population of California

HOW MUCH IS 11 TRILLION GALLONS OF WATER WORTH?

$3.2 billion annual value using water market wholesale prices by sector in California
$367 billion cost of water for Los Angeles households using 100 gallons/day (on a monthly water bill of $100)
$583 million cost of water to San Joaquin farmers at $17/acre-foot

Sources:
4. http://www.globeblue.org/waterbilling, based on 4-region households

Credits:
Dollar sign water from: https://www.pexels.com/photo/close-up-of-splashing-water-247478/
Lato font from: http://www.latofonts.com/lato-free-points/
Comprehensive Forest Sustainability Assessment

- National level forest sustainability reporting using Criteria and Indicators for Sustainable Forest Management (ecological, social and economic)
- Application of C&I in other settings (e.g., Urban and Agricultural forests, forests on U.S. tropical islands)
- Web-based delivery of C&I data and analysis

http://www.fs.fed.us/research/sustain/
The MPC&I at a Glance

--7 Criteria
--54 Indicators

Criterion 1: Biological Diversity
9 indicators—biophysical characteristics of forests
- Ecosystems
- Species
- Genetics

Criterion 2: Productive Capacity
5 indicators—production and capacity of physical outputs
- Wood Products
- Non-wood Forest Products

Criterion 3: Health and Vitality
2 indicators—forest disturbance processes
- Biotic (insects, invasives)
- Abiotic (fire, etc.)

Criterion 4: Soil and Water Resources
5 indicators—forest soils and water characteristics and quality
- Soil condition
- Water condition
- S&W Conservation Efforts

Criterion 5: Forest Carbon
3 indicators—sequestered carbon and flux in forests
- Forests
- Wood Products
- Energy

Criterion 6: Socioeconomic Benefits
20 indicators—broad array of socioeconomic conditions and outputs
- Production & Consumption
- Investment
- Jobs & Community
- Recreation and tourism
- Cultural & Spiritual Values

Criterion 7: Institutional Framework
20 indicators—Capacity to support sustainable management
- Laws & Regulations
- Data & Information
- Policy & Institutions
Forest health

- SAF Dictionary of Forestry: “perceived condition of a forest derived from factors including age, structure, composition, function, vigor, presence of insects and disease and resilience to disturbance.”

- Easier to recognize “unhealthy forests”, especially with low vigor and resilience, and susceptibility to insects, disease, wildfire.

- Healthy forests are also important for people.

- Example of connection between invasive insects, forest health and human health.
Emerald Ash Borer

Loss of 100 million ash trees to Emerald Ash Borer (EAB)

Data on EAB presence and county level human mortality from 1990 to 2007 in 15 states while controlling for a wide range of demographic covariances.

Across 15 states in study area, EAB was associated with an additional 6113 deaths related to lower respiratory systems and 15,090 cardiovascular deaths.

Magnitude of effect was greater as infestation progressed and with counties with above average median household income.

Summary: Decline in forest health and human health.
Ecosystem Services concept is resonating with public agencies at national to local scales and is being implemented in the Forest Service at National Forest to project scales.

Increasing the capacity to articulate connections between forests, ecosystem services and public benefits, can stimulate restoration efforts across landscapes and encourage partnerships across ownerships.

Ecosystem services are important for both forest health, and for providing a wide range of benefits for people including provisioning, regulating and cultural services, economic benefits and jobs, clean water, fish and wildlife habitat, recreation and health benefits for people.
Questions and Discussion