Guidelines for Incorporating Biocultural Diversity into Northern Forest Resource Management

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Take Home Messages

- Incorporating plant gatherers and users at all steps is necessary for culturally and ecologically responsive stewardship.
- Conservation of biological diversity is directly linked to conservation of cultural diversity.
- Use of plant species by Maliseet and Mi'kmaq community members generates sociocultural and ecological knowledge that informs conservation stewardship actions.

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http://www.nsrcforest.org

Project Summary

In collaboration with the Mi'kmaq and Maliseet tribes of northern Maine, this applied research project developed guidelines for incorporating biological and cultural diversity into Northern Forest resource management.

Natural resource-dependent communities in the Northern Forest are affected by the converging challenges of economic crisis, increasing energy demands, and climate change. Ensuring access and sustainable use of natural resources will make Northern Forest communities and ecosystems more resilient to such large-scale changes. Results of previous NSRC-funded research in Maine indicate that Native American gatherers have experienced significant decreases in access to culturally important plant species. We employed participatory methods to collect socio-cultural and biophysical data about four species *(muskrat root, Acorus s*pp.*; goldthread, Coptis trifolia*; sweetgrass, *Hierochloe odorata*; and highbush cranberry, *Viburnum opulus*), their uses, habitat requirements, and gatherers' stewardship practices. Botanical field work and herbarium research provided additional insights into muskrat root.

Maliseet and Mi'kmaq plant gatherers currently collect at least 50 species of plants from a variety of habitats. They employ stewardship techniques at scales from individual plants to landscape. Synthesizing sociocultural and ecological information about culturally important plant species revealed previously unrecognized resource management priorities and options. Outputs from this study include:

1) Guidelines for culturally responsive management of four key species;

2) A replicable methodology for exploring biocultural diversity and creating management guidelines for culturally important species;

3) Enhanced knowledge of coupled sociocultural and ecological systems and resilience;

4) Curricular material on Native American uses and management of wild plants; and

5) Public and academic dissemination of results.

Background and Justification

- Biodiversity is linked to conservation of cultural diversity (Harmon 2002; Kassam, 2009; Maffi, 2001; Maffi and Woodley, 2010; Stepp et al 2002).
- Indigenous communities often are left out of the planning process for natural resources central to their livelihoods and identity (Masaquiza, 2005, UN Permanent Forum on Indigenous Peoples, 2007).
- Native American tribes are key contributors to cultural diversity in the Northern Forest.
- Gathering wild plants for food, medicine, and ceremonial purposes is central to contemporary Native American cultures in the Northern Forest.
- Forest management plans generally focus on overstory tree species for timber production. Where herbaceous species are included, attention often is limited to protection of rare or threatened species. Little consideration is given to culturally important plant species and the social relationships associated with their use (McClain and Jones, 2005).
- Most large land owners/managers in the Northern Forest region do not include wild plant gathering in their management considerations; often they are unaware of cultural practices and/or unsure how to establish channels of communication with Native American tribes (Ginger et al, 2012) .

Background and Justification

The livelihoods and cultures of indigenous peoples of Maine may very well depend on their abilities to participate and provide input in the shaping of new forms of economies and sustainable development, including decisions on management of natural resources.' (Daigle and Putnam 2009)

- Developing management guidelines for culturally important plants through participatory processes provides a mechanism that enables Native peoples' participation economic and natural resource management decisions.

- Plant gatherers often have detailed traditional ecological knowledge about species they collect, including habitat preferences, and perceived changes in abundance and health (Baumflek et al, 2010, Kassam 2009, Turner et al. 2000).

- Obtaining gatherers' input from the outset of a management planning process reduces the potential for unintended social and ecological outcomes (Anderson et al, 1996).

- As the Northern Forest region becomes more ethnically and culturally diverse (Johnson, 2007), it becomes increasingly important to understand how the practices of new arrivals to the Northern Forest interact with those of current forest resources users, including Native peoples.

- Reporting research findings back to tribes in a manner useful to community members strengthens traditional ecological knowledge and supports continued biocultural diversity (Maffi, 2005; Nabhan 2008).

Background and Justification

- Northern Maine is home to two Native American tribes:
  - The Houlton Band of Maliseets
  - The Aroostook Band of Micmacs (Mi'kmaqs)

- Results of previous NSRC-funded research in Maine indicate that Mi'kmaq and Maliseet gatherers report a significant decrease in availability and access to certain culturally important plant species (Ginger et al, 2012).

Right- Northern Forest Region, Left- Northern Maine study area

Participatory Methods

Initial Steps

- Established research agreements with Houlton Band of Maliseets and Aroostook Band of Micmacs
- Received IRB approval for project methods , consent form and interview guide.
- Recruited three community researchers to aid with participant identification, development of interview protocol, conduct of interviews, and vegetation sampling.

Data Collection

- **Individual semi-structured interviews** with Maliseet and Mi'kmaq plant gatherers and natural resource managers (n=25, 18 women, 17 men, ages 33-85).
- **Small group interviews** (n=3).
- **Participant Observation**

  Observed plant gathering and stewardship practices in the field, teaching workshops and ceremonies involving plants.
- **Community Meetings**

  To inform community members about potential environmental hazards associated with gathering certain culturally important species and seek their input about ways forward.

Examples of participant observation. Observing the gathering of muskrat root , *Acorus americanus* (top). Medicinal plant workshop at the Houlton Band of Maliseets (bottom).

Participatory Methods

Data Collection

Herbarium Sampling to distinguish habitat preferences of Acorus species**.**

- Obtained 300+ *Acorus* specimens from 10 regional herbaria

Vegetation Sampling with tribal members to characterize Acorus americanus habitat and abundance.

- Line Transects
- Daubenmire Quadrats (107)
- Soil Samples (95)
- Community members often gave feedback on habitat and gathering practices while in the field

Habitat Suitability Modeling for Acorus americanus

- Created an initial iterative, rule-based model drawing on:
  - ecological parameters described in literature (Pai, 2005)
  - sociocultural factors identified by community members (access, distance to road)

From top to bottom: Community researcher Rhonda Ireland (Maliseet) with a patch of *Acorus* along the Aroostook River; Daubenmire quadrat at the Mars Hill *Acorus* site ; project volunteer Angie Paul (Maliseet) taking a soil sample; collaborator David Putnam recording vegetation data, Michelle Baumflek along a line transect in Oxbow Maine.

Participatory Methods

Data Analysis

- Transcribed interviews. Narrative accounts were written for interviews that were not audio-recorded.
- Coded and analyzed data using NVIVO software.
- Identified herbarium specimens to species
- Used herbarium accession data to create several habitat types
- Classified herbarium specimens by habitat type
- Analyzed plant species composition from quadrat data
- Tested soil samples for pH and organic matter content

Data Validation

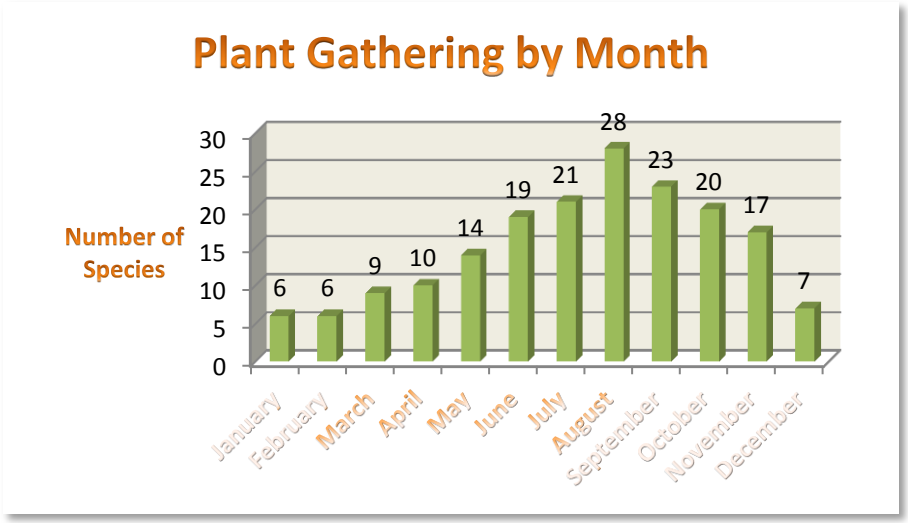
- Conducted follow-up interviews with participants. Confirmed previous interview content and received input on initial findings.
- Presented herbarium and vegetation sampling research at community meetings to receive feedback and suggestions from community members.
- Ground truthed habitat model in summer 2010, refined in 2012 based on project-generated ecological and interview data

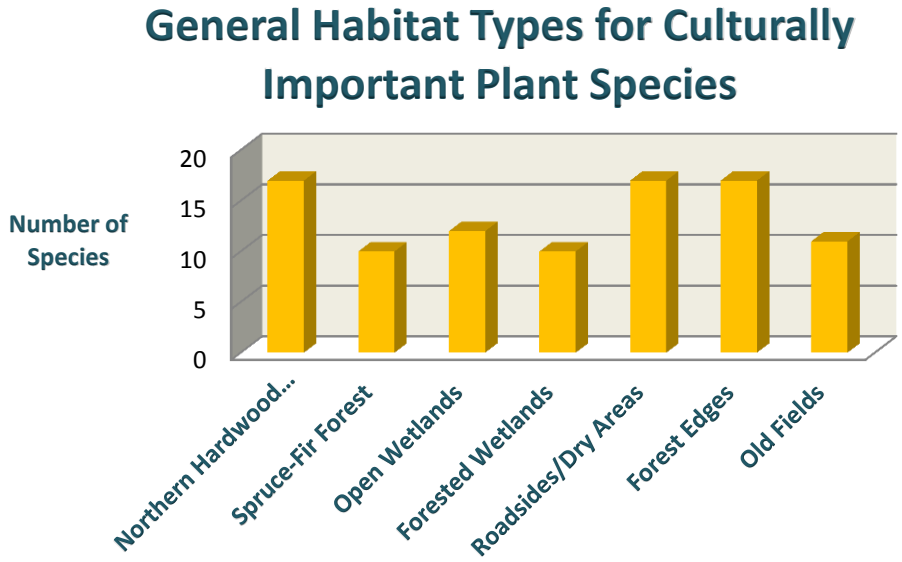
Images from a community meeting about *Acorus* species Tobique First Nation.

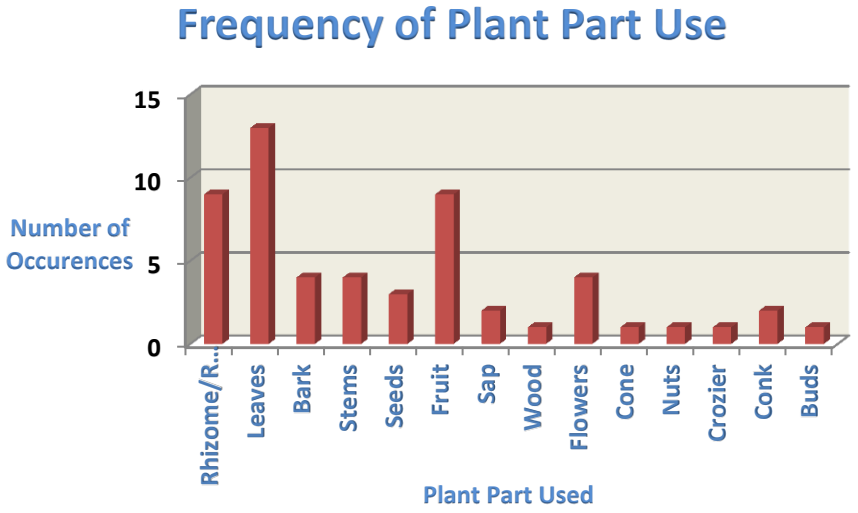
Results

Plant Use

- At least 50 species from 28 families are currently gathered and used.
- Families with the highest representation are Asteraceae (5 species), Rosaceae (5 species), Pinaceae (4 species), and Apiaceae (3 species).
- Gatherers collect plants from a variety of habitats and age classes (below).
- Summer months, specifically August is when most species are harvested (top figure right).
- Leaves are the plant part most often utilized, followed by roots and fruit (bottom figure right)







Results

Gatherer stewardship norms and preferences

- Gatherer stewardship practices are tied to spiritual practices and rooted in concepts of respect, reciprocity and interconnectedness.
- Sharing of gathered plants is common. Not everyone who uses these plants gathers them. More often, a few people collect plants for many people's use.
- Gatherers generally do not oppose permit systems for some species of plants. However, they want indigenous community input into permit system design.
- Gatherers are not opposed to using plants started in nurseries and transplanted to natural habitats.
- Gatherers are interested in establishing populations of key plants closer to their homes.

Results

Gatherer Stewardship of Plants Occurs at Individual and Population Scales

Gatherers employ harvest and management techniques throughout a plant's life cycle to ensure continued abundance of important species. Examples of these techniques include:

- scattering/sowing seeds: gatherers report scattering the seeds of species including lupine (*Lupinus sp.*) , sweetgrass (*Hierochloe odorata*), angelica (*Angelica purpurea*) and mullein (*Verbascum thapsus*).

- replanting roots and rhizomes: After harvesting the below-ground parts of certain plants, gatherers will replant small rootlets and tubers to allow them to regenerate in coming years. This practice is implemented for Muskrat root (*Acorus americanus, Acorus calamus)* and goldthread (*Coptis trifolia*).

- pruning/coppicing: harvest methods for some species encourage vigorous vegetative regrowth and fruit production. Example species include red willow (*Cornus sericea),* high-bush cranberry and common raspberry (*Rubus ideaus).*

- transplanting species: gatherers will actively transplant species they use, placing them in locations that are more convenient to their homes. Species include high-bush cranberry (*Viburnum opulus),* muskrat root (*Acorus sp.*) and fiddleheads *(Matteuccia struthiopteris).*

Results

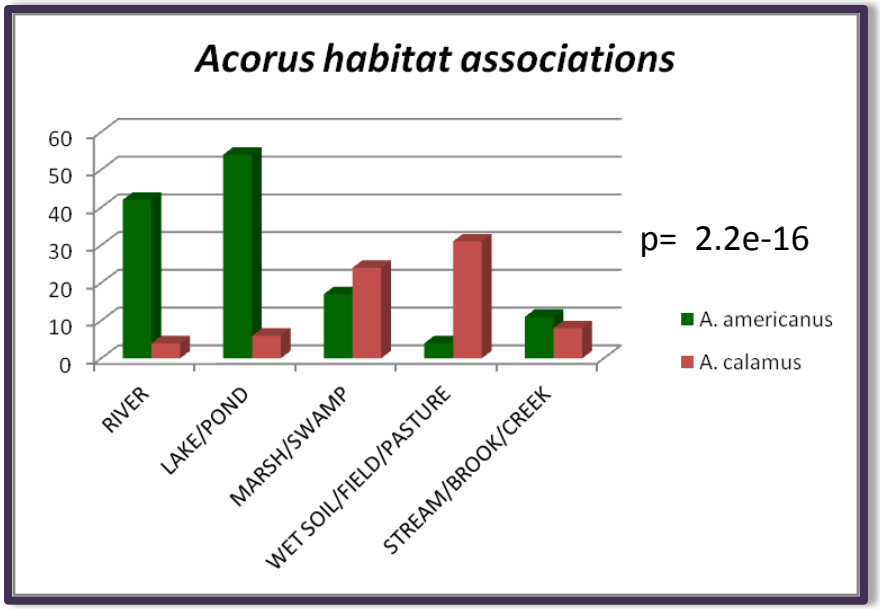
Vegetation Sampling

- *Characterizing Acorus americanus habitat*
  - Soil pH of 4.5-5.2
  - Soil organic matter range 4%-21%
  - Vegetative associations with Arrowhead*, (Sagitaria latifolia),* Burweed (*Sparganium eurycarpum*), Tussock Sedge (*Carex stricta*), Bluejoint grass (*Calamagrostis canadensis*), *swamp St. Johnswort* (*Triadenum fraseri).*
  - River morphology is important
    - Typically found in slow-moving backwaters or lake shores.

Herbarium Research

Discovered significant differences in the habitat preferences of *Acorus americanus* and *Acorus calamus*.

A. americanus is more closely associated with rivers and lakes/ponds, while *A. calamus* is more often found in wet fields.



Top figure- typical *A. americanus habitat.* Left figure: Analysis of the accession data of over 200 herbarium samples demonstrates significant differences in the habitat associations of *Acorus americanus* and *Acorus calamus.*

Results

Project Outcomes/Outreach

- Creation of plant stewardship guidelines for 4 species of importance to Maliseet and Mi'kmaq communities.
  - These guidelines are of immediate use to Maliseet and Mi'kmaq resource managers and cultural directors.
  - Guidelines: discuss plant significance, identify sociocultural and ecological issues of concern, highlight indigenous stewardship practices, provide information on natural history of species, and provide a series of recommendations for stewardship along with a time table.
- Creation of a template designed to allow other natural resource managers to create their own stewardship guidelines.

Goldthread

Maliseet Name: wisawkeskil
Mi'kmaq Name: mali'japa'qawey
Scientific Name: Coptis trifolia
Family: Ranunculaceae
Common Names: Goldthread, yellowroot

Significance

- Goldthread is a popular medicinal plant used by Mi'kmaq and Maliseet community members.
- It is mainly used to treat ailments of the mouth and throat, including mouth sores, toothaches and sore throats
- The rhizome of goldthread has traditionally been used as a yellow dye for quill work and basketry

Sociocultural and Ecological Issues of Concern with Recommendations

Maintaining appropriate habitat

- Conserve old coniferous forest types.
- Purchase land that contains appropriate goldthread habitat.
- Create a long-term forest management plan that contains appropriate areas for goldthread.
- In areas that are important for goldthread harvest, limit activities that could alter local hydrology.
- In designated areas, use minimally-invasive tree harvesting methods.

Distance traveled to harvest

- Share knowledge of gathering locations between communities.
- Establish relationships with nearby landowners who may have a healthy population of goldthread on their land.

Long term sustainability of popular collection sites

- Maintain several collection sites, to allow appropriate rotation time for plant regeneration

Figure: First page of Stewardship Guidelines for Goldthread

Results

Project Outcomes/ Outreach

- Creation of curricular materials about Native American plant stewardship for Maine public schools.
- Creation of a documentary film for undergraduate curriculum about the importance of wild plants to Maliseet and Mi'kmaq communities.
- Identification of suitable habitat for establishing new populations of *Acorus americanus*.
  - Both social (ease of accessibility for elders) and ecological parameters (river morphology, presence of associated plants, soil attributes (pH, % silt, %organic matter) were used to identify planting locations.
- Establishment of new populations of *Acorus americanus* on Houlton Band of Maliseet lands.

NSRC project community researcher Rhonda Ireland, Maliseet Natural Resource Manager Matthew Edberg, and his summer field assistant Ethan planting *Acorus americanus* along the Meduxnekeag River on tribal lands. This location was selected because it fit our ecological model specifications, and was in an location accessible to elders.

Implications

- Understanding Native peoples' plant gathering will help resource managers incorporate biocultural diversity into Northern Forest management.
- Synthesizing sociocultural and ecological information about plant species can aid in identifying resource management options and priorities.
- Options for plant stewardship exist at multiple ecological and social scales.
- Herbarium specimens are a useful tool for distinguishing between similar plant species and their habitat preferences. This can be important to sociocultural uses.
- Maliseet and Mi'kmaq plant gatherers have substantial knowledge about culturally important plants and strongly desire a say in their stewardship.
- Spirituality is at the heart of Maliseet and Mi'kmaq stewardship practices and needs to be taken into consideration when designing and implementing management efforts.
- Plant gatherers often collect for extended social networks. Culturally appropriate permits and harvest limits will accommodate this practice.

Applications

- Stewardship guidelines created for four culturally important species already are informing Maliseet and Mi'kmaq natural resource management decisions.

- Our management guideline template can be adapted for a variety of Northern Forest needs including identifying and setting management priorities for culturally important animal species.

- Our documentary and curricular materials will be used to educate high school students in Maine, as well as university students worldwide.

- Techniques employed in herbarium research may be replicated for other species.

- Our *Acorus americanus* habitat suitability model integrates socio-cultural and biophysical data. It can serve as a template to guide land acquisition or population establishment programs for other culturally important species.

Future Directions

Comanagement of culturally important plant resources with Acadia National Park

- The National Park Service (NPS) has a new mandate to allow Native American plant gathering in all units of the NPS system.
- Data and products generated from this NSRC funded project will contribute directly to comanagement planning between Maine tribes and Acadia National Park.

Climate change adaptation planning

- The stewardship guidelines this project has generated may also be applicable to climate change response planning.
- The Environmental Protection Agency Office of International and Tribal Affairs has expressed interest in using our plant stewardship guideline template to assist other indigenous communities as they plan for the effects of climate change.

Products

Peer-reviewed publications

Baumflek, M. K. Kassam, M. Emery ,C. Ginger and D. Putnam. 'T-ankeyutomon-en: Integrating Indigenous Resource Stewardship in Plant Conservation and Management. (Expected date of completion May 2013).

Baumflek, M., K. Jordan and K. Kassam. Practicing Health Sovereignty: A Transborder Study of Maliseet and Mi'kmaq Communities. (complete, preparing for review).

Baumflek, M. Using herbarium specimens to compare the habitat associations of closely-related medicinal plant species: an example from the Genus *Acorus.* (Expected date of completion April 2013).

Baumflek, M. and S. DeGloria. Developing a species distribution model for the culturally important plant *Acorus americanus*. (Expected date of completion June 2013).

Kassam, K.A. , M. Karamkhudoeva, M. Ruelle, and M. Baumflek. 2010. Medicinal Plant Use and Health Sovereignty: Findings from the Tajik and Afghan Pamirs. *Human Ecology,* 38(6): 817 - 829.*

Leveraged grants

Bridging Learners with Practitioners: Interdisciplinary experiential learning in Conservation science using Conservation Bridge. National Science Foundation

Leveraged funding to create film documentary for undergraduate curriculum to be used at post secondary institutions in North, Central and South America, Central Asia, China and Australia

Products

Conference Presentations

- Baumflek, M., M.Emery, C.Ginger, K.A. Kassa,m. "Increasing Access to Socio-culturally Important and Ecologically Relevant Wild Plants in Northern Maine." Paper presentation given at the Society for Applied Anthropology annual meeting, Seattle, WA, March 29-April 2, 2011.
- Baumflek, M., R. Ireland and S. Bear. “Ecological Aspects of Muskrat Root (*Acorus sp.*) in northern Maine.” Invited presentation to the Native American Fish and Wildlife Society national meeting, St. Regis Akwesasne Mohawk Reserve, August 30-September 1, 2011.
- Baumflek, M. and S. Bear. “Combining Natural History and Traditional Ecological Knowledge to Enhance Knowledge of Muskrat Root, A Culturally Important Plant.” Paper presentation given at the Northeast Natural History annual conference, Syracuse, NY April 16-18, 2012.
- Baumflek, M. “Using herbarium specimens to compare the habitat associations of closely-related medicinal plant species: an example from the Genus *Acorus.”* Paper presentation given at the Society for Economic Botany annual meeting, Frostburg Maryland, June 2-7, 2012.
- Baumflek, M., S. Bear, K.Kassam, M.Emery and C. Ginger. “Maliseet and Mi’kmaq community responses to climate change health and food security issues .“ Invited presentation at the forum: Climate Change Adaption Planning: Facilitating Action to Address Climate Change Adaptation Needs in Indigenous North America. St. Regis Akwesasne Mohawk reserve, September 18-20, 2012.

Products

Technical and Community Publications

- *Guidelines for the Stewardship of Four Culturally Important Plant Species*
  - *Species of focus are:* Goldthread (Coptis trifolia), Highbush cranberry (*Viburnum opulus, var. trilobum*), Muskrat *root* (*Acorus species*), and Sweetgrass (*Hierochloe odorata*).
  - Guidelines synthesize sociocultural and ecological considerations to create recommendations for the continued sustainability and use of culturally important plant species.
  - Guidelines will shortly be freely available online at: http://www2.dnr.cornell.edu/kassam/publications.html

- *Template for creating Stewardship Guidelines*
  - This template was used to create the species guidelines above. Other natural resource managers may use this template to identify, and create recommendations for, management issues related to other plant species and cultural groups.
  - Template will shortly be freely available online at: http://www2.dnr.cornell.edu/kassam/publications.html

- *Plant gathering calendar*
  - A calendar that identifies plants harvested each month, as well as their uses.
  - For Mi'kmaq and Maliseet communities who will disseminate at their discretion.

Products

Dissertations

- *PhD Dissertation:* The Human Ecology of Health Sovereignty. Michelle Baumflek, Cornell University Department of Natural Resources. (expected completion June 2013).

Curricular Materials

- Lesson plans for state of Maine high school students, planned in accordance with LD 291, which mandates including Native American studies across the curriculum
- Lesson plans focus on Native American plant management at different environmental scales, and the importance of medicinal plants to the Maliseet and Mi'kmaq culture.
- Curricular materials will shortly be freely available online at http://www2.dnr.cornell.edu/kassam/publications.html

Educational Documentary and Case Study

- Will be used along side curricular materials, and will be used in undergraduate education at universities around the world (Cornell University, Beijing Normal University, University of Central Asia, Earth University, Zamarano University, University of Melbourne).
- Documentary and Case study will be shortly be freely available on the internet at www.conservationbridge.org