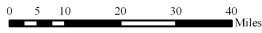


Connecticut River Watershed Project
Assessment Report

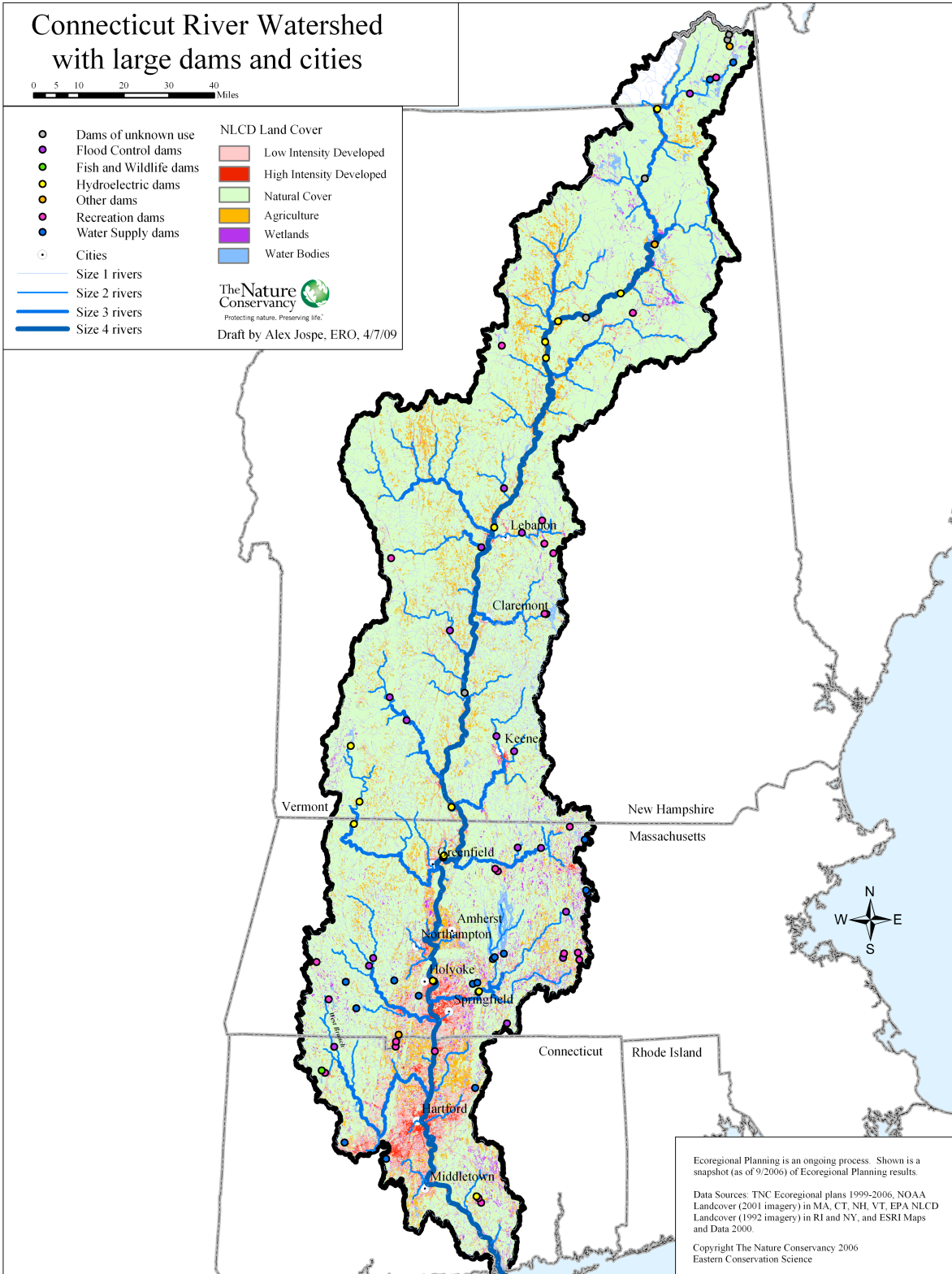
Prepared by the Consensus Building Institute
for The Nature Conservancy and the US Army Corps of Engineers
October 13, 2009

Connecticut River Watershed with large dams and cities



- | | |
|---|--|
| <ul style="list-style-type: none"> ○ Dams of unknown use ● Flood Control dams ● Fish and Wildlife dams ● Hydroelectric dams ● Other dams ● Recreation dams ● Water Supply dams ○ Cities — Size 1 rivers — Size 2 rivers — Size 3 rivers — Size 4 rivers | <p>NLCD Land Cover</p> <ul style="list-style-type: none"> □ Low Intensity Developed □ High Intensity Developed □ Natural Cover □ Agriculture □ Wetlands □ Water Bodies |
|---|--|

The Nature Conservancy
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Draft by Alex Jospe, ERO, 4/7/09



Ecoregional Planning is an ongoing process. Shown is a snapshot (as of 9/2006) of Ecoregional Planning results.

Data Sources: TNC Ecoregional plans 1999-2006, NOAA Landcover (2001 imagery) in MA, CT, NH, VT, EPA NLCD Landcover (1992 imagery) in RI and NY, and ESRI Maps and Data 2000.

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I. Introduction to the Connecticut River Ecosystem Restoration Study

Project Overview

In their natural state, rivers have flow regimes that vary with the seasons, precipitation and other factors. Species and habitats in these ecosystems are adjusted to these flow regimes, depending on the right conditions at the right times for their success. The Connecticut River watershed is the largest in New England, flowing through the states of New Hampshire, Vermont, Massachusetts and Connecticut. The main stem and its tributaries have been heavily modified over the decades in this cradle of the American industrial revolution for power generation, flood control, water withdrawal and other purposes. While these uses of the river are important, the changes in flow that they bring about often have detrimental effects on the natural environment. The negative impacts associated with these human uses may be ameliorated through better management. Hydropower generation, flood control, recreational opportunities, water supply and so on can be continued, but in ways that reduce or minimize the impact the services the river provides to traditional species and habitats.

In order to better understand the Connecticut's flow regime and identify ways to better manage human uses, the U.S. Army Corps of Engineers (USACE), The Nature Conservancy (TNC) and their partners are developing a basin-wide hydrologic model and decision support tool. The modeling tool will help decision makers and other stakeholders comprehensively understand the positive and negative environmental, economic and social consequences of various management options. This will be useful to USACE as it manages its own dams, could inform Federal Energy Regulatory Commission (FERC) licensing processes, and may help dam owners and water users make better decisions. This study may also inform other ongoing processes, such as the New Hampshire Department of Environmental Services Instream Flow Program.

The Connecticut River Ecosystem Restoration Study is in its initial stage. In 2009, the USACE, TNC, and partners are developing the project plan, initiating modeling efforts, and investigating and consulting with stakeholders on the current state of the river and how people use it. The estimated project timeline for going forward is as follows

Project Timeline (estimated)

Dam Data (Physical/Operational) Collection Completed	1 st quarter, 2010
Ecological Flow Workshops	2 nd quarter 2010
Operation & Optimization Models Complete	3 rd quarter 2010
Ecological Models Complete	2 nd quarter 2011
Alternative Flow Simulations Complete	3 rd quarter 2011
Draft Watershed Management Plan	2 nd quarter 2012

The Assessment and Interview Process

The Nature Conservancy and USACE hired the Consensus Building Institute (CBI) to conduct a stakeholder engagement process.¹ The purpose of engaging stakeholders in this initial stage is to better

¹ The Consensus Building Institute (CBI) is a non-profit organization that specializes in facilitating collaboration, mediation and stakeholder engagement. We offer in-depth knowledge of group dynamics, multiparty negotiations, and intercultural interaction. Using mediation, facilitation, and a range of specialized tools we have developed for assessment, evaluation, process design, we help our clients integrate thought and action to achieve wiser, more stable, and fairer results.

understand their diverse perspectives on flow issues, what they perceive as the primary issues the Connecticut River Basin is facing, ideas on how flow might be managed differently, and to get an idea of how stakeholders would like to be involved as the project develops.

CBI was provided an initial list of potential interviewees by TNC and the USACE and expanded this list to ensure diverse stakeholder representation. In consultation with TNC and the USACE, this list of almost 150 potential interviewees was paired down to a list of approximately 50. This group was sent information packages and e-mails introducing the project and informing them of the interview process. CBI staff followed up via phone to arrange interviews. Not all potential interviewees were able to participate, and some new interviewees were identified as the process proceeded. We reached out to a broad set of stakeholders, including watershed groups and state scientists, some of whom were not able to participate. The project team has been in regular correspondence with the relevant congressional delegations for the past five years.

In a parallel process, a team from the US Army Corps, University of Massachusetts and The Nature Conservancy reached out to dam owners and operators in the Connecticut River Watershed. Because the study requires a comprehensive understanding of how water managers in the basin make decisions concerning the operation of the river's many dams, we decided to engage the largest dam owners and operators (approximately 70) as participants rather than stakeholders. All large dam owners were contacted by mail about the study and the 10 largest owners were visited in person. The remainder were contacted a second time, inviting them to participate in a dam owners workshop, to be held in November 2009. Through these efforts we are encouraging the involvement of dam owners as the project will benefit from their knowledge of the purpose, operational objectives, and operational needs in the watershed.

Dams identified as large include those operated for flood control, hydropower production, water supply and recreation. For the purposes of this study, large was defined on the basis of storage capacity and energy production.

In the end, CBI staff conducted 46 interviews in June 2009. See the cover letter that went to interviewees in Appendix B and the interview protocol in Appendix C. This report summarized what the assessment team (CBI Managing Director Patrick Field, Senior Associate Ona Ferguson, and Graduate Associate Todd Schenk) heard during interviews. The assessment team sent this report in draft form to interviewees for their review to ensure that it included all key points. The intent of this report is to capture the range of interviewee sentiments and to provide TNC and USACE with suggestions to inform the rest of the project.

Who we spoke with

The assessment team interviewed 46 stakeholders for this assessment. They represented a range of stakeholder groups, and had varied levels of technical knowledge and expertise as well as a wide range of interests in the management of the Connecticut River. The following is a list of the number of interviewees representing different stakeholder groups. For a complete list of individuals interviewed, see Appendix A, and a description of their organizations can be found in Appendix D.

In terms of assessment, CBI offers both a proven methodology and the legitimacy of a neutral third party.

For more information on CBI, please visit: www.cbuilding.org

Stakeholder Group	# of Interviewees
Academic/Research	1
Commissions	3
Environment/Conservation non-profits	10
Federal Agencies	6
Municipal/Regional Planning	10
Recreation Non-Profits	3
CT State Agencies	2
MA State Agencies	5
NH State Agencies	3
VT State Agencies	3
Total:	46

The people the assessment team spoke with are involved in: ecosystem restoration for the benefit of wildlife; land use planning; setting policy; providing sewer and municipal water services; advocating for the paddling community; conserving land; agriculture; protecting particular species; and government oversight of particular jurisdictions, laws and regulations. We talked with representatives of regional planning agencies as an entrée into the concerns of municipalities, as over 100 towns and cities border the main stem of the Connecticut alone. Many interviewees were intimately familiar with the intricacies of the watershed and flow-related issues, while others focused on one or two key issues and still others had only a general understanding of flow-related topics.

Not all stakeholders who care about the health and management of the Connecticut River and its tributaries live or work directly in the basin. Water authorities may supply customers outside the Connecticut River watershed with water from the system; hydroelectric power generated in the Connecticut is supplied to users across the region; and people who visit the region for recreational purposes also have a stake in the health and the wellbeing of the river. These groups are affected by how the river is managed, but may be difficult to identify or engage. Because the broader project team is in discussion with dam owners/operators outside of this assessment process, no dam owners or operators were interviewed at this time.

Since securing authorization for this study in 2008, the project has received consistent congressional support from key members of the house and senate. Indeed, support has come from house and senate members representing all four of the Connecticut River basin states. To date, the project has received close to \$750,000 in federal appropriations.

Overview of Findings

- People see a range of challenges facing the Connecticut River watershed including development of land, current river management practices, natural and human-influenced shoreline erosion and hardening, climate change, and funding limitations. They identified the key flow-related challenges as overly rapid releases and fluctuating water levels, impoundments, shoreline hardening and the loss of floodplains.
- Most interviewees see value of creating a basin-wide hydrologic model and believe that it can inform managers in such a way that they will make better flow management decisions in the Connecticut River watershed. They feel that the model can, and must, inform planning and permitting decisions, including FERC relicensing processes and how the USACE operates its flood control dams. They supported the development by all key players of a sophisticated model with multiple temporal and spatial scales.

- Many suggested flow regime modifications they'd like to see, generally toward a more natural hydrograph, and supporting sound land use changes to reduce shoreline erosion and water pollution.
- People see great value in the model for long-range emergency and hazard mitigation and land use planning, for the FERC relicensing process, for identification of critical habitats in need of protection. They are comparatively less interested in the components of a model focused on climate change or unaltered flows (i.e. without dams), as many are skeptical that doing these kinds of modeling effectively is possible.
- Interviewees are almost universally supportive of the balanced goal of the proposed model, which is to determine if altering flows can improve aquatic species and floodplain habitats while preserving the numerous, diverse human uses of the river. Most strongly support the objective of developing a modeling tool that will help stakeholders make more efficient, mutually beneficial decisions.

II. Findings: The River

This section of the report captures what interviewees said about the aspects of the river that are important to them, the key challenges facing the river today or in the future, aspects of current flow regime that they see as problematic, recommendations for changes to flow regimes, and information people would like on water management.

The Importance of the Connecticut River

People talked about the importance of the Connecticut River, focusing in on the health of its ecosystem, the recreational opportunities it provides, its flood control benefits, the hydroelectric power it generates, and its cultural value. They said the river is important:

- For hydroelectric power generation
- For municipal and private residential & industrial water supply (both directly and via wells)
- As a repository for municipal wastewater and stormwater runoff
- In providing recreational opportunities, including motor boating, quiet water paddling, white water paddling, swimming, fishing and hiking
- For its scenic, historic and cultural value
- For the aquatic and terrestrial wildlife habitat and passage it provides
- For agriculture in its floodplains, and
- For commercial transportation

Many told the assessment team about their focus on river restoration, particularly for the benefit of wildlife. The Connecticut River has several designations recognizing its importance for habitat, including ‘Wild and Scenic’ designations along the Farmington, Eightmile and Westfield, Rivers (Connecticut tributaries); critical habitat designations for Atlantic salmon and other species; an American Heritage River designation for the entire river; the existence of the Silvio O. Conte National Fish and Wildlife Refuge, which owns and manages 32,000 acres throughout the watershed; participation in the Rivers Management Protection Program; designation into the New Hampshire Rivers Management and Protection Program (RSA 483 - the Rivers Management and Protection Act); coverage under the New Hampshire Comprehensive Shoreland Protection Act (RSA 483-B); and the presence of a Ramsar Convention on Wetlands site in the estuary. The Rivers Management and Protection Program complements and reinforces existing state and federal water quality laws and maintains instream flows along designated river in a manner that will enhance or not diminish the enjoyment of the outstanding characteristics for which the river was designated including recreational, fisheries, wildlife, environmental, hydropower, cultural, historical, archaeological, scientific, ecological, aesthetic, community significance, agricultural, and public water supply.

The Connecticut River Basin is an important watershed for a variety of threatened or endangered species, including sturgeon, Atlantic salmon and American shad. While some discussed the importance of restoring populations of Atlantic salmon, others indicated the need to deliberately decide which aquatic species deserve the most attention.

The river is also an important recreational and cultural feature in the four states it traverses. Particularly on the tributaries, millponds created by smaller dams are cultural and aesthetic centerpieces in many municipalities. The land along the Connecticut River is in high demand, and this development pressure is indicative of the value communities and individuals place on this often scenic, special system. Many people boat on the river (in motor boats, or doing whitewater or quiet water paddling), and those who do whitewater paddling are appreciative of management that provides favorable whitewater conditions created through timed, controlled releases in tributaries.

People mentioned that they could not imagine the Connecticut without its many flood control dams, as they are key to the protection of developments and infrastructure along the river. Lower municipalities, including major centers in the Pioneer Valley and Hartford areas, rely on the USACE flood control system upstream, along with their own dikes and dams, for protection.

Major challenges facing the Connecticut River

The assessment team asked participants what they see as the major challenges facing the Connecticut River in coming years. They listed a range of social and environmental challenges that are currently influencing the river or that they expect to have an impact in coming years. The following challenges were identified:

Impediments to fish passage – Dams, culverts and other artificial obstacles in the watercourse are detrimental to the success of many species that must travel up and down stream, particularly diadromous fish. Many species, such as eels, suffer casualties as they pass through turbines. Even when fish passages exist, populations are diminished by the challenge of passing through them and the opportunities this affords predators.

Development in the watershed – Urban development, both directly along the banks and throughout the watershed, has impacts on both water quality and flow regimes. For example, impervious surfaces and land clearing along banks both lead to more rapid runoff during and immediately following storm events. Runoff is often of poor quality, adding contaminants to the river. As the river has become cleaner and as population has grown, the Connecticut River and its tributaries have seen the effects of increasing development pressures. Some described a general lack of knowledge among the public of the fragility and interconnectedness of the ecosystem and said that this can make it difficult to address development-related issues.

Daily fluctuations in flow and rapid ramping rates – Though beneficial to power generators and paddlers, regular and rapid changes in river flow can be difficult for many aquatic species to adjust to. People described such rapid changes in several places throughout the basin, including extreme fluctuations near the Northfield Mountain pump-storage and Turner's Falls hydroelectric facilities.

Reduced whitewater opportunities – Dam operators, including the USACE, have been reducing or eliminating timed releases traditionally implemented to create favorable conditions for paddlers in order to improve ecological resources. Paddlers contend that their interests, which provide social and economic benefits for the region, are being neglected and that the flow patterns that were designed for their benefit mimic natural patterns and are not detrimental to aquatic species.

Channelization and artificial flow management – The Connecticut River no longer reaches geomorphic equilibrium, meanders as it once did, floods freely, or flows at its unaltered rates and patterns. Both development and increased demand for hydroelectric power generation keep the pressure on managers to tightly control the flow of the Connecticut. Development in the floodplains, both historic and ongoing, also limits the public's tolerance for ecologically desirable seasonal overbank floods. Some interviewees described their concern that modifications to the flow regime, moving toward a more natural hydrograph, could increase the flooding risk to developments and infrastructure in low-lying areas.

Decline in habitat – Development and artificial flow management are reducing the quantity and quality of natural environments necessary to the health of numerous aquatic, amphibious and terrestrial species. These include floodplain habitats and the role river valleys play as wildlife corridors. Many interviewees

are addressing the flow issue, but feel that much more can be done. Development in key locations has detrimental effects on some species, removing key habitats and/or corridors.

Shoreline erosion – Erosion can be a significant large-scale problem, though erosion and sedimentation are natural riverine processes caused by waves and river flow. Land use and agricultural practices influence shoreline erosion, and excessive erosion may indicate valuable farmland lost, changes to the course of the river, and sediment-related problems downstream, including the choking of dams and unhealthy growth of aquatic vegetation. Some interviewees said that the wakes from motor boating is exacerbating shoreline erosion and that docks and other river entry points are altering the shoreline and causing further erosion. Other interviewees argue that acute erosion is the result of frequent and rapid changes in flow caused by dam ramping and withdrawals and related changes in water elevation, such as occur as a result of withdrawals for the Northfield Mountain Pumped Storage Facility. Poor farming practices and the reduction of riparian buffers, often as a result of aforementioned development, may also be contributing to erosion problems.

Invasive species – Invasive species are a significant problem throughout the watershed, particularly to the extent that they crowd out traditional, and often threatened, species. In the Connecticut watershed, invasive species include aquatic vertebrates like smallmouth bass, flora like purple loosestrife and algae like didymo. Invasive species often succeed at least in part, because the artificial conditions resulting from flow changes create more beneficial conditions for them than they do for native species.

Climate change – Many stakeholders recognize that climate change is likely to pose real challenges throughout the basin. The uncertainty around how exactly the effects will be manifested makes planning for them all the more difficult. Most believe that the river will behave differently with a changed climate and have a general understanding of what these changes might involve – including more intense storms, changes in snow cover in the upper reaches and sea level rise pushing the saltwater wedge upstream – but have little detailed understanding, nor comprehensive idea of how the river will need to be managed differently.

Water quality – Both point sources of pollution such as combined sewage overflows and wastewater treatment facility nitrogen loading and non-point sources like agricultural runoff and septic tank leakage are reducing the quality of the river. Over the years, much has been done to clean up and reduce the load of PCBs and other chemical contaminants, but many contaminants still remain. In addition, dam impoundments (where reservoirs are deep and cool) and use of water for cooling power plants also artificially modify water temperatures, which in turn affect quality.

Water withdrawals – Thus far, water withdrawal is not a significant issue, especially on the main stem. Some interviewees suggested that this could change for a variety of reasons, including increasing water scarcity (potentially climate change-related) and/or new users (e.g. a new biomass plant proposed on the Westfield, population growth).

Funding – Tight budgets and limited resources make addressing many of the aforementioned challenges difficult. Cutbacks have already reduced support and enforcement resources in many cases, and many of the solutions to these problems require investment that may be difficult to secure.

Many interviewees described improvements on those things that matter most to them. They also identified significant hurdles that remain or are likely to emerge. Many noted the ongoing challenge of balancing the needs of a ‘working river’ (flood control, recreation and power generation) with wildlife and environmental protection objectives. Many believe that the river can be better managed for mutual gain.

In addition to the challenges listed here, numerous interviewees described the opportunity provided by upcoming dam relicensing. They suggested that the hydroelectric project relicensing process scheduled to begin in 2012 is a chance for stakeholders to come together to discuss flow issues and find ways to improve river management.

Current flow-related problems in the basin

Interviewees were asked to describe any problems they see currently with flows in the Connecticut River basin. Some asserted that current flow regimes are generally good, and that management has been modified to benefit ecosystems and whitewater paddlers. Others asserted that the biggest flow-related issues are on the tributaries, not the main stem (which is such a large watercourse that flow disruptions have comparatively less impact), as disruptions in tributary flow can have substantial impacts on water quantity and temperature. Those interviewees who identified current flow-related problems generally focused on overly rapid releases and fluctuating water levels, impoundments, shoreline hardening and the loss of floodplains. In greater detail, interviewees identified the following flow-related problems:

Overly rapid releases (peaking and ramping) and fluctuating water levels – Under undisturbed conditions, the rate of river flow would change according to the seasons and, to a lesser extent, with climatic events. Species and ecosystems have naturally evolved over time to match these seasonal flow regimes. People expressed concern that dam operations sometimes cause water levels to change drastically and rapidly. They talked about the ways that such changes in flow and water levels disrupt the shorelines and lead to acute erosion and destabilized shoreline ecosystems. In those cases where hydroelectric dams are operated to maximize power generation, the natural hydrograph may be substantially disregarded (as operators are modifying the volume of water they release rapidly in response to power demands). These rapid changes disrupt ecosystems with extreme water velocities, depths and temperatures, which may have particularly detrimental impacts on fish during sensitive periods like spawning and on their habitat.

Impoundments – Impoundments provide different conditions than would otherwise be present in the Connecticut River Basin. Such impoundments may be detrimental to certain aquatic species, and do not mimic the river prior to human modification and management. Impoundments change the ecosystem, altering plant and animal life as well as viewscapes and human uses.

Shoreline hardening and loss of floodplains – Shoreline management and hardening, often implemented to meet human desires for predictable and fixed shores, has created a path the river must follow. It cannot change course over time, but is rather guided by human decisions. In addition, human management of the river frequently prevents flooding of floodplains, which diminishes the prevalence of important floodplain ecosystems and reduces the natural flood control capacity of the river.

Some interviewees noted that addressing these flow-related problems is challenging. There are real tensions between competing uses and goals for the watershed. The competing uses may not be obvious. In some cases, recreation and conservation have shared interests (such as clean water), while in others (such as dam releases for whitewater paddling) their interests may differ. Furthermore, in the case of dams and impoundments, licensing is long-term and change is difficult outside of the relicensing process. The fact that dam licenses are typically negotiated on an individual basis can make holistic watershed analysis and planning difficult.

On the other hand, some interviewees asserted that these flow-related problems may be improved in the coming years. They talked about the opportunity to better manage the river for mutual benefit. Several interviewees stated that USACE dams could be better managed with additional collaboration and input from other stakeholders on flow regimes. They suggested that people could get more environmental,

recreational and perhaps even flood control benefits if processes were managed more collaboratively, integrating science and user input. Similarly, a few interviewees suggested that FERC processes could be better managed, following a more intentional and collaborative strategy.

Recommendations for flow modification

Building on identified problems in flow regimes, interviewees were asked for suggestions of flow regime modifications they would like to see to the Connecticut River. Some say current river flows are appropriate given the myriad uses of the river while others see room for improvement. Many interviewees had concrete flow modification recommendations. Others less familiar with flow issues did not provide specific suggestions. The general sentiment by many interviewees was that river flows should be modified to bring them more in line with natural conditions in order to benefit species and ecosystems, while recognizing human needs, including power generation and recreation.

Interviewees described competing objectives shaping flow regime management decisions on the Connecticut River. Some prioritize the need to have a flow regime that more closely mimics a natural system to benefit various species and habitat, particularly diadromous fish. Others prioritize the need for a working river that generates hydroelectricity, provides drinking water, is used for recreation and is designed to meet the needs of human communities. Some stakeholders are guided by mandates and/or interests that fall squarely on one side or the other of this issue, while others are tasked to find broader solutions. The following flow modifications were recommended by interviewees:

Make dam and impoundment releases more natural – Many people said that though attempts are being made to move releases towards more natural ‘run-of-the-river’ hydrographs, much more can and should be done in this regard. This could include providing more constant flows, minimizing short-term fluctuations, making ramping rate changes more gradual and bringing releases more in line with natural seasonal variations. Some suggested increasing releases after storm events to more closely mimic river flow in the absence of dams. People mentioned some infrastructure difficulties with this idea such as the fact that certain dams are not designed to release water gradually. Recreational users, specifically whitewater paddlers, are accustomed to a flow regime that favors weekend releases, which are predictable and fit with people’s leisure time. They are concerned by the possibility that management priorities might shift toward a more natural hydrograph, reducing benefits that are very important to them. Another challenge to this recommendation is that we heard that infrastructure is not always in place to allow more natural releases; for example, some dams have difficulty making small adjustments to the gate settings to produce the desired flow.

Modify impoundment management – Limit how much water can be collected behind dams, mandating that water levels be kept within a certain range.

Improve fish passage – Install and improve fish ladders and other methods of fish passage to support the movement of diadromous fish, eels and other species and assist in species recovery efforts.

Remove non-operational dams – While interviewees generally stated that they believe the removal of large hydroelectric and flood control dams is unlikely and, to many, undesirable, they said that many smaller, defunct and inactive tributary dams could be removed to restore more natural flow conditions. Some noted that even in these cases, those considering such dam removal must consider the historical significance of dams and the aesthetic value of millponds.

Limit withdrawals – While interviewees did not describe water withdrawals as a major issue, some voiced concerns about withdrawals on particular tributaries where municipal, industrial or agricultural

withdrawals are proportionally significant. Interviewees recommended that these withdrawals be better monitored and controlled. Several noted that where there is adequate in-stream flow, the river can provide enough water volume to dilute some contaminants, and one interviewee asserted that the costs of maintaining flow for absorption capacity must be compared to the costs of improving the quality of effluence itself.

Encourage and allow overbank flow – People recommended promoting regular overbank floods to support the health of valuable floodplain habitats, allow for sediment deposition, and provide natural flood protection mechanisms. They described the importance of wetland habitats for many species, and said that such habitats have generally been reduced in size and quality throughout the watershed by artificial flood control and flow management regimes.

Support positive land use changes – Several interviewees suggested that supporting and compensating landowners for better managing their land could have positive impacts on water flow and quality. They said that farmers and other landowners should be encouraged to maintain riparian buffers, and that all landowners should be encouraged to minimize impervious surfaces.

Some stakeholders noted the importance of considering the potentially negative consequences of any flow modifications. Consequences they identified for consideration included eutrophication, the impact on ice jams and ice jamming problems, and takings compensation for landowners (were new parcels to be flooded).

Additional information about water management

The assessment team asked interviewees what they would like to know regarding water management in the Connecticut River Basin. Many stated that they know enough about how the river is managed today, including those who know a lot and have active management responsibilities and those who do not know much but for whom the details of river management are less important in the scope of their work.

Many others said they would like to know more about the dam relicensing processes and about current or future flow models (including the Connecticut River Ecosystem Restoration Study and other models such as the model used in the Fifteen Mile Falls relicensing process). If decisions are made to change flow regimes, people wanted to know what was being considered in advance and to learn about the trade-offs under consideration. For example, does more run-of-the-river power generation mean that more coal must be burned to generate electricity? In general, interviewees would like to know about any options for altering river flow and how they are compared and evaluated both during the licensing process and by operators/users on a more regular basis.

Interviewees also said they would like to know more about:

- The impacts of current activities on the river, including hydroelectric generation and withdrawals.
- The options for operating dams differently to improve flow conditions.
- The impacts of any flow alterations on: migratory fish; floodplain-dependent species (e.g. larvae); recreational uses, like whitewater boating; flood protection; and the prevalence of invasive species.
- The roles, services and current health of floodplains, and how they might be improved with flow changes.
- Flow regimes basin-wide, and how activities/changes in sub-watersheds or particular areas impact the broader system.

- What a naturalized hydrograph for the main stem and tributaries looks like, so as to better understand what the river was like before human impact, and to identify how to manage the river to mimic that hydrograph.
- The impacts climate change will have on flows.
- The extent of the benefits and impacts of flood control actions by USACE dams.
- The impact of climate change and flow regime changes on the tides and on the movement of the saltwater wedge up or down the river.
- How to ensure there is adequate funding and support for concrete data collection. One interviewee mentioned that data collection gauges (USGS gages), which are important to flood control and increasing understanding of flow, are often at risk due to proposed cuts in state matching funds
- How toxin concentration in sediment behind dams will be addressed.
- The impacts of reforestation and thus re-transpiration from shoreline trees.
- The dams on the river: a list of dams, who owns them, when they come up for relicensing, how much they impound, when they release water and how much.
- The frequency of sewerage or stormwater overflows in each municipality along the river.
- What conditions would be like after a dam removal, to ensure no one would be adversely impacted and that sediments accumulated behind those dams would be properly managed.

People said there could be better sharing of information across boundaries, since the watershed crosses many counties and four states. Someone requested in particular an easily accessible database of permitted water withdrawals, a description of typical withdrawals, and whether or not the individuals with those permits are subject to existing water management acts or are grandfathered. Existing state-level databases of permitted withdrawals are either non-existent or incomplete.

III. Findings: The Proposed Model of the Connecticut River Basin

This section of the report summarizes feedback from interviewees about the idea of a Connecticut River Flow Model, as conceived by USACE and TNC. Interviewees shared thoughts on which parts of a model they thought would be most and least helpful to them in their work and gave suggestions for TNC and the USACE to consider as they go forward.

Views/feedback on the goal of the model

Interviewees were almost universally supportive of the balanced goal of the proposed model, which is to determine if altering flows can improve aquatic species and floodplain habitats while preserving the numerous, diverse human uses of the river. Most said that developing a modeling tool to help stakeholders make more efficient, mutually beneficial decisions is a laudable objective. Their responses then varied about how attainable this goal is and which part of the goal is most important.

Many supported the balanced nature of the goal, and said that their organizations and agencies likewise strive for balance between ecosystem and social goods and services. According to some, the Deerfield relicensing process was fairly successful in part because stakeholders acknowledged and worked towards this dual objective. Many said that ecosystem restoration objectives will necessarily be tempered by the human uses of and modifications to the river, but that there is an opportunity to reduce the impact of human uses of the river. One person said that there is an opportunity to optimize the benefits from flow regime management, and that taking a more systemic perspective, moving from an installation-by-installation process towards a watershed-wide one, could yield real benefits. Things like the timing of flows and changes in groundcover might yield real benefits without drastically impacting any users.

Other interviewees focused on either the environmental or the social component of the goal and talked about the trade-offs between these. They noted that even with the best modeling and most collaborative processes, human modification of flow regimes is still likely to create some winners and losers. One person noted that rivers naturally erode and move their beds, and that this movement is important. Interviewees stated their preference for human modifications based on the missions and responsibilities of their different agencies and organizations. Some agencies are focused entirely on upholding federal environmental regulations, while other organizations are focused specifically on particular recreational uses. Whitewater paddlers, for example, may lose out if dams are operated in a more run-of-the-river fashion, as they currently benefit from scheduled releases, which create the conditions they want at the times they want. Flatwater fishing will suffer if dams are removed, while fishing for other riverine species may improve. Encouraging overbank flooding may restore wetlands, but at the cost of farmland in some cases. As one interviewee put it, ‘the devil is in the details; you can’t change anything without affecting someone.’

Using the flow model

Would a basin-wide hydrologic flow and dam operations model would be of use to interviewees? In general, interviewees said it would indeed be useful to have a model that would help to identify what the impacts of various changes to flow would be. Interviewees were generally interested in the ways that modeling could help them better understand likely impacts of management decisions on ecosystems and human uses. The majority felt that the model would be directly useful in their work, and almost all could see the overall value of having it.

Many see the value of the model in FERC relicensing and other negotiations around dam operations and water usage. In particular, some feel that it would be very valuable to have this model in the public

domain and accessible to all (apparently existing data and models are often protected by river users as proprietary). A minority said that it would not be of direct use to them, most noting that it would likely be of significant value to others. A few people were skeptical that an additional management tool is necessary, given the multitude of studies and management plans that already exist. They recommended that this model be built off of that work rather than starting from scratch.

People named criteria that, if met, would ensure that the model would be useful. Many of these criteria were listed by a variety of different interviewees, while some were suggested by only a handful. The model must:

- *Be Rooted in Dialogue* – People thought that this model would be helpful if it were used by multi-stakeholder groups in negotiations or dialogues on how to improve river-related decision-making. They said that if it were not paired with such a process, it would serve as a tool for hydrologists but not for managers and would therefore have little influence on the river itself.
- *Build on Existing Data* – The model needs to build on data that already exists and to incorporate existing support tools so that it takes what exists further rather than starting from scratch. Data from other modeling systems and decision support tools can be found in programs like EQIP (Environmental Quality Incentives Program from USDA) and WHIP (Wildlife Habitat Incentives Program from USDA), which help landowners address sedimentation and stream runoff.
- *Provide Data at Multiple Scales* – This model will be very valuable if it can provide information at many scales. Interviewees noted that decision-making often takes place at a very fine scale, around a particular parcel of land or a single dam, so the model must show results at that resolution as well as at a basin-wide level.
- *Be Credible* – All stakeholders must trust the data and the modeling techniques used in order for the results to assist them in decision-making. Transparency is an important prerequisite to credibility.
- *Be Technically Comprehensive and Sophisticated* – The strength of this model is that it takes a basin-wide approach, incorporating comprehensive data from various sources and applying sophisticated analysis. One specific request was for the modeling process to gather better stream gaging data.
- *Temporally Detailed* - One interviewee noted that the timescale in which the modeling operates is critical to them. They would need numbers calibrated to days to weeks, not just monthly or seasonal conditions. Modeling must be at this finer scale for making management decisions related to protecting in-stream biology.
- *Be Easy to Understand* – Those making local land use decisions need information that is clear and easy to understand both for their own work and so that the public can see the reasoning behind any related decisions that are made. There must be summaries designed for non-technical audiences.

People noted that such a model could be used in other processes, like those establishing water quality standards and fluvial geomorphic assessments. Stakeholders also suggested that there might be additional value from the model if it were developed in such a way that it can be replicated for other rivers across the country. They see this as an opportunity to develop a better way of understanding flow and comparing management alternatives.

Interviewees went on to describe the information they would want in this model, including:

- A list of impoundments
- Flow rates and patterns at dams
- A list of withdrawal sites, rates and patterns
- A list of problematic spots, like where operations are inadvertently diverting fish from the river (for example, the Turners Falls canals)

- Concrete predictions about the impacts of possible changes (e.g. the impact of a given increase in impervious surfaces throughout the watershed) so planners can use the model in their decision making
- The likely impacts of flow changes on habitat, bank stability, erosion and floodplains
- Identification of those parts of the river that are most conducive to restoration/treatment (e.g. which parcels are most suitable for restoring wetlands)
- The comparative advantages and disadvantages of various management alternatives
- The likely impacts current and future laws and policies would have on flow
- Population assessments and studies that show how various species respond to different flow conditions at various points in their lifecycles
- Water temperature data, and how it will change at different points in the river at different stages in time if impoundments are reduced and water is flowing more quickly
- The thresholds of sustainable water withdrawal levels
- A baseline for measuring climatic shifts, and an understanding of how climate change is impacting the basin over time

Modeling the effects of flow changes on floodplain and shoreline ecosystems

Would a model that shows the effects of flow changes on floodplain and shoreline ecosystems be of use? Many interviewees stated that a model of the effects of flow changes on shoreline ecosystems would not be particularly valuable to them, but that they could see how it might be useful to others.

Others said such a model would be very useful. Interviewees engaged in nature conservation highlighted the importance of riparian habitats to the health of rivers and many species. Some species, such as the federally listed tiger beetle, are entirely dependent on healthy riparian zones. Some asserted that modeling could help them to efficiently and effectively identify restoration and conservation opportunities; that is, areas that, under existing or modified conditions, have significant resource potential. This data could be used in policy and decision-making, helping people to prioritize areas most appropriate for conservation.

Those involved in land use planning likewise said that this type of modeling could influence how they permit and manage development in floodplains. It could help them develop hazard mitigation plans and understand the broader implications of what should and should not be permitted. Some said that the results from such a model would be especially beneficial if they helped to redefine floodplains, which haven't been redefined in decades. The model could also help land use planners to understand which areas are critical and/or vulnerable, and develop policies for the protection of those areas. Some talked about how difficult it can be to explain why it is important to minimize development in floodplains and any data to support land use planners in that endeavor would be much appreciated.

Several mentioned that it would be valuable to have models showing sediment transport, sedimentation patterns, and shoreline dynamics. Others mentioned the challenge of acute erosion and said that having a model to explain the ways in which erosion influences and is related to other shoreline conditions would be beneficial. People would like to know what is causing increased erosion today (boaters, dam operation, land owners?) and how that can best be managed.

Modeling the effects of climate change

Interviewees were asked to assess the value of a model that examines the impacts of climate change on the flow dynamics in the Connecticut River. While most interviewees were generally concerned about the impacts of a changing climate, in many cases they did not see how they would use modeling of the impacts of climate change on flows in their work. One interviewee said the priority should be developing

a model of current flows as a starting point. Some interviewees ultimately stated that other issues such as land use changes and improving flow are much more pressing for them than climate change and much easier to address in the short term.

Many interviewees described how a model showing the effects of climate change on the Connecticut River would be useful. Some said such a model would be helpful in regional planning for mitigation and emergency management (as greater understanding of likely impacts such as severe flooding or intense storms would mean more adequate planning for these changes). Others noted that it would have great value in planning for dam relicensing under FERC, as licenses are granted for decades and so must consider climate change. We heard that this model could help engineers appropriately design bridges and establish standards for roads. Similarly, modeling could help experts develop better guidance for landowners. According to TNC and the Corps, dam owners and operators are very interested in having models showing the effects of climate change for their own planning purposes.

Some expressed doubt that an accurate model of climate change impacts could be produced, given the many uncertainties about how the climate will change New England and the Connecticut River watershed. They talked about the complexity resulting from the likelihood that there will be many very different changes and impacts over time and space. Flood events may be more frequent in some cases, while droughts could be equally frequent and problematic in others. Additionally, some interviewees said that the inherently dynamic nature of the climate makes it intrinsically difficult to predict. Finally, historical flow records may no longer serve as an accurate approximation of what will happen in the future. Those who doubt that it is possible to create a model accurately depicting the effects of climate change see developing such a model as futile. According to TNC and the Corps, it is possible to create an accurate and useful model of climate change impacts, using statistical downscaling of global circulation models (GCMs, a commonly used method of evaluating the impact of climate change on water resources) coupled with a hydrologic model representative of current climate conditions. Statistical downscaling uses past meteorological data to develop relationships between the GCMs and specific points of interest within the watershed. Downscaled climatic variables are then input into the hydrologic model to simulate runoff processes for individual watersheds under climate change scenarios.

The model could also be used in more broad climate change planning. For example, someone suggested that the Connecticut River presents an outstanding area in which to prepare for climate change as an adaptation corridor for flora and fauna because of its latitudinal range, length, and change in elevation. While it is not clear how the model might support this, it might help decision-makers decide how best to invest in setting aside land for species movement and new destinations. Another interviewee noted that this model might help managers in implementing the newly completed New Hampshire Climate Action Plan and other plans like it by providing relevant, fine-scale data.

According to interviewees, modeling may also be valuable for habitat evaluation assessments; nitrogen loading models; understanding precipitation changes; and understanding the backwater impacts associated with sea level rise. One interviewee noted that the Connecticut River could be a valuable case study for other rivers, providing information on the ways large rivers might adjust to climate change. In general, stakeholders noted their expectation that management regimes will likely have to change in response to climate change and that they are anxious to understand what this will look like.

Usefulness of modeling unaltered flows

Interviewees were asked to assess the value of a model showing the river in its natural unaltered state (i.e. the river without the influence of dams). Opinions varied widely among interviewees on this topic. Many said that modeling unaltered flows would be useful, while a substantial number said otherwise.

Many said that a naturalized flow hydrograph is a valuable goal, no matter how unlikely it is that it could ever be completely attained. People suggested that this model could be useful by clarifying what that hydrograph would look like. It could serve to impartially indicate the ways in which the river is or is not being managed to mimic a natural hydrograph when people claim they are already mimicking unaltered flows. It could help conservationists by identifying a target they want to be moving towards in relicensing negotiations under FERC, in contrast with the current practice of using current conditions as the baseline. According to TNC and the Corps, dam owners and operators are themselves interested in learning more about unaltered flows. A better understanding could show how the removal of some small, individual dams on tributaries would change flow conditions. Finally, it could demonstrate whether more ideal whitewater conditions did exist on the river prior to dams, as some believe.

Other people see the modeling of unaltered flows as futile, as they believe it is highly unlikely that most of the dams will be removed from the river. They asked what the purpose would be of establishing unrealistic expectations by laying out how the river would have looked had humans not altered it. Still others doubted that unaltered flows could be accurately modeled as the river is so changed from years of human intervention. They suggested that there might be other causes that prevent the river from acting as it did before human intervention such as climate change. One interviewee suggested that if users of the model could make adjustments to model assumptions, it would increase the credibility of the results. Another interviewee suggested that it would be better to seek opportunities in which feasible changes in infrastructure or land cover could have real impacts on the river than to invest resources in comprehensively modeling unaltered flows. According to TNC and the Corps, it is possible to accurately model flows that are unaltered due to the influence of dams by statistically relating flows at stream gages in unaltered watersheds (i.e., watersheds without any dams) to points of interest in the basin. This method has been developed by USGS for the state of Massachusetts, and is being expanded to the entire Connecticut River watershed. Extensive model calibration has shown that agreement between observed streamflows and streamflows estimated using this method is high (near 90% across basins).

Additional comments and feedback on the flow model

Interviewees shared thoughts on this modeling effort that did not all fit in the categories above. The comments in this section are a compilation of those.

Interviewees raised general questions and concerns as they shared their feedback on this proposal. Some worried that the entire scope of the watershed would not be included because USACE does not have operations throughout the watershed. Others were anxious to remind those developing the model that they must actively engage other key players such as FERC. Still others asked how USACE and TNC are going to integrate this model into the relicensing process in which they do not have jurisdiction or standing and whether they might inadvertently cause problems for those engaged in delicate decision-making processes already underway. Several interviewees asked what flow changes TNC and USACE are considering, indicating that they assumed the modeling effort was designed around a particular management objective or proposed change. Finally, many interviewees asked about project timeline.

Some stakeholders said that the model should be directly integrated into decision-making processes. In their opinion, the model is not useful as an academic or analytical exercise; rather, it should be feeding into better regulations and management decisions. Many stakeholders who work in government were keen to assess how the model could be incorporated into their own planning and regulation-setting processes.

One interviewee noted that it is not so easy to draw direct correlations between flow changes and the health of aquatic species; there needs to be some level of translation to understand the impacts of

management changes. Quantifiable objectives (e.g. number and/or diversity of fish) first need to be set, then viable ways of measuring them established. Some stakeholders emphasized that the solution would need to be reasonable; the flood control mechanisms protecting urban areas cannot, for example, be sacrificed.

One interviewee suggested that it is important to consider the services provided by the Connecticut River in terms of their broader environmental costs and benefits; for example, if flows are more tightly managed, reducing hydroelectric generation, will people in the region burn more coal?

Finally, some perspectives were shared by many or most in a particular stakeholder group we spoke with. We have grouped a few of them here to provide the flavor of those perspectives:

Conservation agencies and environmental non-profits – Those representing these groups were generally concerned with the state of various species and the natural ecosystems that sustain them. They are interested in seeing flow changes that will enable the Connecticut to follow a more natural regime to the benefit of native species.

State agencies - Those working in state government were keen to assess how the model could be incorporated into their own planning and regulation-setting processes.

Regional planning agencies – People from the regional planning agencies had more divergent and diverse concerns, depending on the specific challenges of the regions in which they work. They are concerned with population growth and land use changes, which can contribute to both increased runoff and erosion, and with emergency management planning and preventative measures to minimize flooding.

Water authorities/users – These people were interested in protecting the health of the systems, which they depend on for fresh water, and in preserving their access to these systems to meet the needs of their clients.

Paddlers – Paddlers benefit from targeted releases, which create ideal whitewater and fast water conditions. These targeted releases are often the result of negotiations with dam operators, and some are concerned that the releases could be reduced or eliminated with renegotiated operations.

IV. Process Suggestions

Overview

Building on feedback collected from the assessment interviews and based on professional experience, the assessment team has the following process advice for TNC and USACE. Remaining engaged with stakeholders has a variety of advantages:

- Stakeholders are more likely to support the project if they understand it and believe that their questions and concerns are being heard;
- Stakeholders have valuable feedback and data they can contribute to the project;
- Some stakeholders constitute the target audience for the modeling outcomes (e.g. dam operators), and are more likely to listen to those outcomes if they understand how they were developed;
- Stakeholders are more likely to use the model if they are aware of it, have had some input into its development, and understand its uses, purposes, and capabilities; and
- Some stakeholders are (or are planning to be) engaged in similar or related modeling efforts at different scales, and this project provides an opportunity to learn together.

There are many ways in which those developing and carrying out this modeling effort can manage engagement with stakeholders, including collaboration and information sharing. This section summarizes the components the assessment team feels would be most productive and useful in gathering and sharing information at key points.

Interviewees were asked how they would like to be involved in the project going forward. Almost all stated that they would at minimum like to be kept informed; electronic newsletters and a project website that would serve this purpose are described below. Some hope to be consulted several times over the course of the process through large public workshops or meetings. Others would very much like to weigh in on the technical aspects of model creation and use through a technical advisory group.

Given the technical nature of the project, messaging to the public is likely to be difficult and require significant attention. Engaging in these various efforts to raise awareness of the project at key points is likely to benefit the project as input will strengthen it and understanding will increase the likelihood of its use. Key stakeholders to reach out to include dam owners and operators, state-level decisionmakers, councils of government and conservation organizations.

We recommend that project managers consider developing and managing the following:

- A database of organizations and individuals interested in project progress,
- An electronic newsletter to provide regular updates for the public,
- A project website containing key documents and data,
- A technical advisory group to discuss modeling assumptions, techniques, strategies and outcomes,
- Public workshops, to be held once modeling outcomes are known,
- Guest presentations for organizations that want to learn about the project, and
- A dam owners and operators' group.

Information sharing

This section describes opportunities for the project team to make information widely accessible to a broad range of people on a regular basis.

Database – Through this effort, we have begun to build an extensive database of interested organizations. It is attached in Appendix D. Though involving regular effort and diligence, we think that this database is the core to any ongoing outreach effort. Names and contacts should be added after each public engagement effort, be that a meeting of a particular group or a regional workshop. The website described below should provide on its home page a way for any interested party to sign-up to be part of this database. Contacts and addresses may change over time, so, at least once a year, someone should review and update the entire database for accuracy.

Electronic newsletter – A simple, digital newsletter could be produced three times a year and broadly distributed to the wide audience of stakeholders. The newsletter should focus on progress made, next steps, and upcoming events and should invite readers to provide feedback on any key issues that will be addressed in the next project phase. Each newsletter could also contain a human-interest story about a particular species, dam operator or other attribute of the watershed to give a human face or concrete story to the project. While reaching most stakeholders, a newsletter would be particularly valuable for keeping those informed who have a more cursory interest in and connection to the project. These might include civil servants in indirectly connected departments or units and regional planning agencies. Newsletter content should be accessible to a lay audience, translating technical information into easily understandable statements. Those who desire more technical background data should be directed to it on the project website.

Project website – A comprehensive project website could serve as both a repository for project information and a channel for collecting feedback. As a supplement to the electronic newsletter, the website could host more regular blog-style updates. The site should also contain an introductory description of the project, a map of the project area (watershed), links to related efforts, a place for people to sign up for the newsletter, a way to request a presentation on the project, and a copy of relevant background documents. Technical data and information should also be stored and made available online as it is developed. One example of an effective and somewhat analogous project website is that of the Comprehensive Everglades Restoration Plan: www.evergladesplan.org. Technically, a good website will allow the project team to provide regular blog-style updates with little or no technical skill required. Project leads will need to regularly post information to the site for people to consider the site relevant. In practice, most visitors will not visit frequently, but when they do, they will want it to feel up-to-date. Recognizing that most visitors will not be regulars, it is also important that the site is structured in an easily accessible manner. The site should be piloted with different users while under development to better understand how and why they will interact with it.

Meetings and discussions

This section describes opportunities for the project team to engage different stakeholder groups face to face, whether through small guest presentations or more structured groups that meet regularly such as a technical advisory group and a dam owner and operator's group.

Technical advisory group – Some of the interviewees directly engaged in flow regulation and/or modeling were interested in participating in a technical advisory group in order to both contribute to this important project and to learn from the process. We recommend the creation of a technical advisory group comprised of 10 to 15 individuals invited to participate because of their diverse and relevant technical expertise. These technical advisory group members would come from relevant agencies in the four states through which the river passes (e.g. MA Dept. of Fish and Game, Division of Fish and Wildlife); relevant federal agencies (e.g. FERC); and other relevant organizations (e.g. the Connecticut River Joint Commissions); and likely some representatives from hydropower operators, though we did not speak with them through this process. Possible criteria for selecting members of this group include:

- Representative of states along the River;

- Diversity of technical expertise in fisheries, shorelines, river ecosystems, hydrological modeling, and climate change.
- Willingness to participate actively and in on-going manner.
- Ability to link this effort with other related data collection and modeling efforts.

The technical advisory group would meet several times over the course of the project, at least twice a year. The first meeting should be held early to test initial assumptions, with later meetings scheduled at key project milestones so participants can raise important questions, provide useful suggestions and follow project results. Because this is a group of selected professionals, the technical advisory group should meet directly with technical project staff and be privy to technical data. By providing data up front and consulting this group regularly, the project team will be able to build substantial goodwill among those with whom it may want to cooperate later on, particularly within various government agencies at the state and federal levels.

Many stakeholders were interested in how this project might overlap with and/or complement a variety of other efforts already underway, including state flow modeling projects, the ongoing Long Island Sound Study (www.longislandsoundstudy.net) and various climate action processes. Some fear that this project will duplicate existing work, or fail to develop relevant data when the opportunity exists. The technical advisory group could be one venue for uncovering opportunities for cooperation and reducing unnecessary overlap.

The technical advisory group will need good project coordination, which could be done by a staff person or by an outside contractor. The project manager could focus on helping the group reach positive outcomes at the table, and could also work with parties individually, helping them explore their options and hone their positions. Having a project coordinator will allow the technical advisory team to participate as interested parties with specific interests. Furthermore, the project coordinator would serve in a useful coordinator role, ensuring participants are kept informed, the group interfaces regularly and appropriately with the technical progress of the project, and that action items are completed and commitments met.

Public workshops – The Connecticut River is a large and diverse watershed. Because of this geographic diversity, multiple jurisdictions, and scope, we recommend that once some modeling results are known, several regional workshops be held in places throughout Connecticut, Massachusetts, Vermont and New Hampshire. Such workshops would focus primarily on regional issues and opportunities, possible changes to river flow suggested by the model, and would enable members of the public to participate without extensive travel. These workshops should be open to a broad lay audience, translating options into language they can understand and respond to. These workshops should target watershed organizations, paddlers, land trusts, municipalities and other regional stakeholders. The workshops should also be open-ended, allowing stakeholders to bring the issues they are concerned about to the table. The workshops should focus on ways in which the modeling might be useful to municipalities in their land use and other decisionmaking. Though the USACOE and TNC have specific project objectives, we learned through our interviews that people will best be able to engage the model if they can see how it can be used to address a problem or opportunity specific to them.

When the time comes to hold such workshops, we recommend working closely with regional planning agencies and/or watershed organizations, as these groups have experience holding such events and have strong local networks to reach key stakeholders. One of the challenges, of course, is reaching out to the almost 100 municipal jurisdictions along the river (not even counting the larger watershed local jurisdictions). In our experience, these regional planning groups have the best direct contacts to municipalities. While we explored the interest of state-wide municipal associations, there was little

interest at this kind of technical level by such broad, policy oriented groups, especially in these times of economic crisis.

The project team might employ a professional neutral facilitator (or facilitation team) to run these workshops. Having an external facilitator will allow the project team to focus on representing its interests, explaining and advocating for the project. A professional neutral will use their process experience to devise a workshop format that is most likely to lead to productive discussions and engaged participants.

Guest presentations – In order to ensure the transparency of this project and foster support, we recommend that the project team make itself available to different groups and organization that request presentations or information. A standard presentation template should be developed that outlines the project and can easily be modified as the process evolves, and based on context and audience. Organizations could request a presentation or an update at any time, and the project team would strive to be available to present. We have gathered in this assessment a range of interested groups and organizations. The project team could start by offering such presentations to the groups on that list.

Dam owners and operators group – Utilities, the Corps, and a small group of other dam owners/operators and water users will play a significant role in any flow regime changes. For this reason, it is crucial to engage them as the project develops. The project team may want to create a dam owners and operators group, which would be invited to review outcomes, comment on the implications and weigh trade-offs. This group should include dam owners and operators who manage dams that provide water supply, recreational opportunities, flood control services and hydroelectric power. Like the technical advisory group, members of this group would be selected based on a set of criteria that would provide the project team with a representative group of dam owners and operators with a range of skills and knowledge. By better understanding their views, the project team is more likely to identify flow changes that are most likely to be successfully implemented. As these groups were not the focus of this assessment, their opinions and suggestions are not reflected in this report. Prior to creating the users group, we recommend that the project team approach these groups individually to learn how they would best like to be involved, continuing the already ongoing process of engaging with dam owners and operators.

As noted previously, it is important to recognize that not all stakeholders are directly in the basin. Water is extracted for consumption beyond the watershed boundaries, and hydroelectric power generated is transmitted throughout the broader region. Flow regime changes do, however, have impacts on these stakeholders; a reduction in hydroelectric power generation may, for example, lead to increased power generation elsewhere. While some of the major users will indirectly represent them – particularly the water and hydroelectric utilities they are customers of – the best way to represent the interests of these external stakeholders is an outstanding question.

State decision makers – State-level decision makers will need to be kept updated on the project, especially as results become known. To date, the Corps and TNC have been updating the congressional delegation regularly. We recommend that they continue in this effort and also seek opportunities to present to those state-level decision makers who have a role in water allocation and the management of the Connecticut River. The first step will be to identify opportunities to present to these groups, the second to get on a cycle of regular presentations and information sharing.

“Missing” Stakeholder Engagement

Groups underrepresented among interviewees include local municipal officials, residents, and agricultural interests. As one interviewee noted, many of the flow changes that modeling may propose will be

significantly easier or more difficult to implement depending on the support or opposition of the communities they will impact. This is particularly true in the case of changes that will have substantial local impacts, like the removal of historic dams in the tributaries and increased overbank flows.

The scale of the Connecticut made it impossible to directly reach out to every community at this stage. Instead, the assessment team interviewed a sampling of regional planning agencies to develop an understanding of the key issues. As a next step, the project team might consider reaching out to each municipality, introducing the project and inviting feedback. This could be done via a targeted mailing to municipal offices and the offices of state and federal representatives. In fact, TNC and the Corps have been in correspondence with each of the relevant congressional delegations over the past five years regarding the project. The regional workshops should also be very useful in reaching out to municipalities and local stakeholders.

Lastly, we encourage the project team to directly and actively reach out to agricultural interests, at least through statewide associations such as Farm Bureaus. Agricultural interests will ultimately become most concerned about flow regimes that may affect water withdrawals, flooding, seasonal changes, and amount/degree of wet ground.

Project evaluation

Self-evaluation and reflection could be useful in ensuring continuous process improvement. The project team should hold periodic internal process review sessions to reflect on the following questions, among others:

- What did we want to accomplish in the last time period? Did we meet those goals? Why or why not?
- What problems have we encountered and how did we overcome them?
- What have we learned?
- What could we have done better?
- Did others effectively understand our progress and respond positively to it?
- What resources did we use, and were they used wisely?

Some stakeholders were also keen to learn from this process, as they envision themselves engaging in similar efforts in the future. In general, the lessons learned from this significant project could be extremely valuable to other groups looking to engage in complex watershed flow modeling. The project team should track and document both the technical and management process as it proceeds. A ‘lessons learned’ section on the website could serve as a repository for information on the process, including self-evaluation process documentation.

The project team might also include some key outreach goals and evaluation criteria. While these would need further refinement and development, we have included preliminary suggestions below.

Outreach Goals and Potential Metrics

- Ensure key agency technical staff and managers are aware of the modeling effort.
 - Key agency staff within all affected states have heard of the modeling project and can state the general intent and goal of the effort.
 - Key agency staff have read a newsletter, flyer, or attended at least one related-event in the last year.
- Enlist a focused set of key agency technical staff in model development

- A geographically diverse and technical proficient group of technical staff are participating in an on-going technical advisory group.
- The project team receives additional data from agency personnel.
- The project team is able to link this effort with at least one other related project in each state.
- Ensure key stakeholders are aware of the modeling effort.
 - The database of interested stakeholders grows by at least 25% per year.
 - The project database includes a wide range of diverse interests from municipalities to ag interests.
 - The newsletter is sent out at least X times per year.
 - Brief to longer articles on the modeling effort appear in numerous interest group newsletters, websites, newspapers, and trade publications.
 - At least 500 people attend public workshops held along the river later in the project.

V. Appendices:

A. List of Interviewees

Abele, Ralph
Allen, Rob
Bennett, John
Breshnihan, Pat
Caduto, Marie
Clarke, Christine
Clendenning, Bruce
Colburn, Kevin
Couture, Steve
Cueto, Jeff
Currier, Paul
Damon, Mark
Downes, Torrance
Duerring, Christine
Erhart, Monica
Estes-Smargiassi, Steve
Fellows, Peter
Fielding, Eileen
Fitzgerald, Brian
French, Andy
Guey-Lee, Bill
Gwyther, Chelsea
Hammond, Evan
Heidell, Pam

Hull, Sally
Ives, Wayne
Jones, Robert A.
Khorana, Julia
Kimball, Kenneth
King, Michael
Kowalewski, Mary Ellen
LeVangie, Duane
Libby, Steve
MacPhee, Kimberly
Miner, Margaret
Mulligan, Adair
O'Leary, John
Rasmussen, Jason
Ruppel, Rachel
Russ, Mary
Ruzicka, Denise
Simon, Brice
Sprankle, Ken
Stacey, Paul
Walk, Marie Françoise
Walker, Christine
Warner, John

B. Interview Protocol

Connecticut River Ecosystem Restoration Study Stakeholder Survey

OMB Control Number: 0710-0001

SAMPLE INTERVIEW QUESTIONS

GENERAL

1. How do you use the Connecticut River and why is it important to you and your organization?
2. What do you think are the major challenges facing the Connecticut River in the coming years? (*Prompts include anadromous fish, forested floodplain habitats, climate change, shoreline erosion, contaminants, etc.*)
3. What problems, if any, do you see with water flows in the Connecticut River basin at the current time?
4. What would you like to know more about regarding water management in the Basin (e.g., dam operation, flow regimes, habitat impacts)?

PROJECT SPECIFIC

5. Would a basin-wide hydrologic flow and dam operations model be useful to you? If so, how and why?
6. Would a related model that can model the affects of flow changes on shoreline ecosystems, including floodplains, be useful to you? If so, how and why?
7. Would a related model that can model the affects of climate change on flow be useful to you? If so, how and why?
8. Would a related model of baseline flows (i.e., without the influence of dams) be useful to you? If so, how and why?
9. The purpose of the model is to determine if altering flows can improve aquatic species and floodplain habitats while preserving numerous, diverse human uses of the river. What are your views on this goal?
10. What kind of flow regime modifications can you imagine that might be useful to meet your interests, if any?

PROCESS SPECIFIC

11. The model proponents – TNC and the USACE – are currently approaching dam owners and operators for the necessary data to develop the model. How would you like to be involved? Some options are:
 - a. Review of information posted on a project web page
 - b. Included on an e-version newsletter mailing list
 - c. Participation in occasional regional Workshops
 - d. Participation in a technical workgroup to develop alternative flow scenarios
 - e. Participation in a stakeholder advisory group
 - f. A user of the completed models
 - g. Other?

12. At what points would you want to be involved?
 - a. Early and on-going as the model is developed
 - b. Early to understand the scope and focus and then only later when the model is functional enough to demonstrate its use
 - c. Only once the model is developed and can be used
 - d. Other

13. Attached is a list of stakeholders we are reaching out to at this time. Are we missing any key groups or individuals you would recommend including?

C. Introductory Letter

Connecticut River Ecosystem Restoration Study CT, MA, NH, VT

Dear:

We are writing you to ask if you would share your knowledge and expertise with us regarding the Connecticut River by participating in the Connecticut River Ecosystem Restoration Study Stakeholder Survey.

As you know, over the years substantial work has been done by many of you, the individuals and organizations working here, to improve the ecological health of the Connecticut River watershed. This important work has led to dramatic improvements in the watershed, among them improved water quality and increased land protection.

Based on input from partners throughout the watershed, The Nature Conservancy and the U.S. Army Corps of Engineers decided to focus our efforts on the hydrology of the Connecticut River and its important tributaries. Beginning in 2005, we initiated a series of studies to gain a better understanding of the hydrology of the watershed by examining the essential linkages between flow and the species, natural communities, and human uses in and along the river. Through this body of work, we have concluded that the best way to understand the hydrology of this large basin is to create a basin-wide hydrologic model. Our goal for this model is to examine current hydrology and potential alternative scenarios of water management to inform flow recommendations that benefit both conservation objectives and human uses. The Connecticut River Ecosystem Restoration Study Stakeholder Survey is geared to those objectives.

To explore how we can best engage stakeholders in this study, we have selected the Consensus Building Institute (CBI), a consulting firm that has broad experience in stakeholder engagement and outreach. This team will assess the perspectives and needs of all those who have a stake in the watershed, and determine ways to engage stakeholders as the project moves forward. The CBI team will conduct a number of interviews with representatives of organizations with a range of interests and views on issues related to the river. The intent of the Stakeholder Survey is to identify the key issues facing the Connecticut River, to identify how a basin-wide model might be useful to stakeholders, and to ascertain how stakeholders might want to participate in the development of the model. CBI will prepare a written report, based on information gathered in the interviews, with their findings and process recommendations. The report will be made available to the public.

The survey will be conducted in person, whenever possible, or by telephone, between mid-May and mid-June. Sample questions from the Connecticut River Ecosystem Restoration Study Stakeholder Survey are enclosed for your information. You do not need to take any action on this. You will be contacted by CBI to respond. You may decline to participate if you wish.

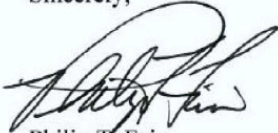
If you participate, your answers to their questions will remain confidential; specific comments or findings will not be attributed to anyone by name or position in writing or verbally to us or

others. Please see the enclosed Privacy Act notice and Survey Burden Statement for more information. The official Government OMB Control Number for this survey is: 0710-0001.

Your voice is a critical element to the success of this assessment phase. Your active involvement will help create the foundation for a productive, collaborative planning process going forward. We appreciate your valuable time in responding.

The project managers for this work are Kimberly Lutz (klutz@tnc.org) from The Nature Conservancy and Christopher Hatfield (christopher.l.hatfield@usace.army.mil) from the Corps of Engineers. Please feel free to contact either of them if you have any questions or require additional information.

Sincerely,



Philip T. Feir
Colonel, Corps of Engineers
District Engineer



**US Army Corps
of Engineers®**
New England District



Daryl J. Burnett Lise A. Hanners Robert J. Klein Wayne A. Klockner
NH Chapter Director CT Chapter Director VT Chapter Director MA Chapter Director



Enclosures
Privacy Act Notice
Survey Burden Statement
Summary Document
Map of Watershed
Restoring Ecosystem Flows

D. Organization profiles

Organization descriptions are referenced from their respective websites.

Academic/Research

University of Connecticut, Institute of Water Resources
Pat Breshnihan
1376 Storrs Road, Unit 4087
WB Young Bldg., Room 308
Storrs, CT 06269-4087

Description: The Connecticut Institute of Water Resources was established in 1965 by the Federal Water Resources Research Act with two primary objectives. The first is to plan, conduct and arrange for competent research in the field of water resources. The second is to cooperate closely with colleges and universities in Connecticut in order to develop a statewide program designed to resolve state and regional water and related land problems.

Connecticut (State)

Department of Environmental Protection
Paul Stacey and Denise Ruzicka
79 Elm Street
Hartford, CT 06106-5127

Description: Founded in 1971, the mission of the Department of Environmental Protection (DEP) is to conserve, improve and protect the natural resources and environment of the State of Connecticut in such a manner as to encourage the social and economic development of Connecticut while preserving the natural environment and the life forms it supports in a delicate, interrelated and complex balance, to the end that the state may fulfill its responsibility as trustee of the environment for present and future generations. The DEP achieves its mission through regulation, monitoring, inspection and enforcement, and licensing procedures that help control air, land and water pollution in order to protect health, safety, welfare and natural resources. DEP also improves and coordinates the state's environmental plans, functions and educational programs in cooperation with federal, regional and local governments, other public and private organizations and concerned individuals, while managing and protecting the flora and fauna for compatible uses by the citizens.

Environment/Conservation

Connecticut River Watershed Council
Chelsea Gwyther, Executive Director
15 Bank Row
Greenfield, MA 01301

Description: The Connecticut River Watershed Council advocates for the entire, four-state Connecticut River watershed. It works to protect water—the river, its tributaries, lakes, fish; and the land, plants, and creatures connected to that water. The CRWC works to keep them safe now, and for future generations. The Connecticut River Watershed Council works to protect the watershed from source to sea. From alpine forests to tidal estuaries, rural farmlands to urban riverfronts, spotted salamanders to bald eagles, and mussels to salmon, the Connecticut River watershed unites a diversity of habitats, communities and

resources. As stewards of this heritage, CRWC celebrates their four-state treasure and collaborates, educates, organizes, restores, and intervenes to preserve the health of the whole for generations to come.

Deerfield River Watershed Association

Marie Francoise Walk, President
15 Bank Row, Suite A
Greenfield, MA 01301

Description: The Deerfield River Watershed Association is a non-profit organization with the mission to preserve, protect, and enhance the natural resources of the Deerfield River watershed in south-eastern Vermont and north-western Massachusetts. DRWA is committed to pursue the following program goals for the benefit of the watershed: protect and monitor water quality, protect and monitor wildlife habitat and wetlands, protect open space, be an active local partner, support the implementation, improve watershed stewardship, encourage watershed/environmental education in local schools.

Farmington River Watershed Association

Eileen Fielding, Executive Director
749 Hopmeadow Street
Simsbury, CT 06070

Description: Founded in 1953, the Farmington River Watershed Association has been working six decades to protect the River that connects us all and to restore the natural resources of the watershed. We invite you to join us and become a part of this important effort. The FRWA is a citizen-based, non-profit 501©(3) organization at the forefront of restoration and conservation issues such as water quality, water allocation, recreational usage, open space, and wetland and floodplain protection. We work with federal, state and local governments, business and industry, and the people of the watershed's 33 communities to protect the river and the region's natural resources.

Northern Forest Alliance

Bruce Clendenning, Policy Director
54 Portsmouth Street
Concord, NH 03301

Description: The Northern Forest Alliance, formed in 1990, is a coalition of conservation, recreation and forestry organizations united in their commitment to the Northern Forest of Maine, New Hampshire, Vermont and New York. [Click here for information on our member organizations.](#) Its mission is to ensure the economic and ecological future of the Northern Forest and its communities.

Rivers Alliance of Connecticut

Margaret Miner, Executive Director
P.O. Box 1797
Litchfield, CT 06759

Description: Rivers Alliance of Connecticut is the only statewide nonprofit dedicated to protecting and enhancing Connecticut's rivers, streams, and watersheds. We promote and support environmentally sound state policies, assist the state's many watershed and river groups, and educate the public about the importance of water conservation and aquatic habitats. We are a membership-based nonprofit corporation founded in 1992. Rivers Alliance seeks to protect Connecticut's rivers, streams, and watersheds by: building coalitions, encouraging collaboration, strengthening the grassroots, promoting sound public policy, and educating the public.

Upper Valley Land Trust
Monica Erhart, Stewardship Coordinator
19 Buck Road
Hanover, NH 03755

Description: The Upper Valley Land Trust helps people conserve land. We engage people in the vision and process of land conservation and in the stewardship of conserved lands. UVLT provides conservation leadership, tools and expertise to permanently protect the working farms, forested ridges, wildlife habitat, water resources, trails and scenic landscapes that surround residential areas and commercial centers and make the Upper Valley a truly special place to live. Our conservation projects secure the mixture of land uses so critical to the region's vitality and identity. We work with local conservation commissions and volunteer groups to identify and prioritize land conservation opportunities. We provide technical assistance and conservation solutions for landowners. We steward permanent agreements that conserve key properties forever. UVLT focuses its mission in 44 Vermont and New Hampshire towns in the upper Connecticut River valley.

Vermont River Conservancy
Brice Simon, Chair and Steve Libby, Executive Director
29 Main Street, Suite 11
Montpelier, VT 05602

Description: The Vermont River Conservancy protects public access, wildlife habitat, clean waters, scenic natural beauty and ecological integrity by conserving undeveloped land along rivers, lakes and wetlands of Vermont. Since 1995, working in cooperation with state and federal agencies, municipalities and other conservation organizations, VRC has completed over 25 projects around the state. Popular local swimming holes, breathtaking gorges and waterfalls, fishing and boating accesses, paddlers' trails and meandering river corridors have all been protected for future generations to enjoy.

Westfield River Watershed Association
Mark Damon, President
P.O. Box 1764
Westfield, MA 01086-1764

Description: The Westfield River Watershed Association was established in 1953 to protect and improve the natural resources of the Watershed, as well as to expand recreational and other land use opportunities for people's enjoyment and for sound ecology. WRWA is a tax-exempt non-profit organization funded largely by membership dues and some grants.

White River Partnership
Mary Russ, Executive Director
P.O. Box 705
South Royalton, VT 05068

Description: The White River Partnership (WRP) is a grassroots, non-profit organization that brings together people and local communities to improve the long-term health of the White River and its watershed. The WRP formed in 1996 as a group of local people who shared common concerns and interests in the watershed. That same year, we organized a series of public forums to identify the concerns shared by the larger watershed community. More than 150 community members participated in the forums, and the most prevalent concerns for the White River watershed were streambank erosion, water quality, declining fish populations, and public access to the river. Since 1996, the WRP has worked to address these concerns by uniting citizens, schools, businesses, towns, local and regional organizations,

and state and federal agencies to implement on-the-ground programs designed to evaluate the health of the watershed, to protect and restore the watershed, and to raise awareness about watershed issues, including sustainable agriculture, forestry, and recreational uses.

Federal Agencies

Connecticut River Atlantic Salmon Commission

Ken Sprankle
103 East Plumtree Road
Sunderland, MA 01375

Description: The mission of the Connecticut River Fisheries Program is to conserve, manage and restore Atlantic salmon, American shad and other migratory fish and their habitats in partnership with the Connecticut River Atlantic Salmon Commission and consistent with the USFWS mission.

Silvio O. Conte National Fish and Wildlife Refuge

Andy French, Project Leader
103 East Plumtree Road
Sunderland, MA 01375

Description: Silvio O. Conte National Fish and Wildlife Refuge was established in 1997 to conserve, protect and enhance the abundance and diversity of native plant, fish and wildlife species and the ecosystems on which they depend throughout the 7.2 million acre Connecticut River watershed. Legislators made the charge so comprehensive because they realized that, in order to protect migratory fish and other aquatic species, there was a need to protect the whole river system and its watershed; the health of any aquatic ecosystem is linked to the health of the whole watershed upstream. It is one of only three refuges in the National Wildlife Refuge System that has Fish in its title.

Federal Energy Regulatory Agency

Bill Guey-Lee
888 First Street, NE
Washington, DC 20426

Description: The Federal Energy Regulatory Commission, or FERC, is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects.

U.S. Environmental Protection Agency, Region 1

Ralph Abele
1 Congress Street, Suite 1100
Mail Code CWQ
Boston, MA 02114-2023

Description: EPA leads the nation's environmental science, research, education and assessment efforts. The mission of the Environmental Protection Agency is to protect human health and the environment. Since 1970, EPA has been working for a cleaner, healthier environment for the American people.

U.S. Fish and Wildlife Service, New England Office

John Warner
70 Commercial Street, Suite 300

Concord, NH 03301

Description: The U.S. Fish and Wildlife Service is a bureau within the Department of the Interior. Our mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people. A few ways we try to meet our mission are: enforce federal wildlife laws, protect endangered species, restore national significant fisheries, and conserve and restore wildlife habitat such as wetlands.

Massachusetts (State)

Massachusetts Department of Environmental Protection
Duane LeVangie, Director, Water Management Program
One Winter Street
Boston, MA 02108

Description: The Department of Environmental Protection is the state agency responsible for ensuring clean air and water, the safe management of toxics and hazards, the recycling of solid and hazardous wastes, the timely cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources.

Massachusetts Department of Environmental Protection, Division of Watershed Management, Central Region (CERO)
Christine Duerring
627 Main Street
Worcester, MA 01608

Massachusetts Executive Office of Energy and Environmental Affairs
John O'Leary

Description: Secretary Ian Bowles oversees the Commonwealth's six environmental, natural resource and energy regulatory agencies. Massachusetts is the first state in the nation to combine energy and environmental agencies under one Cabinet secretary. The overall mission of the Executive Office is to safeguard public health from environmental threats and to preserve, protect, and enhance the natural resources of the Commonwealth. Our commitment to protecting our environment now recognizes the importance of energy efficiency; making renewable energy a reality in our state, and reducing our dependence on fossil fuels; diversifying our energy sources; and leading the country in energy technology innovation.

Massachusetts Water Resources Authority
Steve Estes-Smargiassi and Pam Heidell
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Description: MWRA's mission is to provide reliable, cost-effective, high-quality water and sewer services that protect public health, promote environmental stewardship, maintain customer confidence, and support a prosperous economy. MWRA is an independent authority that provides wholesale water and sewer services to its customer communities, and funds its operations primarily through user assessments and charges. MWRA was created by the legislature in 1984 and inherited operations and facilities beginning in 1985 from the Metropolitan District Commission, a century-old department of state government.

Municipalities/Regional

Capitol Region Council of Governments

Mary Ellen Kowalewski, Director of Community Development
241 Main Street
Hartford, CT 06106-5310

Description: The Capitol Region Council of Governments (CRCOG) is guided by the chief elected officials of our 29 Metro Hartford municipalities. The mayors, first selectmen, and town council chairmen who make up our governing Policy Board recognize that the future of our individual members is tied to the future of our region. Our members have collaborated for more than 30 years on a wide range of projects to benefit our towns individually and the region as a whole.

Connecticut River Estuary Regional Planning Agency

Torrance Downes, Senior Planner
P.O. Box 778
Old Saybrook, CT 06475

Description: The Connecticut River Estuary Regional Planning Agency is dedicated to planning for and promoting voluntary cooperative approaches to changing land use and other issues affecting the character and people of the Connecticut River Estuary Region.

Franklin Regional Council of Governments

Kimberly MacPhee, Natural Resources Planner
425 Main Street, Suite 20
Greenfield, MA 01301-3313

Description: The Franklin Regional Council of Governments (FRCOG) is a regional service organization serving the twenty-six towns of Franklin County. Franklin County is the most rural county in Massachusetts with a population of 72,000 over 725 square miles and located in the upper Connecticut River Valley in mid-western Massachusetts. The FRCOG is the former county government. The county government was abolished in 1997 and reestablished as a voluntary membership organization. Today the FRCOG operates 12 programs with more than 40 staff. Our annual operating budget is approximately \$3 million. The organization's focus is overseen and directed by a 29-member Council.

North Country Council

Michael King, Executive Director
107 Glessner Road
Bethlehem, NH 03574

Description: It is the mission of North Country Council to encourage effective community and regional planning for the development of economic opportunity and the conservation of natural, cultural and economic resources. This is accomplished by providing information, regional advocacy, technical assistance, community education, and direct service to the region, its organizations, and political subdivisions. During our over 30-year history, NCC has always been a flexible organization, working with communities on a variety of issues and community concerns as needs have arisen. In its function of service to the region, NCC initiates or provides essential support for planning and economic development services.

Southern Windsor County Regional Planning Commission

Jason Rasmussen, Senior Planner
P.O. Box 320
Ascutney, VT 05030

Description: The SWCRPC advocates for the needs of member towns and seek collaborative strategies to address local, regional, and state opportunities and concerns. One of our primary purposes is to provide technical services to town officials and to act as a resource for local governments. We help mediate inter-jurisdictional planning and development issues arising between member communities; facilitate discussion and understanding between local and state entities; and develop plans, policies, strategies, and procedures for addressing issues that are regional in scope.

Two Rivers-Ottawaquechee Regional Commission
Sally Hull, Regional Planner and Pete Fellows, GIS Service Manager
3117 Rose Hill
Woodstock, VT 05091

Description: TRORC is a compact of thirty municipalities in east-central Vermont, and was founded in 1970 by acts of its constituent towns. It is not a part of State Government, but is governed by a Board of Representatives appointed by each of our member towns. Our primary goals are to advocate for the needs of our member towns, and to help bridge the opportunities and concerns that exist between towns and the State. The Commission's staff provides technical planning services to town officials, and acts as a resource to local government.

Upper Valley Lake Sunapee Regional Planning Commission
Christine Walker, Executive Director and Rachel Ruppel, GIS Coordinator
30 Bank Street
Lebanon, NH 03766-1756

Description: The Upper Valley Lake Sunapee Regional Planning Commission is a not-for-profit, voluntary association of 27 municipalities in western New Hampshire. We provide a mechanism for communities that live, work and recreate together to plan for the balanced growth of the Region and collaborate on issues of common concern.

Windham Regional Commission
John Bennett, Senior Planner
139 Main Street, Suite 505
Brattleboro, VT 05301

Description: The Windham Regional Commission is an association of twenty-seven towns in southeastern Vermont. Formed in 1965, the WRC assists member towns to provide effective local government and works cooperatively with them to address regional issues and review major development proposals. The WRC is one of eleven regional planning commissions in Vermont. The WRC accomplishes its mission primarily by helping towns; draft new or revised town plans, develop or improve zoning, subdivision and other land use regulations, conduct educational programs and provide technical assistance on town planning and land use issues, mapping and information services, major development review and a variety of inter-governmental coordination activities.

New Hampshire (State)

New Hampshire Department of Environmental Services

Laura Weit, Acting Rivers Coordinator, Steve Couture, Rivers Coordinator, Paul Currier, Watershed Management Bureau Administrator and Wayne Ives, Instream Flow Specialist
29 Hazen Drive, PO Box 95
Concord, NH 03302-0095

Description: The protection and wise management of the state of New Hampshire's environment are the important goals of the NH Department of Environmental Services (DES). The department's responsibilities range from ensuring high levels of water quality for water supplies, ecological balance, and recreational benefits, to regulating the emissions of air pollutants, to fostering the proper management of municipal and industrial waste, to managing water resources for future generations. Formed in January 1987 by state statute RSA 21-O, DES was legislatively created through the consolidation and reorganization of four previously separate agencies: the Air Resources Agency, the Office of Waste Management, the Water Supply and Pollution Control Commission, and the Water Resources Board. Each of these groups is now represented within the department's three divisions: Air Resources, Waste Management, and Water. Also, DES has units within the Office of the Commissioner whose roles are to coordinate such activities as agency-wide planning, enforcement, permitting, public information, laboratory services, geologic services, information resources, and financial and personnel management.

The Rivers Management and Protection Act of 1988 (RSA 483) established a statewide rivers program based in a two-tier approach to river management and protection: state designation of significant rivers and protection of instream values and local development and adoption of river corridor management plans to protect shorelands and adjacent lands. More information about the Instream Flow Program can be found online at <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/index.htm>.

Parastatal/Management

Connecticut River Joint Commissions
Adair Mulligan, Conservation Director
P.O. Box 1182
Charlestown, NH 03603

Description: The Connecticut River Joint Commissions, working together since 1989, are composed of New Hampshire and Vermont's legislatively-established watershed advisory commissions. The Commissions facilitate public involvement in decisions that affect the river and its watershed, and have recently published the Connecticut River Water Resources Plan and Connecticut River Recreation Management Plan for the NH/VT watershed, in cooperation with CRJC's five local river subcommittees of citizens representing the riverfront towns.

Connecticut River Valley Flood Control Commission
Evan Hammond, Chair
Office of the Governor
109 State Street
Montpelier, VT 05609-0101

Description: The Connecticut River Valley Flood Control Commission was established September 8, 1953 for the purposes of: promoting inter-state comity among and between the signatory states, assuring adequate storage capacity for impounding waters of the Connecticut River and its tributaries for the protection of life and property from floods, and providing a joint or common agency through which the signatory states, while promoting protecting and preserving to each the local interest and sovereignty of the respective signatory states, may more effectively cooperate in accomplishing the object of flood control and water resources utilization in the basin of the Connecticut River and its tributaries.

USDA: Natural Resource Conservation Service, Massachusetts
Christine Clarke, State Conservationist
451 West Street
Amherst, MA 01002-2953

USDA: Natural Resource Conservation Service, Vermont
Rob Allen, State Conservation Engineer
356 Mountain View Drive, Suite 105
Colchester, VT 05446

Description: The Natural Resources Conservation Service (NRCS) is a federal agency that works hand-in-hand with landowners to improve and protect their soil, water and other natural resources. For decades, private landowners have voluntarily worked with NRCS specialists to prevent erosion, improve water quality and promote sustainable agriculture. NRCS employs soil conservationists, soil scientists, agronomists, biologists, engineers, geologists and resource planners. These experts help landowners develop conservation plans, create and restore wetlands, restore and manage other natural ecosystems as well as advise on stormwater remediation, nutrient and animal waste management and watershed planning. NRCS, formerly called the Soil Conservation Service, was initially focused on preventing soil erosion on America's farmland. Over the years Americans have become concerned with a broader array of natural resource issues. In response, NRCS has broadened its technical services in order to provide science-based solutions to address America's ever-changing environmental concerns. While farmers remain the primary client of NRCS, the agency also provides technical assistance to city planners, watershed groups, state and local governments, civic organizations and individual homeowners.

Recreation

American Whitewater Affiliation
Kevin Colburn, National Stewardship Director
1035 Van Buren Street
Missoula, MT 59802

Description: Founded in 1954, American Whitewater is a national non-profit organization with a mission "to conserve and restore America's whitewater resources and to enhance opportunities to enjoy them safely." American Whitewater is a membership organization representing a broad diversity of individual whitewater enthusiasts, river conservationists, and more than 100 local paddling club affiliates across America. The organization is the primary advocate for the preservation and protection of whitewater resources throughout the United States, and connects the interests of human-powered recreational river users with ecological and science-based data to achieve the goals within its mission.

Appalachian Mountain Club
Kenneth Kimball, Director of Research and Julia Khorana, Event Coordinator
5 Joy Street
Boston, MA 02108

Description: Founded in 1876, the Appalachian Mountain Club is America's oldest nonprofit conservation and recreation organization. We promote the protection, enjoyment, and wise use of the mountains, rivers, and trails of the Appalachian region. We believe that the mountains and rivers have an intrinsic worth and also provide recreational opportunity, spiritual renewal, and ecological and economic health for the region. We encourage people to enjoy and appreciate the natural world because we believe that successful conservation depends on this experience.

Connecticut River Salmon Association
Robert A. Jones, President
76 Deming Street
South Windsor, CT 06074

Description: The Connecticut River Salmon Association (CRSA) is a nonstock, nonprofit Connecticut corporation. Our mission is to support the effort to restore Atlantic salmon in the Connecticut River basin, a joint undertaking by the states of Vermont, New Hampshire, Massachusetts and Connecticut, together with the U.S. Fish and Wildlife Service of the National Marine Fisheries Service, pursuant to an act of Congress in 1983. The Connecticut River Atlantic Salmon Commission, consisting of the chief fisheries official from each of the participating states and federal agencies, and a citizen appointed by the governor of each participating state, oversees this program. Current CRSA president Robert Jones serves as a member of this Commission, which is staffed by a technical committee consisting of senior fisheries biologists from the participating states and federal agencies.

Vermont (State)

Department of Environmental Conservation
Brian Fitzgerald and Jeff Cueto
103 South Main Street
Waterbury, VT 05671-0401

Marie Caduto, Watershed Coordinator
100 Mineral Street, Suite 303
Springfield, VT 05156

Description: The Vermont Department of Environmental Conservation's mission is to preserve, enhance, restore and conserve Vermont's natural resources and protect human health for the benefit of this and future generations. The DEC, along with the Dept. of Fish and Wildlife and the Dept. of Forests, Parks and Recreation, is part of the Vermont Agency of Natural Resources. Through its programs, the DEC manages water and air quality; regulates solid and hazardous wastes; and administers a number of voluntary pollution and waste reduction programs. While the DEC issues most of the state's environmental permits, the department does more than just set forth regulations and assure compliance. Among other responsibilities, department staff members collect data; conduct research; run volunteer programs; develop educational and outreach materials and programs; administer grants; and work with conservation organizations and state and federal agencies to examine critical environmental issues.