## Multi-Criteria Decision Aid for Northern Forest Lands: Participatory Tools for Balancing Ecological, Social, and Economic Considerations

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<tr>
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<td>Jon Bouton, Vermont Agency for Natural Resources</td>
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<td>Thomas Noordewier, Business School, University of Vermont</td>
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<td>Richard Howarth, Dartmouth College</td>
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| Completion date | August 2006 |

**Outcome**: Designed, tested, and completed a multicriteria decision process supported by public opinion surveys and workshops. Cases involved both river management and forestry practice citizen groups in the White River watershed.

Funding support for this project was provided by the Northeastern States Research Cooperative (NSRC), a partnership of Northern Forest states (New Hampshire, Vermont, Maine, and New York), in coordination with the USDA Forest Service.  
[http://www.uvm.edu/envnr/nsrc/](http://www.uvm.edu/envnr/nsrc/)
Project Summary

The vitality of communities in the Northern Forest depends on the relationship between forest ecosystems and evolving social values held by citizens. Sustainable approaches to forestland management must therefore actively engage the citizenry to address the complex web of social, economic, and ecological challenges facing Northern Forest watersheds, communities, and working landscapes. Conventional top-down managerial strategies that have been used to define and resolve these challenges in the past must now be reoriented toward bottom-up implementation involving “the people who live within its boundaries, work with its resources, use its products, visit it and care about it” (NFLC 1994). Toward this end, this project designed, tested, and implemented a standardized small group decision-making process and management evaluation framework that was detailed enough to capture community-based landscape goals and management alternatives, yet flexible enough to be adapted to communities throughout the Northern Forest region. The research represented a unique marriage of decision tools from ecological economics, international and national work on criteria and indicators for sustainable forest management, and new methods for small group decision-making drawn from social psychology and behavioral economics. The framework was designed, implemented, and evaluated in the White River watershed of Vermont in close alliance with the White River Partnership, a citizen’s group wrestling with issues similar in scope to many communities throughout the Northern Forest.
Landscape-level goals that require landscape-level decisions and broad community participation have historically run up against the legally defined rights of the individual landowner acting in isolation from larger community interests.

Equally valid individual and social preferences are not brought together and reconciled in transparent, open democratic dialogue; rather, they too often end up in legal and political conflict.

The difference between the public nature of most forest-based environmental goods and services and their absence from individual land use decisions calls for a more deliberative, group-based approach to forestland management.

The design of innovative sustainable forest management systems requires an inclusive, transparent, democratic group process and decision-making framework that explicitly recognizes uncertainty in ecological economic systems, feedback loops between socioeconomic and ecological complexity, conflicts amongst competing uses and land ownership patterns, and political power within and between stakeholder positions.
Objectives

1. Develop a multi-criteria decision aid (MCDA) technique and group evaluation process that is widely applicable to natural resource conflicts;
2. Test the technique and process at the watershed scale through the design of a community-based forest landscape management plan; and
3. Build institutional capacity between regional universities, government agencies, and non-governmental organizations.
Methods
Multi-Criteria Group Preference Elicitation

Stage 1: Information Gathering
- Step 1 Education
- Step 2 Initial discussions of values for forest characteristics

Stage 2: Initial information synthesis (preference elicitation)
- Step 3 Measurable attributes defined
- Step 3.1 Conjoint survey developed and administered

Stage 3: Information synthesis and clarification, preference reevaluation
- Step 4 Survey results presented and discussed
- Step 5 Deliberative dialogue around preferences and clarification of information (including reevaluation of individual preferences)
- Step 6 Preferences measured post deliberative dialogue

Stage 4: Survey results presented and discussed
Stage 5: Deliberative dialogue around preferences and clarification of information (including reevaluation of individual preferences)
Stage 6: Preferences measured post deliberative dialogue
Methods
Identification of Criteria informed by Montreal Process

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Specific Indicators</th>
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<tbody>
<tr>
<td>Conservation of <em>biological diversity</em></td>
<td>9</td>
</tr>
<tr>
<td>Maintenance of <em>productive capacity of forest ecosystem</em></td>
<td>5</td>
</tr>
<tr>
<td>Maintenance of forest ecosystem <em>health and vitality</em></td>
<td>3</td>
</tr>
<tr>
<td>Conservation &amp; maintenance of <em>soil &amp; water resources</em></td>
<td>8</td>
</tr>
<tr>
<td>Maintenance of forest contribution to <em>global carbon cycles</em></td>
<td>3</td>
</tr>
<tr>
<td>Maintenance &amp; enhancement of long-term multiple <em>socio-economic benefits to meet the needs of society</em></td>
<td>19</td>
</tr>
<tr>
<td><em>Legal, institutional &amp; economic framework for forest conservation &amp; sustainable management</em></td>
<td>20</td>
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Methods

Survey designed by citizens group used to measure watershed-wide opinions and presented at community forums.

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We are a network for landowners and communities, promoting forest land use that sustains the link between healthy forests, water quality and economic, environmental, and cultural interests.

Forestry Work Group

Do you care about the future of the forests in the White River Watershed? Do you walk in the woods? Do you have an opinion about Forest Management in the White River Watershed?

The Forestry Work Group of the White River Partnership wants to know!

The enclosed survey:

- Provides a starting point for public dialogue around forestry issues.
- Was developed by watershed citizens for watershed citizens with assistance from the University of Vermont.
- Will help the Forestry Work Group develop a vision for forestry in the watershed.

Please take a moment to fill out the survey and return it in the enclosed envelope.

If you complete and return the survey we would also like to invite you to attend one of three community forums that will happen in June. At the forums we will present the results of the survey and you will have an opportunity to talk with your neighbors about their opinions. You will also have the chance to win door prizes, have fun and most importantly, make a difference in your community!

All forums will start at 7:00 p.m. at the following locations:

- June 14th, Vermont Technical College, Randolph
- June 16th, Stockbridge School, Stockbridge
- June 22nd, Royalton Academy, Royalton

99 Ranger Road Rochester, VT 05767
(802) 767-4600
Case: White River Watershed, Vermont

- 454,000 acres (710 sq. miles)
- 56 mile main stem – longest free flowing river in Vermont – largest un-dammed tributary to the Connecticut River
- Over 100 miles with tributaries
- 21 towns
- 40,000 residents
Case: Groups formed from Existing NGO

White River Partnership

- Mission: To help local communities balance the long-term cultural, economic and environmental health of the White River Watershed through **active citizen participation**.
- EPA National Showcase Watershed

www.whiteriverpartnership.org
Case: Forestry Working Group

We are a network for landowners and communities, promoting forest land use that sustains the link between healthy forests, water quality and economic, environmental, and cultural interests.

Forestry Work Group

- Formed in 2003 in response to large scale clear-cuts
- Formalized through NSRC project and collaboration with UVM class in Spring 2004
- March 2004 workshop on identifying criteria and indicators of sustainable forest management
- June 2004 workshop on reporting on the status and trend of criteria and indicators
- Monthly meetings through 2005
- Leading up to Community Forums in June 2005
- Today, the FWG continues to work actively with White River Partnership and State County Foresters during monthly meetings, education forums, field trips, and agenda-setting processes.
Project Outcomes

There were multiple project outcomes, including:

1. The formation of concrete missions for 2 citizen groups in the White River watershed,
2. Testing and implementation of small-group process tools,
3. Measurement of group preferences (including socio-economic factors behind the preferences and the impact of group process on preference change),
4. Measurement of the preferences for forest and river management of the larger public through surveys and community forums, and
5. Extension of the results on group process to a second NSRC project in the Adirondacks.
Forest Survey Results

Community Forums
June 2005
Demographic Information

- 208 Respondents to date
- 101 are in Current Use program
- 17 from the outside the watershed
Out of Watershed Owners are from:

- Connecticut
- Massachusetts
- New Hampshire
- New Jersey
- Colorado
- New York
- Rhode Island
- Florida
- Pennsylvania
Demographics continued

- Average number of years living in the watershed: 24.1
- Average age: 60
- 26% Female, 74% Male
- 94% live fulltime in watershed
  - 99% own land
- 41% manage forestland
- 15% Dependent or very dependent on health of the forests
• Under 10 acres: 10%
• 10-49 acres: 27%
• 50-99: 24%
• 100-299: 28%
• 300-500: 7%
• 700-900: 2%
• 1400-1500: 2%
Forest Management

- Percent of land forested: 80%
- 70% of landowners have a forest management plan
- 78% have timber harvesting experience
- 52% use a forester on a regular basis
- 66% in Current Use Program
- 17% post land against trespassing
Reasons for Posting

- Hunters show lack of respect for property owners - strewn garbage, too close to house, don’t ask permission to hunt
- Drunk/rowdy/irresponsible hunters
- Don’t want out-of-state hunters on land
- Don’t want to get shot at
- Want safety zones around house
- Allow hunting with permission - want to know who is on my land
- Would allow hunting - IF hunters would tell us they were on our land - but they don’t
- Livestock concerns
- Use land during hunting season
- Want only locals to hunt on my land
- Others show lack of respect: ATV use, vandalism of gates/fences/equipment
Opinions of Watershed Residents

Over 85% agreement:

- Incentives leading to good stewardship should be available to forest land owners (85%)
- A forest management plan should address water quality in streams/rivers (89%)
- Forests can be managed for both economic and ecological values (94%)
At least 60% Agreement

- Zoning and subdivision regulations should be in place to manage development in the watershed (73%)
- Fragmentation has a negative impact on wildlife and forest health (65%)
- ATV use damages forest health and should be limited (60%)
Agreement above 50%

- It is important to limit residential small lot development in forested areas (56% agree, 18% disagree)
- Privately owned forests should be a source of wood products (54% agree, 9% disagree)
- Private forests should be managed for biodiversity even if it changes the amount of logging that takes place (54% agree, 18% disagree)
- Non-local logging operations should communicate their plans (58% agree, 18% disagree)
- Deer habitat should be improved (56%)
- Private landowners should be allowed to do what they want with their land, even if they want to clear cut (58% disagreed, 24% agreed)
Areas where opinions are split

- Society has a right to restrict certain activities on private forest lands
- The current level of snowmobile use in the watershed damages the health of forests
- There are not enough publicly owned forestlands in the watershed
- Private forest management plans should incorporate comprehensive, community-based planning
- It would be beneficial to have a watershed-wide forester
## Public ownership

<table>
<thead>
<tr>
<th></th>
<th>Agree</th>
<th>?/Neutral</th>
<th>Disagree</th>
</tr>
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<tbody>
<tr>
<td>More FEDERAL land</td>
<td>31%</td>
<td>37%</td>
<td>32%</td>
</tr>
<tr>
<td>More STATE land</td>
<td>41%</td>
<td>34%</td>
<td>25%</td>
</tr>
<tr>
<td>More CONSERVATION EASEMENTS</td>
<td>63%</td>
<td>24%</td>
<td>14%</td>
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</table>
Areas where more information is needed (over 20%)

- Fragmentation of forest lands into smaller parcels is a major problem
- There are not enough publicly owned forestlands in the watershed
Reasons for using a forester
How is your land used?

- Primary
- Timber
- Hunting
- Open space
- Investment
- Other
- Secondary
- Rental
- Tourism
Why do you own property in the Watershed?

- Natural Surroundings: 60%
- Pleasant rural: 50%
- Raise children: 40%
- Recreation: 30%
- Investment: 20%
- Family: 15%
- Family Land: 10%
- Timber mgmt alternatives: 5%
- Business: 5%
- Job Oppty: 5%
- Favorite Vacation Place: 5%
- Live near river: 5%
- Other: 5%
How do you use the forests?

- Hiking: 80%
- Wildlife: 70%
- X-C skiing: 50%
- Forest Improvement: 40%
- Hunting: 30%
- Camping: 30%
- Photography: 20%
- Fishing: 20%
- Other: 20%
- Sugaring: 20%
- Canoeing: 20%
- Snowmobile: 20%
- ATV: 20%
- Trail/Road Maint: 20%
Zoning:
Would you like to see more or less restrictive zoning on your land?

- More Zoning: 52%
- Less Zoning: 48%
Public Access:
Would you prefer to post or not post your land?

- Do Not Post Land: 70%
- Post Land: 30%
Forest Management: Which choice best reflects your view on forest management?

- Limited Logging: 96%
- Logging Economic Return: 3%
- No Response: 1%
- Other: 1%
Development: Which action would you most likely undertake?

- Development with Large Return: 83%
- Conservation Easement: 13%
- Neither: 2%
- Both: 2%
How important are the different forest property characteristics (on average)?

- Zoning: 29%
- Public Access: 12%
- Forest Management: 41%
- Development: 17%
What is your preferred combination of forest/development characteristics?

- 20% of respondents would choose the following:
  - Medium density housing
  - Posted land
  - Heavily logged
  - Real estate investment
What is your preferred combination of forest/development characteristics?

- 13.4% of respondents would choose the following:
  - No zoning
  - Posted
  - Heavily logged
  - Real estate investment
What is your preferred combination of forest/development characteristics?

8% of respondents would choose the following:
- No zoning
- Posted land
- Heavily logged
- Sell development rights
What is your preferred combination of forest/development characteristics?

• 1% of respondents would choose the following:
  - No zoning
  - Not posted
  - Managed for long term timber value
  - Sell development rights
Implications and applications in the Northern Forest region

This project broke new ground in the design and implementation of a participatory sustainable forest management process by merging research on group decision making, emerging analytical tools of multi-criterian decision analysis (MCDA) and conjoint analysis, with internationally accepted social and environmental criteria for temperate and boreal forest ecosystems. By testing the small group decision making approach with the collaboration of a successful citizen group, we developed a replicable decision protocol that can be extended to communities and watersheds throughout the Northern Forest region as they strive to reconcile the needs of private landowners with the expectations and values of the communities within which they live. This protocol was published as a dissertation and in peer-reviewed journal publications, and has since been extended to an NSRC-funded project in the Adirondacks.
Future Directions

• Extension of results to other citizen groups throughout the Northern Forest, in partnership with NSRC university partners, the Northern Forest Center and other regional NGOs.

• Creation of a hands-on MCDA manual to guide similar small-group processes and development of grassroots survey implements.

• Creation of a web tutorial on MCDA and small-group process.
List of products

Peer-Reviewed Publications:

List of products continued …

Dissertation:

Presentations:
List of products continued …

Workshops:
- **Forestry Working Group**
  - Working group formed, continued to meet every other month throughout 2005 and 2006
  - Public survey lead to three public workshops in the watershed
  - The Forestry Working Group continues to meet on a monthly basis with the support of the White River Partnership and Jon Bouton, Windsor County Forester
- **Upper Stream Team, White River Partnership**
  - This stakeholder group met during facilitated monthly workshops throughout 2005
  - Continue to be active in White River Partnership and management decisions within the watershed of the upper reach of the White River

Class:
- **Forest Resource Values - Forestry 152 / Recreation Management 152**
  - University of Vermont, Spring Semester, 2004
  - Class produced a technical report of criteria and indicators for the Forestry Working Group

Press: