NERRS Science Collaborative
Progress Report for the Period 09/01/12 through 03/01/13
Project Title:

Sustaining Coastal Landscapes and Community Benefits:
Developing an Interdisciplinary Model for Enhancing the Impact of NERRS Science
Submitted March 1, 2013

Principal Investigator(s): Dr. Christine Feurt & Dr. Robert Johnston

Project Investigators Wells NERR Science Collaborative Team
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Titles:
Coastal Training Program Coordinator (CTP), Stewardship Coordinator, Education Director, Research Associate, Research Associate, GIS Specialist, CTP Associate,

Project Research Team
This interdisciplinary team designs and conducts economics, ecological and communication research in collaboration with stakeholders.
Co-Principal Investigator Dr. Christine Feurt, CTP Coordinator, Wells NERR & Director Center for Sustainable Communities University of New England
Co-Principal Investigator: Dr. Robert Johnston, Director, George Perkins Marsh Institute and Professor, Department of Economics Clark University
Dr. Verna DeLauer, Research Scientist, George Perkins Marsh Institute, Clark University
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Project start date: Fall 2010

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Contributing team members and their role in the project:
See above for Wells NERR Science Collaborative Team and Project Research Team composition

Wells NERR Stakeholder Network These 18 organizations participated in the development of the proposal. Representative members of the network interacted with the Wells NERR or Project Research Team during this reporting period to provide feedback on research progress and incorporation of results in conservation, management and planning.

1. Maine Association of Conservation Commissions
2. Maine Geological Survey
3. Maine Coastal Program
4. Maine Nonpoint Education for Municipal Officials (NEMO)
5. Maine Sea Grant
6. Maine Drinking Water Program
7. Maine Department of Inland Fisheries and Wildlife, Beginning with Habitat

8. Maine Department of Environmental Protection
9. Maine Department of Marine Resources
10. Southern Maine Regional Planning Commission
11. Mt A to the Sea Conservation Initiative
12. Rachel Carson National Wildlife Refuge
13. University of New England
14. Laudholm Trust
15. Piscataqua Region Estuaries Partnership
16. Town of Wells, Planning Department
17. Town of Sanford, Planning Department
18. Town of Kennebunk, Conservation and Open Space Planning Committee & Planning Department

A. **Progress overview**:

Overall Goal of Project
The proposed project will develop and apply an integrated, spatially-explicit, transdisciplinary framework to characterize and quantify the impact of riparian management on ecosystem services identified as important by Wells NERR stakeholders including land use decision makers, planners and policymakers at state and municipal governmental scales and partner NGOs. Building on ecological models and data available for the Merriland River and Branch Brook watersheds adjacent to the Wells NERR, the project will coordinate economic expertise in ecosystem service valuation with Wells NERR expertise in ecological science to provide defensible estimates of social benefits associated with riparian area management in the Wells NERR region, as realized through changes in ecosystem services.

Quantification of values and tradeoffs associated with management alternatives will provide information crucial for policy design and to identify often overlooked benefits of policies to enhance ecosystem sustainability. Integrated components of the proposed project will ensure that science-based results are applied effectively to inform coastal management and land use decisions and that the results are transferrable to other Reserves. Outputs will provide heretofore unavailable mechanisms through which NERRS ecological data can be integrated with economic data and used in coordination with stakeholders to inform coastal management that sustains ecosystem services associated with riparian areas.

Overall Project Objectives

I. Develop a user-inspired, transdisciplinary model to guide sustainable riparian management in the Wells NERR and surrounding watersheds, grounded in geo-spatially explicit quantification of ecological/economic tradeoffs in ecosystem services and values.
II. Coordinate social science and cognitive theory, principles of effective communication, local motivations for stewardship/conservation, and approaches for social learning to:
    a. Identify specific stakeholders most influential in affecting decisions, management and policy change affecting Wells NERR riparian areas addressed in Objective I.
    b. Evaluate Wells NERR communication approaches to these identified stakeholders/stakeholder groups to assess the degree to which messages are in alignment with values and priorities identified in Objective I;
    c. Develop high impact, science-based communication strategies and decision support tools—based on the ecological/economic results of Objective I—to

inform integrated management of riparian area land use, habitat and nonpoint source pollution in watersheds draining into the Wells NERR region.

III. Engage Wells NERR stakeholders, the Science Collaborative Team and the Project Research Team within a collaborative learning process to build long-term institutional and regional capacity for improved riparian management through a community of practice. Collaborative learning will be grounded in coordinated science, communication and decision support outputs of Objectives I and II.

IV. Based on results of prior objectives, develop transferable templates for application of developed methods to guide policy development and stakeholder interactions in other Estuarine Reserves. Integrate with NERRS/NOAA to assist in broader adoption.

Focus of Objectives for the period September 2012 – March 2013

Project Timeline Highlighted for this Reporting Period

Objectives, Products, Activities	Year 1					Year 2					Year 3			
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4		Q1	Q3	Q3	Q4
Objective I: Develop Models Quantifying Ecosystem Services and Values	x	x	x	x		x	x	X	X		x	x	x	X
Objective I: Develop, Test and Implement Choice Experiment; Conduct Ecological Field Campaigns; (Finalize Model Linkages –not during this period)			x	x		x	x	x	X		X	x	x	x
Objective I: Data Analysis and Results for Ecological/Economic Models						x	x	x	x		x	X	x	x
Objective II: Communications Audit		x	x	x		x	x	x	x		x	x	x	x
Objective II: Mental Models and Test Cases				x		x	x	x	x		x	x	x	x
Objective III: Develop Community of Practice	x	x	x	x		x	x	x	x		x	x	x	x
Objective IV: Develop/Disseminate Decision Support Tools and Transfer Mechanisms											x	x	x	x
Objectives I-IV: Coordinate with Stakeholders	x	x	x	x		x	x	x	x		x	x	x	x

B. Working with Intended Users: Presentations, outreach and engagement about the project, ecosystem services, and collaborative interdisciplinary research.

Interaction with intended users/stakeholders during this period is described below. The collaborative team for this project engages with stakeholders at conferences, workshops, field based trainings, meetings and as members of on-going partnerships such as the Salmon Falls Watershed Collaborative, the Mount A to the Sea Conservation Initiative, the UNE Center for Sustainable Communities, the Maine Sustainability Solutions Initiative and the Sustain Southern Maine Partnership.

The stakeholder network for this project participates regularly in events sponsored by the Wells NERR Coastal Training Program and in on-going research and stewardship projects of the Wells NERR such as the *Mousam and Kennebunk Rivers Alliance*, the *Restoring Stream and Habitat Connectivity in Branch Brook* project and a state sponsored partnership for aquatic resource management called ARMS. These three partnerships were not recognized in the original proposal in 2010 but have emerged as important end users of research findings about communicating riparian buffer ecosystem services and ecosystem service valuation. The Wells NERR is already linked to these groups through member of the ecological team.

The NERR system itself is a primary end user for this project. Engagement with the NERRS was a focus of this period through the NERRS Annual Meeting and an on-line course developed for Coastal Training Program Coordinators on Qualitative Research Methods. The skills and methodology covered by this course are the building blocks for the mental models communication methodology used in the project. A half day training in Collaborative Learning was presented at the annual meeting along with two CTP session. These interactions with NERRS end users allows the team to assess the best ways to connect the findings of the project with priorities of the system. Ecosystem service valuation is a topic of increasing interest. On January 24th Waquoit Bay NERR hosted a day long *Salt Marsh Symposium on Carbon and Nitrogen Cycling and Ecosystem Valuation of Tidal Wetlands in the Northeast*. Pete Wiley and Rob Johnston gave presentations about their work and this project to an audience of coastal managers and scientists from the northeast including representatives from each of the four New England Reserves and the Manager of the Jacques Cousteau NERR in New Jersey. After the workshop, a group of NERRS people started a dialogue about bringing ecosystem service valuation and a role for the NERRS to a larger audience in the system. During the next reporting period this group will continue to work to identify the best way to move this information and build capacity in the system with an eye to a session at the next annual meeting in fall 2013.

Diverse stakeholder engagement events provide opportunities for building trust, creating awareness of the project and staying current on organizational priorities to maintain the relevance of the project and increase the potential for transfer of research findings. Formal evaluations, meeting minutes, participant observation and individual conversations with people in the activities listed above provided input into the project. Members of the project teams use these regular stakeholder interactions to guide the project, build trust and create new partnerships.

During this period individual stakeholder interviews were conducted by DeLauer and Holland to inform design of the choice experiment survey, communication audit and mental models component of the communication research. Through the interviews we direct formal contact with intended users. Some interviewees are also considered intended users such as those affiliated with municipal government. Because of the interview experience, they are more informed about our project's goals and objectives and potential relevance to their professional interests.

Members of the Wells NERR Collaborative Science Team including Christine Feurt, Annie Cox and Tin Smith are actively engaged in the Salmon Falls Watershed Collaborative through monthly conference calls, field trips, trainings and meetings. This partnership of governments, watershed groups, land trusts and water supply agencies includes stakeholders engaged in developing and implementing the NERRS Science Collaborative Project. The innovative work of this partnerships focuses on five action strategies for sustaining watershed ecosystem services. Sustaining riparian buffer ecosystem services is one goal of this partnership. Members of this robust stakeholder network are key intended users for the results of this project.

Annie Cox represented the Wells NERR at Mobilize Maine Regional Meetings and the HUD Sustainable Communities "Sustain Southern Maine" project during this period. This is an economic development initiative for southern Maine business leaders, academics, local governments and NGOs focusing on sustainability, quality of place and economic

development. Representatives for southern Maine businesses, financial organizations, municipal government and NGOS are part of this working group.

Interactions with ecological scientists as intended users: during this period the ecological team working at the Wells Reserve had questions about how the ecological data would be used in developing the choice survey. These questions were precipitated by the unfortunate loss of Research Director, Dr. Michele Dionne to cancer. Research Associates tasked with field research were thrust into the position of having to both collect and analyze data and lack of knowledge about how the data connected to the larger interdisciplinary goals of the project. During this period Wells NERR research staff reached out to experts in the methodologies used in the study in both academia and state government. Benthic macroinvertebrate analysis was contracted to an outside expert. Evaluation of other ecological methods was provided by state agencies familiar with the protocols.

C. Progress on project objectives for this reporting period

Progress is reported in this section according to Objective and Tasks. During the reporting period project team members met monthly at a minimum either through face to face meetings and conference calls.

Objective 1. Develop a user-inspired, transdisciplinary model to guide sustainable riparian management in the Wells NERR and surrounding watersheds, grounded in geo-spatially explicit quantification of ecological/economic tradeoffs in ecosystem services and values.

Task I.1. Develop Ecological Scenarios and Characterize Biophysical Status, Trends and Responses.

Wells NERR Ecology Team Project Update**:** September 2012 - February 2013
Prepared by Jeremy Miller, Jake Aman and Tin Smith

The overall goal of the ecology portion of this project is to determine the influence of forested riparian buffer on aspects of stream ecology – specifically nitrate and ammonium inputs and water column concentrations; water temp, pH, turbidity and level; algal cover on substrates; stream macro invertebrates; in-stream fish habitat, in-stream flows, and fish. This section outlines grant activities related to biological monitoring and stream habitat assessment. Also included are issues, solutions, remaining questions, and next steps.

Nutrients
Resin bags were collected at all 20 study sites on 10/2/2013. Samples were stored until processing on 11/15/2012. Nitrogen was extracted and filtered following lab procedure. Photo documentation of lab procedure was made. Samples were mailed to the University of Maine
Analytical Lab and received on 11/28/12. The samples were analyzed on 12/18/12 by Bruce Hoskins, Assistant Scientist. Nitrogen data has been entered into the database and basic statistical analysis has been conducted. Graphical displays of 2012 nitrogen data are included attached to this report.

Due to lack of familiarity with lab procedure and incorrect lab equipment, it was not possible to exactly follow the protocols for extraction and filtering of nitrogen samples.

The WNERR lacks the appropriate hardware to secure the Erlenmeyer flasks used for mechanical stirring of KCl solution. A method improvised, but not have been an adequate substitute to accomplish thorough mixing of the solution. Also, contamination may have occurred through incorrect use of the vacuum pump filtration system hardware and a potentially contaminated tube. Due to these problems 2012 nitrogen data can be used but should be viewed as suspect.

Some question remains about the appropriateness of resin bag location at study sites. Further consultation with Terry Theodose at the University of Southern Maine is necessary to refine our sampling method prior to the 2013 sampling season.

Periphyton
Chlorophyll a concentration data from epibenthic algae samples was entered into the project database. Formatting and data QA/QC is expected to be complete by 4/15/2013.

Macroinvertebrates
Macroinvertebrate samples were thoroughly picked through and placed in labeled jars at the end of August. Samples were sent to EcoAnalysts, Inc lab in Moscow Idaho in early February for identification of individuals to the family level. Complete macroinvertebrate identifications are expected in late February. Data QAQC and entry to the IBI will be complete by 4/15/13.

It was determined in late January that WNERR would contract with a certified taxonomic laboratory to identify macroinvertebrate samples rather than conduct the analysis in house due to lack of staff familiarity with freshwater species and time restraints. Samples from 2011 have been retained in case it is necessary to have a professional taxonomist confirm sample identifications. The taxonomic lab will prepare voucher specimens for reference, which may enable future in-house identification of samples.

Due to the need for IBI scores for all study sites, reference data will be taken from Maine DEP biomonitoring surveys from Branch Brook. This analysis is experimental and may be subject to future adjustment. New reference data and IBI scores are expected to be available by 4/15/13.

Based on conversations with Tom Danielson and Jean Defranco of Maine DEP, it was determined that the use of the Massachusetts DEP IBI would be adequate for the purposes of this study, given the addition of reference data obtained from the Maine DEP biomonitoring program.

Water Quality
In-situ water quality data has been entered into the project database. QAQC and formatting of data will be complete by 4/15/13.

It has been determined that analysis of water quality data will be contracted out to an outside consultant, to be identified by 3/15/13. Data products put together by a consultant may allow simplified analysis of future water quality data.

Questions remain about the suitability of the YSI nitrogen probes for this type of application. The specifications of the probe are below and seem to fall outside the range we are trying to detect in the MBLR system (10% accuracry or 2mg/l). The probes seem more suited for wastewater or point source pollution applications. After consulting YSI

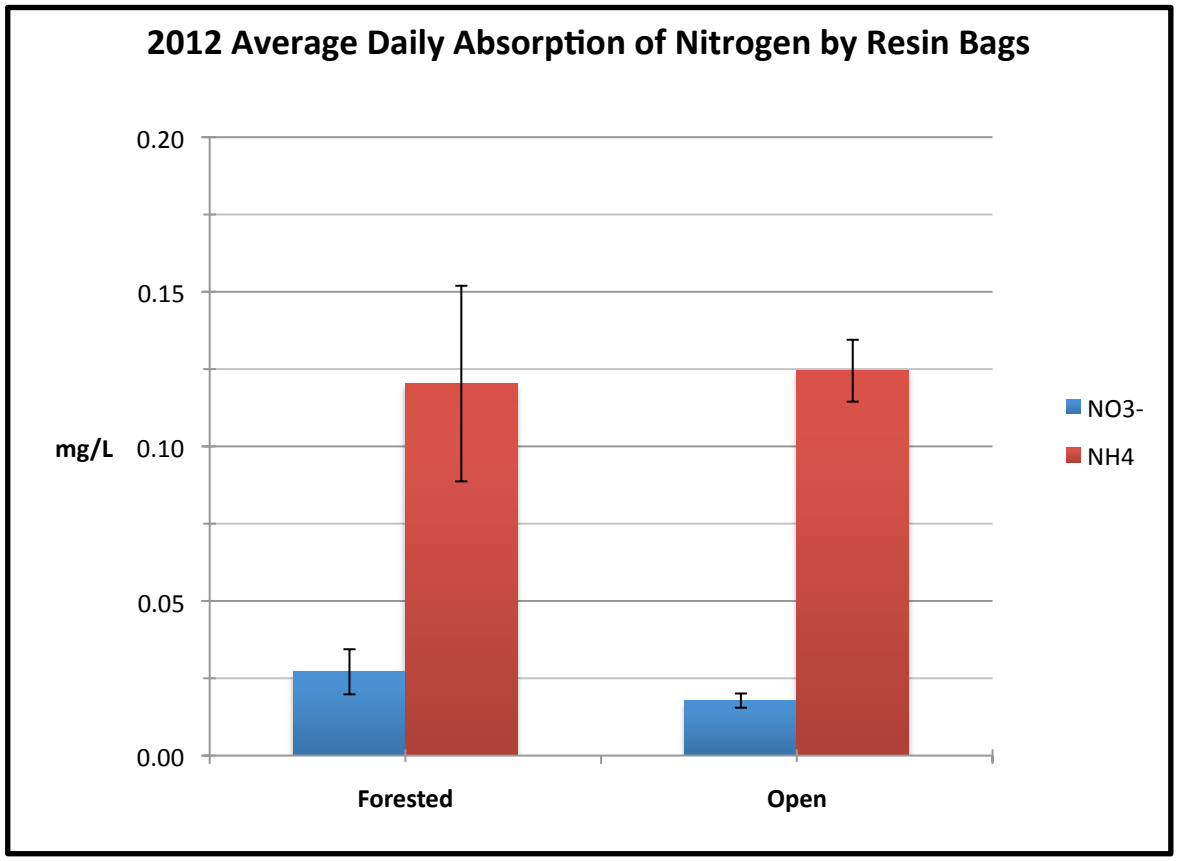
numerous times and following their procedures for calibration and care, the probes returned many errors and calibration failures in years past. A discussion of the accuracy and usefulness of this data should be considered before purchasing these probes for the 2013 field season. We currently calibrate with 1 and 100 mg/l calibration standards.

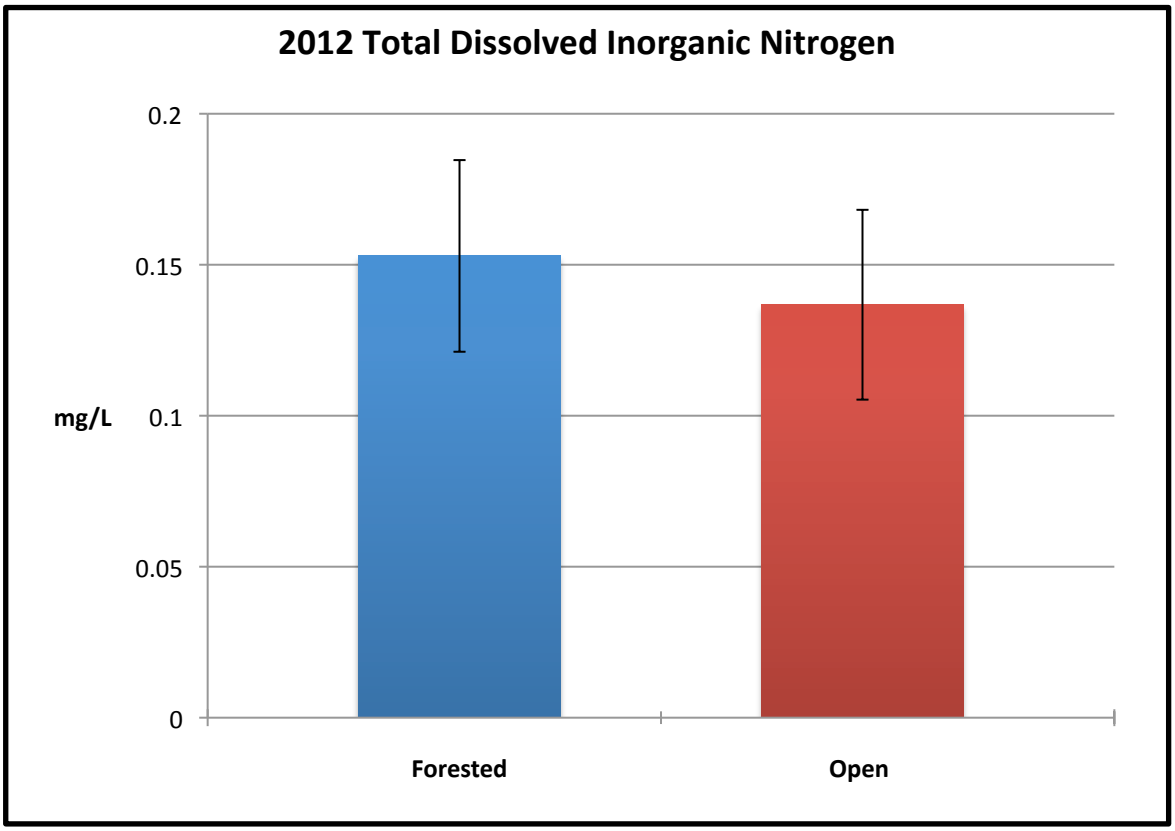
6884 Nitrate/Nitrogen ISE Specifications
Range: 0 to 200 mg/L-N
Resolution: 0.001 to 1 mg/L-N (range dependent)
Accuracy: ±10% of reading or 2 mg/L, whichever is greater
Depth: 50 ft, 15 m

Habitat Assessment
Habitat assessment data has been entered into the project database. QAQC and formatting of data is ongoing and will be complete by 4/15/13.

It may be necessary to contract out analysis of habitat data to an outside consultant. This determination will be made by 3/15/13.

Some questions remain about the habitat assessment protocols appropriateness for this study. Arrangements will be made in the coming weeks for a field training session for staff, conducted by Maine Inland Fisheries and Wildlife biologist Merry Gallagher prior to the 2013 field season.





Task I.2. Characterize Linkages between Ecological Outcomes, Ecosystem Services and Values.

Initial tasks included the development of conceptual models related to the estimation of ecosystem service values for application to riparian land preservation in the Merriland, Branch Brook, and Little Rivers (MBLR) within Kennebunk, Sanford and Wells, Maine. To complete this task, ecological models and data are first used to establish relationships (ecological production functions) relating riparian conditions to ecological responses or outcomes. These outcomes are then mapped to ecosystem service indicators valued by the public (e.g., riparian land condition, recreational fish abundance, water quality). This mapping was accomplished through the following process:

1. Two initial focus groups were used to identify primary, valued outcomes that would result from riparian land preservation/restoration in Maine. These initial focus groups were designed to elicit ways in which respondents valued potential policy outcomes. These outcomes were grouped into categories of welfare-relevant goods and services (e.g., effect on migratory fish, quantity of river habitat restored, etc.), using ethnographic methods.
2. Based on initial focus group results, these goods and services were further disaggregated into final and intermediate outcomes (goods and services). Final goods and services are defined as outcomes that directly enhance respondents' utility, whereas intermediate goods and services are defined as inputs into the biophysical production of final goods and services; they have no direct influence on utility. Only final goods and services were considered for inclusion in survey scenarios. These are akin to *assessment endpoints* in

the ecological literature—often unobservable policy goals that influence well-being or affect utility.

3. Each assessment endpoint was then formally linked to one or more *measurement endpoints*; these are observable ecological indicators used within formal frameworks to communicate, infer, or predict changes in assessment endpoints. This required interactions with ecologists on the project team to identify indicators able to communicate the outcomes valued by respondents. The result was a conceptual model relating each assessment endpoint (final good or service) to a set of ecologically-linked measurement endpoints (indicators).

This conceptual model, completed in early 2012, formed the basis of subsequent theoretical models and design of the choice experiment survey.

Task I.3 Develop Models for Estimation of Ecosystem Service Values and Tradeoffs.

Based on the conceptual models identified in Task I.2, we have specified formal random utility models that—when combined with data from the subsequent choice experiment survey—will enable estimation of ecosystem service values and tradeoffs. The theoretical model for the choice experiment begins with a standard random utility specification in which household h chooses among three policy options, ($k = A, B, N$) for ecosystem service restoration. These include two multi-attribute ecosystem service options (A, B) and a status quo (N) option with no restoration and zero household cost. Each policy option is characterized by a vector of variables, $\mathbf{X} = [X_1 \ldots X_J]$, representing policy outcomes. We define $X_1 \ldots X_{J-1}$ as variables representing ecological outcomes of restoration (i.e., effects on ecosystem services) and X_J as a variable representing unavoidable household cost. Following standard notation, we represent the utility of household h from option k as

$$(1) \qquad U_{hk}(X_1 \ldots X_{J-1}, I_h - X_J) = v_{hk}(X_1 \ldots X_{J-1}, I_h - X_J) + e_{hk} ,$$

where

I_h = disposable income of household h;
$v_{hk}(\cdot)$ = a function representing the empirically measurable component of utility; and
e_{hk} = the unobservable component of utility modeled as econometric error.

Such models are typically specified with a linear functional form for observable utility, $v_{hk}(X_1 \ldots X_{J-1}, I_h - X_J)$, such that

$$(2) \quad v_{hk}(X_1 \ldots X_{J-1}, I_h - X_J) = \mathbf{XA}$$

where $\mathbf{A} = [\alpha_1, \alpha_2, \ldots \alpha_J]'$ is a conforming vector of coefficients to be estimated. When choosing between policy options $k = A, B, N$ with utility specified per equations (1) and (2), the household is assumed to choose the option that offers the greatest expected utility. This enables the parameters of $\mathbf{A}$ to be estimated using maximum likelihood models for discrete outcomes (e.g., a mixed logit model) with likelihood functions determined by assumptions regarding factors including the unobservable component of utility e_{hk} and preference heterogeneity among respondents.

From this model, calculation of willingness to pay (WTP) for a particular

ecosystem service outcome (or choice attribute) follows standard approaches: WTP is the negative ratio of the parameter estimate for the attribute (α_j) and the parameter estimate on program cost (α_J) so that $WTP_j = -(\alpha_j / \alpha_J)$.[1] This is the implicit price of attribute *j*. To streamline notation,

(3) $$\beta_j = -(\alpha_j / \alpha_J)$$

represents implicit prices for all $j = 1 \ldots J - 1$ restoration outcomes in the model.

Based on (1) through (3), total compensating surplus (or program-wide WTP) for a multi-attribute restoration program may be specified as a linear function of the implicit prices for each of the individual ecosystem service changes,

(4) $$CS = \sum_{j=1}^{J-1} \beta_j .$$

Attributes in vector **X** used to characterize composite policy options were selected based on the result of Task I.2, as described above. These attributes include:

- An attribute capturing the extent of natural land cover (i.e., trees and natural vegetation) on riparian land, calculated using a land cover index. This is communicated in the survey as the percentage of riparian land covered by trees and natural vegetation.
- An attribute capturing the ecological condition of area rivers, as influenced by changes in riparian land. This is quantified using an aquatic biotic index.
- An attribute capturing the abundance of of recreational fish in area rivers, quantified using an indicator of brook trout abundance.
- An attribute characterizing the suitability of water quality for swimming, quantified using water quality testing conducted at local beaches (i.e., the percentage of tests that indicate water is safe for swimming).
- An attribute characterizing changes in development setbacks that could be used to enhance the preservation of area riparian land.
- An attribute characterizing changes in land inspections that could be used to enhance the preservation of area riparian land.
- An attribute characterizing annual household costs required to enact specified policies.

Each of these attributes was developed in close coordination with ecologists on the research team to ensure validity.

Task I.4. Develop and Test Choice Experiment Surveys.

Based on the results of Tasks I.1 through I.3, a sequence of preliminary choice experiment surveys was then developed. This involved a collaborative process that included participation of economists, ecologists, resource managers, natural scientists, and members of stakeholder groups. As informed by the model above, the developed choice experiments present survey respondents with voting-type choices between multi-attribute policy options, in this case for riparian area management in the MBLR watershed. Each is described by indicators of ecosystem services developed and refined in prior research phases, along with other relevant attributes. That is, surveyed households are presented with multi-attribute policy choices, similar to public referenda,

[1] If a mixed logit model is used for estimation, one generally simulates a WTP distribution based on draws from an estimated parameter distribution (Hensher and Greene 2003). However, the fundamental definition of WTP as the ratio of parameter estimates remains unchanged.

that allow them to choose among policies with different effects on quantities, qualities and uses of ecosystem services (as forecast by ecological model components), along with attributes of the policy process required to provide those ecological outcomes. Observed choices over many sets of options enables choice probability to be modeled as a function of attribute levels and the estimation of preferences, tradeoffs and values, as summarized by the theoretical model above. Prior to presenting choice questions, the surveys provided information that (i) described the status of and services provided by riparian land in the MBLR watershed, (ii) characterized affected ecological systems and linkages, (iii) described methods that could be used to restore and preserve riparian land and associated tradeoffs, and (iv) provided definitions, derivations, and interpretations for the ecological indicators used in the survey scenarios. The survey conveyed the information via a combination of text, graphics (including geographic information system maps and ecosystem representations), and photographs, all of which have been subjected to extensive pretesting. Multiple survey variants were developed and tested, each including a different sets of measurement endpoints (indicators) for relevant assessment endpoints. These surveys were evaluated and pretested in a second round of focus groups, and then iteratively revised based on focus group results. These focus groups were also used to identify the shared, common language best able to communicate indicators. Thus far, an additional three focus groups have been held to pretest the choice experiment survey, in addition to the two focus groups used to develop the conceptual model. Additional pretest focus groups are planned for spring 2013.

Task I.5. Develop Sampling Plan and Implement Survey.(no progress)
Task I.6. Estimate Choice Experiment Models and Forecast Household Values.(no progress)

Objective 2. Coordinate social science and cognitive theory, principles of effective communication, local motivations for stewardship/conservation, and approaches for social learning to:

a. Identify specific stakeholders most influential in affecting decisions, management and policy change affecting Wells NERR riparian areas addressed in Objective I.
b. Evaluate Wells NERR communication approaches to these identified stakeholders/stakeholder groups to assess the degree to which messages are in alignment with values and priorities identified in Objective I;
c. Develop high impact, science-based communication strategies and decision support tools—based on the ecological/economic results of Objective I—to inform integrated management of riparian area land use, habitat and nonpoint source pollution in watersheds draining into the Wells NERR region.

Task II.1. Develop and Implement Communications Audit

The communication/mental modeling team has completed a communication audit to look at the messaging and materials used in outreach and communications about riparian ecosystem services in the study area.

Task II.2. Develop Mental Models and Test Cases
We have completed 17 interviews and are aiming for at least 25. We are hosting a landowner focus group in March to get data on this perspective. We attempted to gather

a realtor focus group in January but were unsuccessful. We will try different strategies to reach out to realtors during the next three months.

Interviews conducted during this period are going well. We have had a good mix of municipal and state officials or those working in some sort of staff capacity and developers, realtors and those involved in the business community. A master's student from the University of New Hampshire TIDES program is volunteering her time to be a second coder on the interviews to increase inter-rater reliability. During the next reporting period we will use initial findings from the mental models and create some survey questions that can be added to the choice preference survey. This will provide an opportunity to test qualitative theory with a broader population.

Objective 3. Engage Wells NERR stakeholders, the Science Collaborative Team and the project's Research Team within a collaborative learning process to build long-term institutional and regional capacity for improved riparian management through a community of practice. Collaborative learning will be grounded in coordinated science, communication and decision support outputs of Objectives I and II.
(See section B above)

D. Benefit to NERRS and NOAA

Benefits to NERRS is discussed in Section B above.

Impact of project from the perspective of NOAA's Coastal Services Center team member Pete Wiley based upon progress during this period:

NOAA has a broad interest in the connection between estuarine habitat and the services that these provide to society. The agency is currently in the process of creating priorities for ecosystem research based on how these translate to what is important to people. Working with groups that are addressing these issues, the project team is ensuring a connection and integration between ecological and social science research using the project process as an example. In the interagency realm, NOAA is participating in an agency response to recommendations from the President's Council of Advisors on Science and Technology related to ecosystem services. The agency response to these recommendations will include project results and will ultimately serve as a model for future work related to these recommendations.

During this reporting period a number of events occurred related to how Sustaining Coastal Landscapes could be assimilated in the larger NERRS and NOAA context. These include the following:

1. The final draft of the NOAA Response to the President's Council of Advisors on Science and Technology (PCAST) report entitled, *Sustaining Environmental Capital: Protecting Society and the Economy* was completed. The PCAST report provided a review of the status of ecosystem services related activities in the federal community and recommendations for federal agencies to expand these activities. The NOAA response provided NOAA's plan for expanding ecosystem services-related activities and better coordinating existing activities. The Sustaining Coastal Landscapes project is an excellent example of the direction should move in the future in the context of the PCAST recommendations, and will be used to highlight the direction NOAA must go in terms of coordination and transfer of results.

2. The NOAA Social Science Community of Practice planned an ecosystem services-related meeting which will highlight the progress NOAA has made on ecosystem service-related activities and priorities, including: the Marine Ecosystem Services Partnership, an ecosystem services roundtable workshop that is in the planning stages, the Ecosystem Research Agenda, and the Coastal Blue Carbon Team activities and accomplishments. The Sustaining Coastal Landscapes project will be an element of several of these discussions.

3. Pete Wiley presented the plenary talk for the Salt Marsh Symposium at Waquoit NERR highlighting the importance and challenges of ecosystem service valuation {see section B above for details}.

4. Meetings were held to coordination with Science Collaborative leadership and communications and transfer staff to discuss how the Science Collaborative might (1) raise its profile in the larger NOAA community and (2) expand the transfer approach used by the science collaborative to other related elements within NOAA. This involved planning to present the Science Collaborative approach to appropriate groups within NOAA, including the NOAA Research Council, the Ecosystem Research Ad Hoc Committee, the Coastal Blue Carbon Team, and the NOAA Social Science Community of Practice. Additionally plans were made to give presentations as part of the NOAA library brown bag series, and the One-NOAA Science Seminar series.

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

At our February 21st and 25th project team meetings we determined that due to the loss of team member Dr. Michelle Dionne and a series of related consequences leading to delays in data analysis we would like to request a now cost extension of a year on the project. Because each element of the project is interconnected, a delay in analysis and synthesis of the ecological data affects the economics choice experiment. The choice survey will be conducted this summer as well a final third year of ecological data collection. If the no cost extension is granted data analysis for both the economic and ecological data will occur during fall 2013.The tasks listed below would be accomplished from late summer 2012 through August 2014.

Task I.5. Develop Sampling Plan and Implement Survey.(no progress)
Task I.6. Estimate Choice Experiment Models and Forecast Household Values.(no progress)

Objective IV. Develop Decision Support Tools and Methods for Transfer

Task IV.1 Use benefit function transfer methodology to develop parameterized functions from the estimated ecological/economic models for use in other NERR's to approximate and communicate ecosystem service benefits and values based on patterns established in the Wells NERR.

Task IV.2 Develop a template of communication tools and methodologies for Wells NERR Stakeholder Network and NERRS CTP