Lower Farmington River/ Salmon Brook Management Plan

Preliminary Draft – Please be aware that this is the first draft version and significant revisions will occur based on local input.

October 2009

For further information on this plan and for general questions about the Lower Farmington River/Salmon Brook Wild and Scenic River Study, you may contact:
Joyce Kennedy Raymes
Wild & Scenic Study Coordinator
C/o FRWA
749 Hopmeadow Street
Simsbury, CT 06070
860 658 4442 x.203
Joycekennedy1845@yahoo.com

Sally Rieger
Wild & Scenic Study Chair
C/o FRWA
749 Hopmeadow Street
Simsbury, CT 06070
860 658 7317
dfrandssr@aol.com

National Park Service Contact:
Jamie Fosburgh, Rivers Program Manager
15 State Street
Boston, MA 02109-3572
671 223 5191
jamie_fosburgh@nps.gov

Additional information can be found at: www.lowerfarmingtonriver.org

Lower Farmington/Salmon Brook Wild & Scenic Study
C/o FRWA

749 Hopmeadow Street
Simsbury, CT 06070
860 658 4442

The Lower Farmington River/Salmon Brook Wild and Scenic Study Committee

The Study Committee's membership includes locally appointed representatives from each town in the study area, and representatives from The Stanley Works, CT Department of Environmental Protection (CT DEP), National Park Service, the Farmington River Watershed Association (FRWA), the Salmon Brook Watershed Association (SBWA), the Tariffville Village Association (TVA), Connecticut Forest and Park Association (CFPA), and the Pequabuck River Watershed Association (PRWA).

Avon:
Diane Field*-Riparian Landowner
Harry Spring*-Former Inland Wetlands Commissioner
Rob House-Conservationist
Bloomfield:
Paula Jones*-Conservationist
Kevin Gough*-Conservationist
Burlington:
Paul Rochford*-Burlington Land Trust
Thomas Small*-Burlington Land Trust
Canton:
Cynthia Griggs-Conservationist
David Leff*-Author, Former Deputy Commissioner of DEP
East Granby:
Ian Clark*-East Granby Land Trust
Mike Krammen*-Engineer
Farmington:
Walter Sargent*-Executive Director, Farmington Land Trust
Larry Schlegel*-Angler
Josef Treggor-Ecologist/Educator, MERA
Granby:
Carolyn Flint*-Conservation Commission
Eric Lukingbeal*-Land-use attorney, Wetlands Commission member
Hartland:
Sue Murray*-Hartland Plan of C&D Committee, Hartland Land Trust
Kathy Dunn*-Hartland Land Trust

Simsbury:
Sally Rieger*-Simsbury Land Trust, FRWA Volunteer
Margery Winters*-Simsbury Inland Wetlands & Conservation Commission
Suzanne Battos-Conservationist
Windsor:
Frank Davis*-Chair, Conservation Commission, Riparian Landowner
Betsy Conger-Loomis Chafee School Science Dept.
Terry Langevin-Friends of Northwest Park Board Member
Melissa Vanek-Environmental/Science Educator
The Stanley Works:
Kurt Link*-Lean, Productivity & Facilities Mgr., TSW
FRWA:
Sarah Hinks*-FRWA Board, Volunteer
Eileen Fielding*-FRWA Executive Director
Aimee Petras-FRWA Staff
CFPA:
Eric Hammerling*-Executive Director
TVA:

Wanda Colman-Member, Photographer
SBWA:
David Tolli*-SBWA Board
PRWA:
Mary Moulton-PRWA President
CT DEP:
Susan Peterson*
Maryann Nusom Haverstock*
National Park Service:
Jamie Fosburgh-Rivers Program Manager
Joyce Kennedy Raymes-Study Coordinator

* *Officially Appointed*

A Brief History

A question commonly posed since the upper 14 miles of the Farmington River was designated a Wild & Scenic River in 1994 is, "Why didn't the first Wild & Scenic River Study include the lower segment of the river?" With no suitable answer, and a river segment and important tributary worthy of designation, the Farmington River Watershed Association (FRWA) led the effort to pursue congressional authorization for a Wild & Scenic Study of the lower Farmington and Salmon Brook. Under FRWA's leadership, all ten study area towns (Avon, Bloomfield, Burlington, Canton, East Granby, Farmington, Granby, Hartland, Simsbury and Windsor) provided letters of endorsement to the Congress of the United States supporting a Wild & Scenic Study. The proposed study area extended downstream on the Farmington River from the Canton/New Hartford town line (the lower boundary of the designated segment of the upper Farmington River) to the Farmington's confluence with the Connecticut River, and it also included the east and west branches of Salmon Brook. Congresswoman Nancy Johnson and Senator Chris Dodd were very instrumental in securing authorization and funding from Congress to undertake the study. The Study bill was passed by Congress at the end of 2006.

A locally appointed Wild & Scenic Study Committee began meeting in April, 2007. Committee members were appointed by their towns. They have brought a wealth of knowledge and experience in governmental, ecological and organizational processes to the study effort. The committee's credentials, the expertise of independent researchers, local supporting agencies and professional contractors, and input from the general public have helped ensure the study's progress.

Since the Committee first began meeting, its work has confirmed the view of the FRWA and many Farmington Valley residents that the unique natural and cultural resources of the lower Farmington and Salmon Brook make the study area eligible for a Wild & Scenic designation. The Study Committee believes that a Wild & Scenic designation will highlight the Outstanding Resource Values of the watercourses, will provide a sense of connectedness and pride to the people of the Farmington River Valley and will enhance economic opportunities. Also, the Study Committee wants the river towns to benefit from the availability of National Park Service funding and technical resources to augment their efforts to protect the natural and cultural resources of the lower Farmington and Salmon Brook.

This draft version of the lower Farmington River & Salmon Brook Management Plan is being created as a critical step in the Wild & Scenic River Study process. The Management Plan is a **non-regulatory, advisory document**, reflecting a partnership where local, state and federal interests all voluntarily agree to participate in its implementation and the realization of its purpose and goals. The plan is being developed by the locally-led Wild & Scenic Study Committee. The Study Committee is

in the process of seeking input from town land use commissions, local citizens, the state and other key stakeholders. The roles and responsibilities of land use planning, and regulatory commissions and agencies do not change if Wild & Scenic Designation occurs. There are ***no federal mandates or new regulatory powers created with a designation.***

The development of the management plan is guided by three fundamental principles:

(1) Resource Conservation and protection relies on existing authorities.
(2) Management of the corridor is based on a cooperatively developed plan that is implemented through the cooperation of all river interests.
(3) Any land conservation initiatives related to a Wild & Scenic designation will be based solely on voluntary willing seller arrangements.

The National Wild & Scenic Rivers System

The National Wild & Scenic River System was established by Congress in 1968 to protect outstanding rivers from the harmful effects of *new* federally permitted projects such as dams and hydroelectric facilities. To be considered "Wild & Scenic", a river must be free flowing and have at least one outstanding natural, cultural, or recreational value. Over 160 rivers or river segments have been protected nationwide (representing over 11,000 miles), including ten rivers in the Northeast. The upper 14 miles of the Farmington River was the first to be designated as a Partnership Wild & Scenic River in 1994. The Eightmile River in Connecticut was also designated as a Partnership River in 2008.

The Partnership River program is a subset of the Wild & Scenic Rivers system. This program has a proven track record of effectively creating river protection strategies that bring communities together in protecting, enhancing and managing local river resources. **The lower Farmington River and Salmon Brook are being recommended for designation as Partnership Wild & Scenic Rivers**. There are 13 Partnership Wild & Scenic Rivers along the east coast that share some common management approaches including:

- No federal ownership of land.
- River and land use management is regulated through existing local and state authorities, the same as before a designation.
- Administration and implementation of the advisory Management Plan is accomplished through a broadly participatory advisory committee, convened for each river specifically for this purpose.
- Responsibility for managing and protecting river resources is shared between the local, state, federal and non-governmental partners on the committee.
- Volunteerism as a consistent backbone of success of Partnership Rivers.

Benefits of a Wild & Scenic Designation

A National Wild & Scenic River designation can bring a river system many benefits. Through National Park Service funding and staff support, resources are available to help the committee partners achieve the protection of the river's outstanding resource values resulting in:

- **Preservation of a clean water supply for local residents** - The many tools recommended to protect water quality in the watercourses will have a direct benefit on drinking water supply for residents.
- **Protection of the character that defines the local communities –** Opportunities to implement tools that conserve stream banks, voluntarily protect wildlife habitats and important open space areas, and ensure that river and stream quality remain high.
- **Robust and diverse plant and animal populations that reflect a healthy ecosystem –** A key component of the character and quality of the area is the unique plant and animal life that exists.
- **Possible funding support to help towns achieve their open space conservation goals –** Designation may leverage opportunities for funding that can help the local towns and state achieve their open space conservation goals, saving towns' money.
- **Current, sound scientific information and technical support to help in the decision making process for local land use commissions and their staffs –** This can save the commissions and their applicant time and money, providing the information to make sound defensible decisions based on strong science and technical expertise.
- **Small grants to help local schools, towns, scouts, civic groups, land trusts, private landowners and others on projects which support the purposes and goals of the plan –** Often a portion of Wild & Scenic funding is offered as small grants by the local coordinating committee to support local activities that enhance the outstanding resource values and help build the partnership capacity of the grant recipient.
- **National recognition and prestige associated with a designation –** Area towns may see an increase in tourism and an economic benefit to local businesses. The committee may produce recreational and educational guides that encourage proper use of local resources.
- **Outreach and education opportunities that expand local knowledge of techniques that protect our rivers and maintain the characteristics that provide a sense of place. –** Publications, programs, workshops and trainings that promote the resource values and best management practices can be produced and offered to a variety of audiences from school age children, to land use commissions to local landowners.
- **Financial resources to help towns fund activities. –** For example, a town may have an eroding stream bank that is threatening a town road. Funding may be available to help the town restore the stream bank and secure the road.
- **Funding and staff support through the National Park Service**. - The upper Farmington River receives annual funding for river protection work and local staff support and if designated the lower watercourses will likely receive funding too.
- **Prevents federally funded or permitted projects that are determined to have an adverse impact on outstanding resource values. –** Designation creates a specific mandate that no federally permitted or funded "water resource development project" shall be allowed that would have a "direct and adverse" impact upon the outstanding resource values that made the river eligible for designation.

Wild & Scenic Study Process

The Wild & Scenic River Study is being conducted to determine whether the lower Farmington River and Salmon Brook are eligible to be included in the Partnership Wild & Scenic Rivers system.

The study is being conducted in a manner consistent with the principles associated with the Partnership River approach. To complete the study there are three primary components.

(1) Determine if the river is eligible for inclusion in the Wild & Scenic Rivers system by researching and documenting its outstanding natural, cultural or recreational values of regional or national significance;

(2) Determine if the river is suitable for Wild & Scenic designation by substantiating local support and commitment to designation and commitment to locally-based river protection actions; and

(3) Develop a locally supported river management plan for the watercourses that details the strategy for future protection of the area's outstanding values.

Upon completion of all study components a final determination will be made by the National Park Service as to whether the river system should be recommended for inclusion in the National Wild & Scenic Rivers System. A final study report, with opportunity for public comment will be produced by the National Park Service and will summarize the study findings and provide final recommendations to Congress. Attaining designation requires a designation bill be passed by Congress and signed by the President.

Management Plan Elements

The Lower Farmington/Salmon Brook Management Plan is being developed in broad collaboration with the local Study Committee; local land use commissions, community residents, the state and other stakeholders, and details the strategy for future protection of the area's outstanding values.

The Management Plan Is Locally Led: This management plan is in the process of being created as a part of the lower Farmington/Salmon Brook Wild & Scenic River Study to establish recommended tools and strategies to protect and enhance the watercourses for generations to come. The plan is being developed by the locally led Wild & Scenic Study Committee with input from town land use commissions, local citizens, the state and other key stakeholders.

The Management Plan Is Locally Implemented: The Farmington/Salmon Brook Management Plan is a non-regulatory document, reflecting a partnership where local, state and federal interests all voluntarily agree to participate in its implementation and the realization of its purpose and goals. The roles and responsibilities of land use planning and regulatory commissions and agencies will not change if a Wild & Scenic designation occurs. There will be no new federal mandates or new regulatory powers created with a designation.

Implementation Costs to Towns Are Negligible: Implementation of the Management Plan through Wild & Scenic designation potentially offers a net financial gain for lower river towns and local partners. Costs associated with implementing the management plan are to be funded through new annual funding available once the river is designated. In addition, other sources of funding can be more easily leveraged using the "clout" and prestige of a designation. If designation is delayed, unsuccessful or if annual funding levels (provided by the National Park Service) after designation are insufficient, towns have no obligation to expend funds. However, many of the costs associated with implementing recommendations in the Management Plan are negligible, and towns and partners can elect to implement the plan regardless of the status of designation.

Protection Strategies Are Scientifically Driven: This plan relies on scientifically sound recommendations to protect the Outstanding Resource Values (geology, water quality, biological diversity, cultural landscape and recreation) identified during the study. Protecting these resources benefits us all. Ensuring clean drinking water supply, maintaining the area's scenic qualities and caring for and enhancing the river's plant and animal life all contribute to the high quality of life residents of the communities expect and appreciate.

Purpose of the Management Plan

The Management Plan will serve as a guidance document for protection and enhancement of the Outstanding Resource Values (ORVs). In order for the lower Farmington River and Salmon Brook to be included in the Wild & Scenic Rivers program, the Study Committee must demonstrate that the ORVs are adequately protected by the land use regulations that are already in place at the local, state or federal level.

The final Management Plan will achieve a number of objectives:

1. Provide stakeholders with clear recommendations of how to protect and enhance the ORVs and describe the role of a Wild & Scenic advisory committee in implementing such recommendations.

2. Town citizens, local land use commissions and the state are all asked to endorse the management plan and commit to participate in its implementation. Endorsement of the Management Plan by all the key stakeholders substantiates to Congress the suitability of the watercourses for designation.

3. The Management Plan provides a blueprint for how all partners can proceed in ensuring the long-term protection of the ORVs. It also identifies strategies to measure the quality of the ORVs over time. Indicators are provided that can give quantifiable approaches to determine how well the ORVs are being protected and enhanced.

4. The Management Plan will serve as the Comprehensive Management Plan required of all congressionally designated Wild & Scenic Rivers.

5. The Plan will establish the basis for federal, technical and financial assistance if the lower Farmington and Salmon Brook are designated as components of the National Wild & Scenic Rivers System.

6. The tools recommended in the Management Plan rely principally on locally led and locally implemented strategies, and as such the Plan can be used to help all the stakeholders protect the ORVs regardless of whether a designation is achieved.

Overview Description of Study Area

The lower Farmington River presents a sharp contrast to its generally narrow, swift, and steep-sided upper reaches in Massachusetts and northern Connecticut. At the upstream end of the Farmington River and Salmon Brook Wild & Scenic study area in Canton and Burlington, the river has begun to

broaden and slow down, flowing southeast toward flatter lowlands. In Farmington, the river's southeast route is blocked by glacial deposits and it turns abruptly north through Farmington, Avon, and Simsbury, traversing an old glacial lakebed. This reach of the river is called the "bathtub" because of its relatively placid flow and broad valley bounded on the east by a traprock ridge. At Tariffville, the river turns southeast again, dramatically exiting the "bathtub" through a notch in the ridge, then meanders through Windsor before finally entering the Connecticut River.

A journey along this river corridor reveals a remarkable array of natural, recreational, and cultural features. In the Collinsville section of Canton, at the upstream end of the study area, the river is the town's centerpiece. Old mill impoundments are now popular recreational sites for paddling and fishing and are still surrounded by historic mill buildings. This section of river is also well-known for its rich wildlife viewing, as it hosts seasonal congregations of waterfowl and other migratory birds.

Just downstream, forming the boundary between Burlington and Avon and angling into Farmington, the river provides more excellent recreation. A CT DEP Trout Management Area extends from the lower Collinsville Dam to the Rte. 4 Bridge in Farmington and attracts many anglers. The Farmington River Trail, a very popular multi-use rail trail, runs along this same reach from Canton to Farmington.

Executing its loop from southeasterly to northerly flow in Farmington, the river is joined by a major tributary, the Pequabuck River. Here the corridor passes through a broad, rich lowland that borders extensive wetlands to the south, and features a number of archaeological sites, recreational trails, agricultural fields, and community gardens. The names of several tracts of open space along the river in Farmington and Avon, e.g. Tunxis Mead, Meadow Land, Tunxis Plantation (now a golf course), and Fisher Meadow, suggest floodplain and help explain why the corridor here is relatively undeveloped despite its long history of settlement and increasing population.

Continuing northward in Simsbury along the old lakebed, the river corridor skirts the base of the traprock ridge that includes Talcott Mountain. On either side of the main channel, old oxbows and meander scars are scattered through farmlands and wetlands. Placid flow, easy access points, abundant open space, and many wildlife viewing opportunities make this a favorite stretch of the river for canoeing, kayaking, and rowing as well as a fishing area. The Farmington Canal Heritage Trail, commemorating one of the most remarkable engineering projects of the nineteenth century, runs along this stretch also.

As it reaches the far northern end of the "bathtub" in East Granby, the Farmington is joined by Salmon Brook, arguably the most important tributary of the lower Farmington for its high-quality habitat. The corridors of Salmon Brook's East and West Branches and its mainstem have a higher percentage of forest cover than that of the lower Farmington. The water-filtering effect of forested land, plus the shading and tree debris it provides to the streams, is conducive to both high water quality and good fish habitat. The quality of habitat is reflected in the diversity of fish species already documented in Salmon Brook by the CT DEP. Salmon Brook is judged to be an excellent nursery for juvenile salmon and a future spawning habitat for a restored salmon population. The DEP stocks salmon fry here every year in addition to stocking other lower Farmington tributaries and the mainstem.

Turning southeast again, along the East Granby/Bloomfield town line, the Farmington's character changes abruptly to world-class whitewater as it charges through the traprock of Tariffville Gorge. Once a site of hydropower generation for Hartford, the Gorge is now a destination for top-level whitewater kayakers from all over North America. Downstream from the Gorge the river enters the impoundment behind Rainbow Dam, a present-day hydropower facility owned by Stanley Works and operated by the Farmington River Power Company. Below Rainbow Dam and its fish ladder, the river winds between natural levees and belts of riparian forest along the historic tobacco fields of Windsor before finally joining the Connecticut River.

Fish diversity is high in the lower Farmington, in part because of a wide range of cold- to warm-water habitats. This is shown directly by fish sampling, and indirectly by the presence of all 12 species of southern New England's freshwater mussels, which require a wide variety of fishes to disperse their larvae.

Overall, the lower Farmington and Salmon Brook corridors are a remarkable combination of unusual geology, healthy forested watershed, spectacular fishing and paddling areas, impressively diverse communities of plants, wildlife, fish, and aquatic invertebrates, rich agricultural bottomlands, archaeological sites, and historic towns and landmarks. Because of their very attractiveness, these corridors are subject to development pressure. A coordinated management plan that ensures sound land use and river management is essential to preserving the outstanding values of the Farmington River and Salmon Brook.

Lower Farmington River/Salmon Brook Outstanding Resource Values:

Outstanding Resource Value: Geology

Regionally Significant in the Study Area are:

The time span covered by the geology of the area

The Diversity of geologic features in the area

Background

A NW to SE traverse of the Wild & Scenic Study Area reveals bedrock units that range in age from the billion year old metamorphic gneisses and schists of western Hartland to the 200 million year old dolerites, basalts (traprock) and arkoses (brownstone) of Granby, Simsbury, Avon, East Granby, Bloomfield and Windsor. One of the rare (there are only three) true granites of Connecticut, the 400 million year old Nonewaug, occupies the northwestern corner of Burlington. Just to the east, the metamorphosed remains of the Shelburne Falls Arc, an ancient, Japan-like, volcanic island arc, extend northward from Burlington to the Massachusetts line in Granby. The glacial deposits that mantle the bedrock yield evidence of the two glaciations that are known to have occurred, and the fertile modern floodplain of the Lower Farmington runs northward from Farmington to the Simsbury-East Granby line. A billion years of earth history in a 35.1 square mile area!

The present configuration of the bedrock units that underlie the study area developed from west to east in two stages: first the convergence of the proto North American and African continents as the

intervening Iapetos Ocean closed, and the supercontinent of Pangaea was assembled: second the subsequent breakup of Pangaea and the formation of the Atlantic Ocean as Africa and North America diverged. The closing of the Iapetos Ocean, as the ancient African and North American continents converged and collided, was initiated about 500 million years ago. The crushing, heating and mountain building associated with this convergence assembled and metamorphosed the bedrock units that now underlie the area west of the Hartford Basin. A series of faults known as Cameron's Line delineates the boundaries of two bedrock groups that were joined together and metamorphosed as the Iapetos Ocean closed. The former eastern margin of North America is represented by the billion year old gneisses and schists to the west of Cameron's line. Remnants of the Iapetos Ocean in the form of metamorphosed deep ocean sediments and a portion of the Shelburne Volcanic Island Arc underlie the area between Cameron's Line and the Hartford Basin.

The 200 million year old rocks of the Hartford Basin are relative newcomers to the region. They could not form until the supercontinent of Pangaea began to break apart around 250 million years ago. By then, the forces that caused the continents to converge had reversed and Africa and North America had started to move away from each other. A similar process is pulling the East African Rift Valley apart today.

The tension produced by the diverging continents created tears in the earth's crust. The main tear developed just to the east of Connecticut, where the Atlantic Ocean formed along this rift zone. Secondary tears, like the Hartford Basin, had also developed all along the east coast of North America but these rifts failed before they could create oceans. Lucky for Connecticut, otherwise Tolland would be part of Africa, and Canton would be part of our east coast. Faults that defined the Hartford Basin deepened as the rift valley developed and layers of sediment began to accumulate. Eventually the faults penetrated deep enough to intersect magma and periods of volcanic activity punctuated sedimentation. Some of the magma cooled underground forming the Barndoor Hills and Onion Mountain which are composed of dolerite (a.k.a. diabase or traprock). West Suffield, Penwood and Talcott Mountains are composed of basalt (a.k.a. traprock) which flowed across the surface of intervening sedimentary layers in the form of lava. These basaltic ridge lines have distinctive steep scarps on their western flanks and more gentle slopes to the east. Variations in the color of the sedimentary rock layers indicate they were deposited during rainy periods (black to grey layers) that alternated with dryer periods (tan to red layers).

The sequence of events that emplaced the bedrock of the study area resulted in a distinct north-south alignment of major faults and bedrock units. During the nearly 200 million years since the development of the Hartford Basin, bedrock units of varying resistance to weathering and erosion were exposed to freeze and thaw and stream action. Fault and fracture zones and less resistant rock units were preferentially removed forming valleys and lowlands while more resistant rock remained as ridges. By the time that the first of the two known glaciations began, about 150,000 years ago, a well developed south flowing drainage system had developed. This bedrock-controlled drainage system was rounded and smoothed by the glaciers, but the overall north-south alignment of the bedrock-controlled hills and valleys was not significantly altered. The enduring influence of the region's distinctive bedrock fabric can be seen in the transportation system and cultural features that have development amongst the ridgelines and picturesque valleys that still typify the landscape.

Evidence that at least two glaciations occurred in Connecticut comes in the form of the two tills, of different ages, that are commonly found in drumlins. Since till is a glacial deposit, the existence of an

older till and a younger till requires the presence of two distinct ice sheets. The vast majority of glacial deposits in the study area were deposited between about 26,000 and 15,000 years ago, during the last glaciation known as the Wisconsinan. These deposits exist in two forms, till and meltwater deposits.

Till is deposited directly from the ice and is typically a mixture of all of the debris that the ice contained, large boulders to very fine sediment and everything in between. Till, which is commonly exposed in upland areas, is often "bony" and impermeable so it is not a great aquifer and not suitable for septic systems. It is the reason that many New England farmers "went west". Water is a better sorting agent than ice so meltwater deposits tend to fill valleys with layered clays, sands and gravels that were deposited in glacial lakes and ponds or meltwater streams. These deposits are often fairly flat, good sources of aggregate, good aquifers, and more suitable for development than till. Deposits of finer materials – silt and clay – commonly underlie the area's many wetlands. Glacial Lakes Farmington, Tariffville, Hitchcock and the northwest end of Glacial Lake Middletown once occupied the lowlands that flank the resistant traprock ridges of the Hartford Basin. As these lakes drained away, their easily eroded, broad, flat surfaces afforded ample opportunity for the fertile modern floodplain of the Lower Farmington to develop.

Landscapes and Cultural Influences

Landscape features have played an important role in shaping the course of cultural development within the study area. Early on, steep narrow valleys afforded opportunities for hydropower while broad lowlands were more amenable to agriculture. The influence of the landscape can still be seen in the layout of the highway system and in the distribution of population and commercial centers. Much of this relates back to the character of the underlying bedrock. Bedrock units that are resistant to the ravages of weathering and erosion tend to form the underpinnings of uplands and ridge lines while less resistant units, and fault/fracture zones, commonly underlie valleys and lowlands.

Hartford Basin:

The Hartford basin provides an excellent example of the role that rock type plays in landscape development. The resistant traprock (diabase and basalt ridges) stands in sharp contrast to the low-lying layered sedimentary bedrock. The traprock forms prominent outcrops and the shape of the bedrock surface controls the configuration and character of the ridges it forms. Owing to the way traprock weathers, steep talus-strewn slopes often flank ridge tops that have little soil or glacial cover. These opposing settings provide ecological niches related to the warmer and drier conditions at the top and cooler and wetter conditions on ridge flanks. Traprock chemistry can also provide atypical nutrients to support vegetation (see Biodiversity ORV).

In addition to the spectacular vistas and recreational opportunities associated with the traprock ridges (see Recreation ORV), gaps in the ridges provide pathways for east-west commerce and hydropower development., for example, formerly at the mill in the Tariffville Gorge, where hydropower provided the energy for running a carpet mill.

The lowlands surrounding the traprock ridges are underlain by layered sedimentary rocks that are generally much less resistant to weathering and erosion that the traprock. As the last glacier melted northward, the lowlands filled with a succession of glacial lakes and thick accumulations of glacial lake sediment buried the bedrock surface. Where the glacial lakes existed, there is little surface expression of the underlying bedrock, and few outcrops, because of the thick glacial cover. The

landscape is essentially drained lake bed which has been cut into and modified by modern streams. The Farmington was diverted northward across drained lakebed as the ice melted back. Its outlet became the gap at Tariffville. Once the lake beds were exposed, windblown sediment accumulated and dune fields developed. These sandplains are ecologically important today because they support rare plant communities. (See Biodiversity ORV)

The broad, flat, fertile lowlands provided a nice tillable contrast to the rugged uplands west of the Hartford Basin. They harbored the alluvial soils that supported the cultivation of tobacco, an economic driver for the area and the basis of a lucrative international trade.

Although the sedimentary bedrock of the Hartford Basin was largely hidden, some of the accessible brownstone, a type of sandstone, was quarried in the Farmington Valley towns. For example, the Ketchin Quarry in Simsbury, donated to the Simsbury Land Trust by the Ensign-Bickford Corporation, provided the stone for the Belden Building (now town hall), the Methodist church, and other local buildings. (For a list of mines and quarries in the study towns, see Appendix).

Western Uplands:

Except for the 200 million year old sedimentary rock of Canton's Cherry Brook Basin, fairly resistant metamorphic bedrock (primarily gneisses and schists) is at or near the ground surface, and therefore controls the shape and character of the landscape, throughout the upland areas west of the Hartford Basin. The juxtaposition of aligned rock units, folds, faults and fractures, and their varying resistance to eons of weathering and erosion, have produced an overall north-south pattern of ridges and valleys. The steep gradients and numerous pinch points that typify the upland topography afforded ample opportunity for impoundments that provided hydropower (in Collinsville for the Collins Axe Factory), and drinking water (Barkhamsted and Nepaug Reservoirs behind the Saville Dam and Nepaug Dam, respectively).

Owing to the thin glacial cover (mostly till) on the ridges, bedrock outcrops that were capable of yielding a variety of useful stone products were plentiful. The glacial meltwater deposits that filled the valleys were much more suited to development than the till-covered uplands. These layered sands and gravels typically provide plentiful groundwater, sources of aggregate and hospitable settings for roadways and settlement.

From an ecological standpoint the sweet soils associated with the calc-silicate rocks of the amphibolite ridges provide a contrast to the acidic soils typically associated with metamorphic bedrock.

Source: Ralph Lewis, 2009

Soils

Because of the Valley's geologic and glacial history and its location at the junction of Connecticut's Western Highlands and Central Lowlands, the Lower Farmington River and Salmon Brook Study area has the highest soil diversity in Connecticut and one of the most complex soil systems in the United States. Of the over 200 different soil types in Connecticut, fifty percent are represented in the Farmington River Valley. In turn, the biodiversity and habitat complexity of the Study area is strongly influenced by this soil complexity.

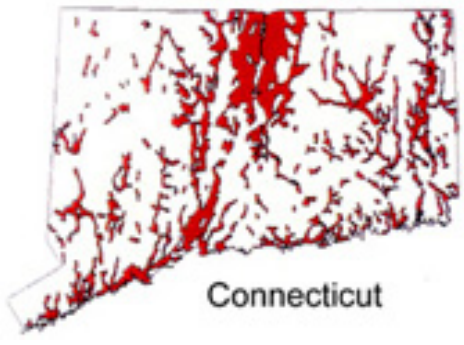
The acidic soils of the Western Highlands developed on glacial till composed of ground up granites, gneisses and schists. Less acidic soils are present in the Central Lowlands formed on the clay, silt, sand and loess deposits associated with the ancient glacial meltwater of Lake Hitchcock. This complex of parent materials has strongly influenced the variety of soils present in the Study area.

Soil patterns dictated the early land uses and land cover. The shallow soils on upland rocky till substrates were not conducive to intensive agriculture but have supported grazing or forestry. Early colonists found the valleys had an extensive history of agriculture by the Native Americans and agriculture has continued to be a dominant land use for the valley soils formed on the glacial and alluvial (water borne) parent materials. Areas underlain by relatively impermeable silts and clays layers have formed the wetlands soils we have today.

Connecticut soils are relatively well known. One the first soil surveys in the US was done in 1899 in relation to tobacco cultivation here and Connecticut is in its 4th generation of soil survey. Connecticut's State Soil, the Windsor Soil series, is found in throughout the Study area. Windsor soils are the preferred soils for the production of shade tobacco, used as outer wrappers for some of the world's finest cigars. Windsor soils are well suited to the highly diversified agriculture of Connecticut such as the production of fruit and vegetable crops, silage corn, and ornamental shrubs and trees.

Because of the sandy/gravely characteristics of soils in many parts of the Study area and shallow depth to water table, groundwater supplies are very accessible but also very susceptible to damage. The alluvial soils in the Farmington floodplain and the terrace escarpments along portions of the Farmington Valley may be easily erodible. River bank stabilization or management of any terrace escarpments is necessary to prevent siltation of the fresh water mussel habitat in the river bed as well as other aquatic species.

To ensure the preservation of agricultural soils and farming operations in the Study area, farm-friendly municipal regulations and sound soil management practices are needed. The agricultural soils in the Study area currently provide locally produced food. The cost of energy for transportation is making the economics of locally grown food more and more attractive along with the value placed on freshness and contributions to local economy.



Windsor Soil Series

-- Connecticut State Soil

Source: Margery Winters
Based on presentations before the Study Committee by Kip Kolesinskas, CT State Soil Scientist; Ethan Nedeau, Biodrawversity; and the NRCS website

Geology Protection Goal
Protect geological features that are important as agricultural, cultural, hydrologic, or recreational resources or that are the basis for natural ecological functions or that serve significant scientific or educational purposes.

Current Threats to Geological Resources

Development pressure is a threat to geological resources in all ten study area towns. Development activities can cause changes to hydrology by altering the slope and topography of the landscape, lead to erosion and sedimentation, and result in loss or substantial alteration of important bedrock and glacial features. In the more developed towns where developable land is relatively scarce, development pressures have shifted to more difficult sites such as traprock ridges. Ridgeline sites are particularly sensitive environmentally because they may, for example, support rare plant and animal populations or be part of a wildlife corridor. Development in areas with surficial glacial features may alter or remove significant drumlins or eskers or fill in glacial remnants like kettle holes. These activities can also negatively impact geological resources. In towns where farmland is available for development, loss of productive agricultural soils to development is a significant threat because those soils tend to be located in areas that are also suitable for business, industrial and/or residential development (see Agricultural Soils Protection, below, for material specifically related to protecting agricultural soils).

In addition to development, earth material extraction, such as gravel mining operations or quarrying, may threaten the bedrock and surficial geological features within the watershed as well as the water quality, biodiversity, cultural history and recreational opportunities of the area.

Current Protections, Protection Gaps and Improvement Opportunities

Development: Geological resources do not enjoy the level of regulatory of protection accorded to endangered species or wetlands, but some protections are in place. All ten towns require soil and erosion control measures that pertain to the development process, although not all towns follow the most up-to-date Soil and Erosion Control Guidelines from the Connecticut Department of Environmental Protection. Where the guidelines a town follows have become outdated, the town should update its regulations to cite the latest edition. Protecting development sites from erosion is important to maintain good water quality because eroded sediments increase turbidity of watercourses and carry bacteria, unwanted nutrients and other contaminants such as pesticides into the water.

In some towns, there are special protections in place for traprock ridges, ridgelines and hilltops. In some cases, these regulations pertain to the protection of ecological function as well as the protection

of viewsheds. Given that the area's traprock ridges harbor plant and animal species not found elsewhere in the study towns, support productive vernal pools, provide a corridor for wildlife movement and shelter recreational trails, including sections of the New England National Scenic Trail (also known as the Metacomet-Monadnock-Mattabasset Trail), they merit protection not only for their scenic beauty but also for their important environmental roles.

By placing more emphasis on regulating to maintain the ecological functions of ridges and hilltops, the study area towns have an opportunity to protect special habitats, wildlife corridors and hydrology as well as the scenic beauty of the area. The regulation review conducted by Robinson and Cole (see Appendix), provides more detailed guidance to specific towns on opportunities for regulatory changes to enhance protection of hilltops and ridges.

Development on steep slopes is another area of regulatory concern. The suitability of a steep slope for development depends on the stability of the site, its drainage patterns and the effects of development on them, the potential for erosion with sedimentation into watercourses, possible flooding issues and safety. The study area towns do not all address steep slopes in their regulations. Those that do not have the opportunity to develop and enact new regulations, in accordance with state statutes, that will help manage development to protect the public's interests. Towns with existing steep slope regulations might review them and update them as needed, depending on soil types and other local characteristics. While the State of Connecticut does not offer model regulations for steep slopes, guidance is available through the Center for Land Use Education (CLEAR) and NEMO associated with the University of Connecticut's Cooperative Extension System.

Earth Materials Extraction: All ten towns have regulations pertaining to removal of earth materials from their original location. The variation in the regulations is considerable and is affected in part by the perceived threats within each community. For example, East Granby, the only town with an active traprock quarry, has a quarry zone. While it is clear that all potential geological resources cannot be left in their natural condition, certain outstanding resources that may not yet be identified deserve conservation.

Agricultural Soils Protection: Good agricultural soils are an essential resource readily lost through development. They are vital to the production of fresh local produce, in which there is a growing public interest. Increasing concern about the health and environmental costs of industrial farming has made the viability of Connecticut's farms a matter of significant community interest. Protecting existing farms and making suitable town land available for farming is critical to protecting valuable agricultural soils. For a "how-to" guide on farmland protection, see Planning For Agriculture: A Guide for Connecticut Municipalities, a publication of the American Farmland Trust and Connecticut Conference of Municipalities. This volume provides information for towns, organizations and citizens about the economic, fiscal, cultural, environmental and recreational values of Connecticut farms, gives advice on town planning and regulatory possibilities for farm protection and lists of sources of assistance and funding. It is available online at www.ctplanningforagriculture.com

Open Space Conservation as a Way to Protect Geological Resources

Because geological resources are not as highly regulated as some other natural resources, conservation of open space has been and should continue to be an important tool in their protection. There are

many examples of open space safeguarding special geological features. Land that belongs to the State of Connecticut, to the study area towns and to various conservation organizations provides a patchwork of protection. At the state level, Talcott Mountain State Park and Penwood State Park protect traprock ridges. The Town of Simsbury has conserved a significant esker in West Simsbury, with the Simsbury Land Trust owning and protecting the adjacent bog. The Town of Granby's ownership of Holcomb Farm in West Granby has conserved an especially steep-sided esker and also alluvial soils along Salmon Brook and Kendall Brook that are used for growing produce for a Community Supported Agriculture project. McLean Game Refuge, with 4000+ acres in Granby, Simsbury and Canton safeguards a section of traprock ridge, and a variety of glacial features. In 2000, the Town of Farmington purchased a dairy farm that it rents out to a working dairy and received $75,000 in Agriculture Viability Grants to improve structures on the property (Planning For Agriculture: A Guide for Connecticut Municipalities, p. 28).

While fee-simple ownership of land with conservation deed restrictions provides the strongest protection, some important geological features such as farmland soils have been protected through conservation easements or purchases of development rights. This allows the farmer to keep farming and provides funds for improvements to the farm, but prevents sale of the land for development. One local example is Rosedale Farm in Simsbury, which has prime agricultural soils and is located on the banks of the Farmington River in Simsbury. The farm has been permanently protected from development by Simsbury Land Trust's purchase of development rights. The land trust would not have been able to accomplish this protection without the efforts of its members, the Epstein family which owns the farm, the Hartford Foundation for Public Giving, the State of Connecticut, the Natural Resource Conservation Service (NRCS) of the USDA and the Town of Simsbury. This sort of cooperative project might be considered in the future in other towns to keep local farms in business. (For a comparison of the effects of fee-simple purchase and purchase of development rights, see pp. 28-29 in Planning For Agriculture: A Guide for Connecticut Municipalities).

Management Priorities for Geological Resources

The Wild & Scenic Study Committee has identified four priorities for managing geological resources in the ten towns of the study area that will be described in the paragraphs which immediately follow.

1. Protecting significant and diverse geological features.
2. Protecting drinking water aquifers
3. Protecting agricultural soils and local
4. Planning for a changing, dynamic river

1. Protecting Significant and Diverse Geological Features

Undertaking a professional inventory of important geological sites in each town and prioritizing their conservation value would be a first step in protecting significant geological resources that are not already protected. Towns could review such an inventory, potentially funded through the National Park Service, and integrate it as they find appropriate into their open space planning. Such an inventory should also be shared with land trusts and other conservation organizations to enable the development of partnerships among the organizations and municipalities to accomplish the most important mutually-beneficial goals.

In some towns, regulatory changes might provide protection for certain geological features. For example, with regard to development on steep slopes, some towns have no regulatory protection or the regulations are not particularly strong, yet the state's enabling legislation allows strong regulation. Developing and enacting effective regulations would help protect water quality and public safety.

2. Protecting Drinking Water Aquifers

Seventy-eight Connecticut towns have well fields in aquifers that serve more than 1000 people. The CT DEP has mapped these aquifers in what it calls "Level B" mapping and requires the water utilities that pump from the aquifers to complete and provide more accurate aquifer maps. These refined maps, produced through "Level A" mapping standards set by the DEP, must be approved by the DEP. The final maps define the boundaries of the Aquifer Protection Areas (APAs). Towns with APAs must designate an Aquifer Protection Agency. The towns must inventory land use in these areas and adopt and implement land use regulations in accordance with State of Connecticut statutes in order to protect the aquifers from contamination. "The regulations restrict development of certain new land use activities that use, store, handle or dispose of hazardous materials and requires existing regulated land uses to register and follow best management practices." (http://www.ct.gov/dep/cwp/view.asp?a=2685&q=322252&depNav_GID=1654).

Of the ten towns in the Wild and Scenic Study area, Avon, Burlington, Canton, Farmington and Simsbury have APAs. These towns are in different stages of the aquifer protection process prescribed by the state, and should move forward with developing appropriate land use regulations when the necessary mapping has been approved by the state. (For protection of ground water other than drinking water aquifers, see the Water Quality section of this Management Plan)

3. Protecting Agricultural Soils and Local Farms

A burgeoning interest in locally grown food, with its advantages of freshness, better flavor and higher nutritional value, savings in transportation costs and enhanced economic multiplier benefits to local communities has made more communities look at their farms as valuable assets. The social climate is favorable to farmland protection, and thus protection of good agricultural soils. The American Farmland Trust and the Connecticut Conference of Municipalities, with funding from the Hartford Foundation for Public Giving and the Connecticut Department of Agriculture, have put together an excellent guide on how to keep farming viable in Connecticut. It is available online at www.ctplanningforagriculture.com.

4. Planning for a Changing, Dynamic River

The landscape of the Farmington Valley is sculpted by the dynamic behavior of rivers and streams. The natural meandering, erosion, and deposition that is characteristic of rivers has become better known over time and is the subject of ongoing study by fluvial geomorphologists. Past development, conducted with a less complete knowledge of river dynamics, has produced some situations where streambank stabilization and flood control measures such as armoring banks or channelizing riverbeds has produced other problems (for example, exacerbated downstream erosion) that tend to recur and cause ongoing expense. In developing long-term plans of conservation and development, it is important to incorporate the principles and best practices recommended by fluvial

geomorphologists so that towns accommodate the behavior of rivers and streams in a way that incorporates safety, ecological function, sustainability, and long-term (as opposed to short-term) cost-effectiveness for the whole community.

Consideration of river dynamics is especially important as we face the challenges of climate change. Increases in precipitation and flood flows in Connecticut rivers over the past century have been documented; these inevitably affect river dynamics and the size of stream channels. River corridor planning should include measures for adapting to the changes that can reasonably be expected for increased flow volumes, channel size, channel changes, wider fluctuations between high and low water, and other predictions emerging from the study of climate change in southern New England.

Outstanding Resource Value: Water Quality

Overview

The very high water quality of the lower Farmington River compared to other rivers its size in Connecticut and the excellent water quality of the Salmon Brook are defining characteristics of these watercourses. The headwaters of both the Farmington River and Salmon Brook are located in largely undeveloped, wooded landscapes. Trees on stream banks provide shade, keeping water temperatures low, and vegetated buffers protect rivers from nonpoint source pollution, one of the greatest threats to water quality in the lower Farmington River.

The outstanding water quality supports a diversity of life and habitats, and provides for a multitude of recreational opportunities including boating, swimming and fishing. The upper Farmington River Watershed provides drinking water to over 600,000 people in greater Hartford. The exceptional water quality in the upper Farmington River and in Salmon Brook contributes substantially to the quality of water in the lower Farmington.

Water quality monitoring of the lower Farmington River and Salmon Brook is conducted by the CT DEP, USGS, EPA, Farmington River Watershed Association (FRWA), Salmon Brook Watershed Association (SBWA), the Farmington Valley Health District, as well as local schools that participate through "Project Search". These monitoring programs provide baseline data for describing and tracking the health of these water resources through key chemical, physical and biological indicators. For the lower Farmington, chemical data meets state water quality standards, and most of the Salmon Brook is consistently better than the standards. A 13.5 mile segment of the mainstem of the Salmon Brook and a 1.5 mile segment of the West Branch Salmon Brook are on the CT 2008 Impaired Waters List due to the presence of bacteria. The bacteria source is unknown, but could be related to agricultural land uses. The mainstem segment is targeted as a DEP priority for developing a "Total Maximum Daily Load" analysis that provides the framework for restoring impaired streams. Total Maximum Daily Load is a measure of the maximum amount of pollution a river can handle. See the Appendices for a more detailed description of the current monitoring programs employed by the CTDEP and the FRWA.

Another important indicator of chemical and physical water quality is the makeup of the community of bottom dwelling aquatic organisms known as benthic macroinvertebrates. Some of these organisms are highly sensitive to water pollution and habitat change. Chemical and physical tests of water samples taken on a given day only show water quality at that moment in time, but the

composition of species found living in a river or stream reflects long-term water quality. Thus, the composition of species provides a biologically based indicator of water quality over much longer periods of time.

Biological data, including both fish and macroinvertebrate community data, is collected in the Salmon Brook because of the presence of riffle habitat that is necessary for current sampling protocols. Exceptional macroinvertebrate communities are present at almost every site sampled in the Salmon Brook basin. For example, the widespread presence of stoneflies, indicative of high water quality, are found throughout the basin. Both the lower Farmington and Salmon Brook macroinvertebrate and fish communities are largely unparalleled in Connecticut.

The Farmington River's high water quality also supports fresh water mussel diversity that is unparalleled regionally. Of the 12 mussel species found in southern New England, all have populations in the Farmington River, potentially making the Farmington River the home of greatest mussel diversity in all New England. Mussels are sensitive to environmental degradation and their populations are under great threat, so the presence of 12 mussel species is particularly significant. Mussels are both indicators of and contributors to high water quality due to their filtering capabilities. "Collectively, mussels can filter an enormous volume of water each year and may help reduce turbidity in some waterbodies." (Nadeau, 2008)

The Farmington River is the largest tributary to the Connecticut River and is therefore an important river for migrating fish including American Shad, Atlantic salmon, Alewife, American eel and sea lamprey. The Rainbow Dam fish ladder in Windsor is in declining condition. The CT DEP is working to correct this situation with the construction of a state of the art fish lift that will provide improved fish passage for the migrating and resident fish. This project is currently in design phase. Also, the segment of the river from the dam outlet to the mouth of the Connecticut River is on the CT Impaired Waters List due to hydropower flow alterations. However, the DEP Fisheries Division has reported that the habitat of the lower river supports a diverse healthy fish population.

From below the confluence of Salmon Brook to the Farmington River's mouth at the Connecticut River; there is high diversity of fish life. This is partially a result of the influx of clear cold water from Salmon Brook that provides refuge for temperature sensitive fish, particularly in summer months. Salmon Brook is one of the last true cold water fisheries in the State of Connecticut, supporting thriving, breeding native populations of brook trout and brown trout. The presence of the slimy sculpin, which requires consistently cold water temperatures, is strongly indicative of excellent water quality. Salmon Brook contains some of the best possible habitat for salmon as well as habitat for a wide variety of fish species.

The outstanding water resources in the stream corridors support unique ecoregions within the study area that were first identified by the Farmington Valley Biodiversity Project. These ecoregions and the habitats within each are described in the biodiversity section. The recognition of water quality as an outstanding resource value is based on the significant diversity of life it supports, the huge recreational resource it represents and the drinking water it provides to Connecticut residents.

Threats to Water Quality

Non-point source pollution is the greatest threat to water quality in the study area and contributing watersheds. As water flows over land it collects pollutants such as fertilizer, pesticides, sediments and bacteria and discharges them to waterbodies and streams. More intensively used land has the potential to create more polluted runoff. However, all types of land uses such as residential or agricultural properties can contribute to the problem. Loss of vegetated buffers along streams allows runoff to enter streams without the benefit of filtration, and an increase in imperious surfaces within the watershed compounds the problem by allowing water to race over heated, impenetrable surfaces, picking up pollutants along the way.

There are six point source discharges along the lower Farmington River and four along the Pequabuck River, a tributary to the lower river that can be a source of water quality problems in the river. Surface water discharges are regulated under the Clean Water Act. The CT DEP issues the discharge permits through the National Pollutant Discharge Elimination System (NPDES).

Additional threats to water quality are often related to new or existing development in the form of increases in impervious surfaces, installation of poor stormwater management systems, destruction of riparian vegetation that buffer river edges, new suburban lawns creating polluted runoff from fertilizer and pesticide applications, stream channel alterations or new stream crossings, lack of or ineffective erosion and sedimentation controls and catch basin failures and lack of maintenance. Also, the altering or filling of streams, wetlands and vernal pools, especially in headwater areas is identified as a major threat.

Fish migration of both migrating and resident fish are threatened by the presence of dams as an obstacle to passage as well as the deteriorating condition of the fish ladder at the Rainbow Dam.

Existing Protections

To understand the existing level of water quality protection and potential need for additional measures at the local, state and federal level a comprehensive review of all applicable regulations within the study area was undertaken (the complete town regulation review is included in the appendix). At the local level there is variability in regulatory protection measures across the ten towns, and there are opportunities for towns to strengthen water quality protection by more complete use of the state's existing enabling legislation. The current strength of water quality protection depends on the strong wetland and watercourse regulations that are already in place in each community and on existing protected open space along the river and tributaries.

Some of the key existing protections for water quality at the local level include regulations that protect wetlands, watercourses, vernal pools, floodplains, aquifers, riparian buffers and existing vegetation.

- All ten towns have inland wetland upland review area regulations that provide oversight regarding activities within riparian corridors; however only some towns regulate activities that affect riparian corridor functions. The vernal pool definition is included within the wetland and watercourse definition for the majority of towns thus adding strength of protection for these special wetlands.

- Town regulations show widespread recognition of the importance of vegetated buffers along wetlands and watercourses in town regulations through a variety of techniques. These include retention of natural vegetation and preservation trees of certain size and condition, establishment of riparian buffer plantings, provisions for planting and best management plans, and protection of vegetation in the Farmington River Overlay District for the towns of Hartland and Canton that are included in the upper Farmington River Wild & Scenic designation. There are many more opportunities to use landscaping requirements to address the protection of water quality and erosion prevention. For example, regulations can require vegetative buffers near wetlands and watercourses, restrict use of invasive plants in site plans and subdivisions, and require retention of existing vegetation for proposed development sites.

- Most towns have some level of floodplain protection, but need to take greater advantage of the state enabling legislation. Floodplain zoning regulations should also be revised to make them consistent with the latest FEMA requirements.

- Five of the ten towns have identified and/or mapped aquifer protection areas through the State Aquifer Protection Area Program. The responsibility for this program is shared with the State, municipalities and water companies.

- Water quality protection at the town level through stormwater regulations is extremely varied. Some highlighted techniques for which towns may have regulations include:
    - Landscape plans that provide for groundwater recharge areas and buffers.
    - Discharge of stormwater within the upland review area.
    - Designing drainage systems based on maximum development of entire watershed.
    - Innovative stormwater management designs with respect to impervious coverage limits.

The State of Connecticut provides guidance on water quality protection through the 1) Stormwater Quality Manual and 2) Soil Erosion and Sediment Control Manual. It is recommended that each town update their regulations to reflect the most recent versions of these guidelines as not all have done so.

The Environmental Protection Agency (EPA) has mandated a number of permit programs, administered by the Department of Environmental Protection (DEP), to manage stormwater pollution.

1. The Stormwater Associated with Industrial Activities General Permit requires industrial facilities to cover or remove materials whose exposure to precipitation could produce polluted stormwater.
2. The Stormwater Associated with Construction Activities General Permit, requires developers and builders to implement stormwater management plans that will prevent the movement of soil and sediments off construction sites and into nearby streams and water bodies.
3. The Stormwater Associated with Commercial Activities General Permit, found only in Connecticut, requires operators of large paved commercial sites such as malls, movie theaters, and supermarkets to undertake actions such as parking lot sweeping and catch basin cleaning to keep stormwater clean before it reaches water bodies.

4. The Stormwater from Small Municipal Separate Storm Sewer Systems General Permit, only recently implemented in Connecticut, requires each municipality to take steps to keep the stormwater entering its storm sewer systems clean before entering water bodies. One important element of this permit is the requirement that towns implement public education programs to make residents aware that stormwater pollutants emanate from many of their everyday living activities, and to inform them of steps they can take to reduce pollutants in stormwater runoff.

Source: http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654

At the Federal level the Clean Water Act Section 404 program, implemented by the Army Corps of Engineers, regulates the discharge of dredged or fill material in the waters of the U.S.

Gaps in Protection

Current local, state and federal programs apply various regulatory and non-regulatory tools to address water quality threats. Some threats are being adequately addressed through existing mechanisms, while others are not addressed in any meaningful way. It is important to utilize existing regulatory mechanisms to the full extent possible because this constitutes the backbone of protection. Non-regulatory measures may be applied inconsistently and will not hold up in court. While it is clear that the study area communities have implemented a number of critical tools to help protect overall watershed health, a number of potential additional tools have been identified that could further advance the protection and enhancement of water quality.

Gaps in protection were identified as a result of comparing known water quality threats with existing protection measures. Primary gaps in protecting water quality were found to be associated with:

- riparian corridor protection
- stormwater design and management
- watercourse crossing design
- stormwater management associated with local and state roadways
- stormwater management for nonpoint source pollution
- septic system maintenance
- agricultural practices that are exempt from review or oversight by local commissions
- public education regarding nonpoint source pollution for landowners

Water Quality Protection Goal

Protecting and improving water quality of the lower Farmington/Salmon Brook is vital to the health of all inhabitants of the Farmington River Valley and beyond. The goal is to identify and understand existing chemical, physical and biological water quality and flow conditions of the streams and their watersheds so that they support the needs of native wildlife, aquatic life, and recreational users.

Water Quality Management Priorities

- Identify and understand existing chemical, physical and biological water quality and flow conditions of the surface water of the river/stream corridor and contributing watershed

- Reduce and prevent non-point source pollution (e.g. using low impact development techniques, limiting impervious surfaces, good stormwater management, and use of riparian buffers). Limit impervious cover to a level that does not impair water quality
- Protect the riparian corridor (e.g. upland review areas, maintaining native non-invasive vegetation, erosion & sedimentation controls)
- Support prioritized open space protection (e.g. prioritizing areas to protect based on their value in conserving river health and ORVs; undertaking needed open space planning; adopting protection techniques such as fee in lieu of open space for developers)
- Protect head waters and tributaries of Salmon Brook

Actions, Tool & Strategies

Monitoring Water Quality and Stream Flow

Identify and understand existing chemical, physical and biological water quality and flow conditions of the surface water of the river/stream corridor and contributing watershed.

- Continue and expand current water quality monitoring programs. Expanded monitoring would increase the ability to assess water quality conditions and trends over time (see the Water Quality Appendix for a description of existing programs).
- Strive to protect and enhance water quality and flow regime so that the needs of native flora and fauna, and traditional recreational uses are supported.
- Protect water quality in healthy stream segments.
- Restore water quality in impaired stream segments.
- Monitor non-point source pollution from agricultural land.
- Maintain or restore stream flow regimes.
- Collect flow data from the Town of Windsor river segment.

Non-Point Source Pollution Reduction & Prevention

Reduce and prevent non-point source pollution. 1) Reduce and prevent nonpoint source pollution problems in tributaries and 2)Use appropriate techniques to protect groundwater quality and recharge capability (e.g. using low impact development techniques, limiting impervious surfaces, good stormwater management, using riparian buffers) 3.) Limit impervious cover to a level that does not impact water quality.

- Utilize the DEP's reference manuals and guidelines to the greatest extent possible to strengthen each town's ability to regulate non-point source pollution. For example, towns that have not already done so can reference the most current versions of the "Stormwater Quality Manual", and the "Guidelines for Soil Erosion and Sediment Control" in their regulations.
- Adopt local aquifer protection regulations to protect aquifer water quality. In towns where no aquifers fall under state aquifer protection requirements as public water supply sources, many residents get drinking water from groundwater sources through their individual wells. Therefore it is vital is to

support protection of all aquifers important to overall public health.

- Incorporate provisions for regulating the storage and release of pollutants, such as pesticides and fertilizer, into existing regulations where appropriate (e.g., floodplain ordinances).
- Employ Low Impact Development (LID) strategies to maintain or replicate predevelopment hydrology, to decrease the volume of stormwater runoff and to recharge groundwater resources. LID techniques also promote infiltration of stormwater and removal of pollutants such as sediments, nutrients, and heavy metals. See the Water Quality Appendix for more detailed LID management strategy recommendations.
- Incorporate LID techniques into town regulations such as 1) regulating the total amount of lot coverage to reduce the amount of impervious surfaces as part of any development approval. For example utilize smaller building footprints, reduced road widths, porous pavement and;
  2) Authorizing applicants to propose alternative/innovative stormwater management s systems, such as bioretention basins, infiltration devices, pervious paving materials, grassed swales, curbless roads, maintain natural drainage patterns.
- Promote local public works and state road construction and maintenance standards that reduce and eliminate (when possible) use of road salt/sand, lawn care pesticides and fertilizers.
- Implement landowner education and outreach initiatives to promote water quality-friendly lawns/landscaping to eliminate lawn care pesticide use, reduce use of fertilizers, encourage use of zero percent phosphorus fertilizers, and reduction of lawn watering and mowing. Provide guidance for use of native/non-invasive vegetation for landscaping.
- Promote best management practices for agricultural land uses, from an agency such as the U.S. Dept. of Agriculture's Natural Resource Conservation Service, to prevent non-point source pollution.
- Establish or update regulations to the extent allowed by state statute to minimize non-point source pollution associated with timber management activities.
- Establish septic system maintenance regulations consistent with the requirements of state statute.
- Support establishment of new EPA turbidity discharge levels from construction sites.
- Support and promote household hazardous waste collection to minimize potential sources of non-point source pollution.

Point Source Pollution Discharges

- Provide input to the DEP regarding permits that regulate point discharges and add pollutant load to the streams through wastewater or industrial point source discharges.
- Identify and report illicit discharges to the DEP.
- Provide education regarding the impacts to water quality, aquatic life and human health from the presence of toxins, pharmaceuticals and personal care waste products in our streams, groundwater and drinking water. Also, provide

information on ways to reduce and recycle these substances.

Riparian Corridor Protection

Promote the protection and establishment of riparian buffers throughout the corridor through regulatory protections, public education and buffer planting projects (e.g. upland review areas, maintaining native non-invasive vegetation, erosion & sedimentation controls). Riparian corridor lands, those lands adjacent to rivers and streams, are the first line of defense for a river system. Maintaining and protecting these areas in a natural native condition is the most important action that can take place to ensure the long-term quality of river and watershed resources.

- Utilize the DEP's reference manuals and guidelines to the greatest extent possible to strengthen each town's ability to regulate riparian buffers.
- Take full advantage of the State of Connecticut's General Statutes enabling legislation that requires towns to adopt wetland regulations and to regulate impacts on wetlands and watercourses beyond the wetland boundary by using Upland Review Areas (URAs). For example, vernal pools typically merit greater protection and so the regulation can provide for a larger URA. URAs can be as large as necessary to protect the wetland function from detrimental impacts.
- Require buffers adjacent to wetlands and watercourses, encourage use of native/non-invasive plant species in site plans and subdivisions, and require preservation of existing vegetation on proposed development sites. Vegetation is important in managing and maintaining stream bank stability, preventing soil erosion and sedimentation, and in filtering pollutants in stormwater run-off.
- Establish and optimize use of town landscaping requirements to protect riparian buffers.
- Incorporate riparian areas as a priority in open space planning and acquisition activities, as well as in defining open space set asides in new subdivision applications.
- Implement landowner education and outreach initiatives on the importance of riparian areas.
- Meet current standards when repairing or replacing existing watercourse crossings.
- Avoid new watercourse crossings to the maximum extent feasible. Where not feasible minimize (e.g. reduce number of watercourse crossings, preferably crossing at narrowest location with a minimum amount of fill or disturbance) or mitigate (e.g. install a clear span over a watercourse instead of a closed culvert) new watercourse crossings.
- Implement municipal and state road construction and maintenance standards that protect riparian area function.

Support prioritized open space protection (e.g. prioritize areas to protect based on their value in conserving river health and ORVs; undertake needed open space

planning; adopt protection techniques such as fee in lieu of open space for developers)

- Protect head waters and tributaries of Salmon Brook
- Prioritize land protection of riparian buffers
- Allow cluster and density bonus development that sets aside open space and promotes outstanding resource protection.
- Require connectivity for open space
- Disallow steep slopes and wetlands in open space requirement calculations
- Purchase development rights on agricultural land.
- Pursue conservation easements.

Sources:
Mike Beauchene, CT DEP, letter correspondence, April 15, 2009
Ethan Nadeau, Freshwater mussels and the Connecticut River Watershed, 2008
Steve Gephard, Conversations, 2008-2009
Jessica Morgan, CT DEP, memorandum, September 23, 2009
Robinson & Cole Town Regulation Review, 2008

Outstanding Resource Value: Biological Diversity

Biodiversity in the Lower Farmington River & Salmon Brook Corridor

Overview
While predominantly rural in character, with large tracts of forest and extensive ridge and wetland systems, the Farmington River and Salmon Brook watersheds support a mosaic of land use including urban centers, suburban residential and commercial development, light industry, and agriculture (Figure 1). The study corridor along the lower Farmington and Salmon Brook reflects this mix, having relatively undeveloped uplands and headwaters and more developed areas in the lowlands along the river.

The study corridor includes all land extending horizontally from the lower Farmington River's mean low water mark to a distance of one-quarter mile inland, on both sides, along its entire course. The same applies to the east and west branches and mainstem of Salmon Brook. Throughout its length, the corridor has a diverse palette of habitats that support a rich variety of resident and migratory species. It also provides a critical dispersal and migratory route for both terrestrial and aquatic wildlife. There is a thriving mammalian community throughout the corridor that includes bear, fisher, otter, bobcat, coyote, deer, and occasional moose. A brief bird survey conducted along the Farmington in spring 2009 alone yielded a count of 2124 individuals of 105 species, including all state and federally listed raptors as well as a number of other federally listed wading and perching birds (Table B). The roster included bald eagle, osprey, American kestrel, northern harrier, American bittern, snowy egret, and great egret. The river itself is the only one known to support all 12 of the freshwater mussel species native to southern New England, including the largest known populations of the

federally endangered dwarf wedgemussel. At least 35 species of finfish are present, supporting an exceptional recreational fishery starring native brown and brook trout. Migratory fish such as American shad, blueback herring, alewife, American eel, and Atlantic salmon have excellent spawning habitat in the corridor.

The watershed as a whole comprises ten ecoregions, or areas with distinctive ecological and physical features (Figure 2).[1] Six of these ecoregions have sufficient area within the corridor to contribute to the corridor's diversity of biological communities and other outstanding resource values. These are described in more detail below.

The Corridor Ecoregions

Traprock Ridge

The traprock ridges of the lower Farmington Valley formed from the tilting of rock strata through faulting and earthquake activity. The upper edges of these tilted layers of rock form the north-south ridges that figure prominently in the valley's topography. The most dramatic section of traprock ridge in the corridor is Tariffville Gorge, where the river cut a ravine through the ridge at the end of the last glacial period. Along the steep elevation gradients and summits of traprock ridges there are a number of specialized habitats.

Where the river skirts the base of a traprock ridge, the corridor includes *steep slopes*, *moist ravines*, and *mineral-rich ledges of basalt talus* having distinctive microclimates that support plant and animal communities uncommon in Connecticut. Spiked false oats, once thought to be extirpated, is one of the notable species found in this ecoregion, as well as Virginia copperleaf (Table P).

Highland and Highland Transition

The east and west branches of Salmon Brook traverse ecoregions known as Highland and Highland Transition. In contrast with the lower lying areas, they feature higher elevations, steeper slopes, and more dramatic stream gradients. Large tracts of contiguous forests of northern hardwood and conifers in these regions support robust communities of *forest interior* birds including the state listed Cerulean Warbler. The highland streams support native brook trout, brown trout, slimy sculpin, and the spring salamander, all of which indicate pristine *cold-water streams.* An intensive salmon restoration program has been implemented in this area during the last three decades with increasing viability rates of the fingerlings. Black bear, fisher, bobcat, otter and an occasional moose are characteristic of this part of the corridor (Table A, Figure 2).

Sand Plain

Sand plain is usually a flat-topped topographical feature composed of sand fill, originally formed as a delta by water running out of a glacier. Sand plains support unique *grassland communities*, including populations of the federally listed Savannah Sparrow and the Giant Tiger Beetle, whose habitats are at a premium and in need of protection. Small pockets of sand plain community are found throughout the low lying central river valley, where they are subject to development pressure. A relatively dense concentration of sand plains is found along the Farmington mainstem east of its confluence with Salmon Brook

[1] The Farmington River Biodiversity Study (FVBS), on which this summary is partly based and which is included as an appendix, contains fewer than ten ecoregions for the corridor. The additional ecoregions were delineated after publication of the FVBS.

(Figure 2).

Glacial Lake Plain

As the name implies, the glacial lake plain ecoregion is underlain by the fine silts laid down at the bottom of the glacial lake that once filled the lower Farmington valley. These silts are fairly impermeable, making glacial lake plain conducive to the formation of extensive *red maple swamps* and many *vernal pools*. By providing critical breeding habitat for amphibians, vernal pools are very important in maintaining the diversity of frogs and salamanders that are significant components of the valley's biological community. The silt of glacial lake plain is also fertile, and thus allowed for the extensive development of agriculture in the lower valley. The resulting large contiguous cleared areas now support outstanding *grassland communities*. Their resident bird populations include the Bobolink and the Eastern Meadowlark (Figure 2).

Glacio-Fluvial Plain

The substrate of these ecoregions is material first moved by glaciers, then sorted and deposited by streams flowing from the melting ice. The deposits are therefore layered and may take various forms known as outwash plains, valley trains, deltas, kames, eskers, and kame terraces. The topography is less flat than the alluvial plain and the sediments more coarse and well drained. They frequently provide an ecotonal region with abundant shrubs and small trees, which support a rich diversity of bird species and foraging mammals. These areas in the corridor tend to have the highest concentration of development.

Alluvial Plain/Alluvial Floodplain

Overview

The *alluvial plain* is a relatively flat landform created by the deposition of sediments over a long period of time by one or more watercourses coming from highland and highland transition ecoregions. The *plain* is the larger area representing the area over which the floodplains have shifted over geological time. The *floodplain* is the active area of that process, a smaller area over which the river presently floods in the course of decades or centuries.

This ecoregion comprises about 40 percent of the corridor land and supports several important and diverse natural communities including *marshes, wet meadows, floodplain forests, sand bars and mud flats, forest levees and vernal pools*. River otters, once absent from these areas, have now been documented as returning residents. These areas also include breeding populations of mergansers, wood ducks, herons, kestrels, harriers, and eagles. The wetlands and wet grasslands associated with the floodplain are second only to dense forest in removing carbon from the atmosphere and also function as water storage and flood mitigation sites. The lower Farmington River system produces the river's highest diversity of finfish with over 30 species recorded in the recreational fishery (Table F). While the mainstem continues to support a cold-water fishery well into the floodplain due to many cold-water springs along the plain's riverbed and the input from Salmon Brook, a lower river-bed gradient resulting in a slower current with frequent impoundments supports a warm water finfish population as well. This combination results in outstanding species diversity. The warm water finfish include small, largemouth, rock, and calico bass, yellow and white perch, chain pickerel, bluegill, white and channel catfish, northern pike and many pan fish. Diadromous fish (those that spend part of their lives at sea) which

include the protected Atlantic salmon, and the American shad, alewives, blueback herring, American eel and sea lampreys follow the colder water cues presented by the Farmington as it enters the Connecticut River to take up residency in the cooler waters for a part of their life history (Figure 3).

Alluvial Floodplain Habitats

Marshes are wetlands subject to frequent or continuous inundation, and are dominated by grasses, rushes, reeds, cattails, sedges, and other herbaceous plants. Disturbed marshes often have low-growing shrubs and even small trees in a context of shallow water (scrub and shrub marsh). They have an extremely high rate of production of plant matter, effectively utilizing excess nutrients from runoff and preventing those nutrients from entering the river (where they are in effect pollutants). They act as ground water recharge sites and provide for floodwater storage reducing the severity of flood events. Marshes are critically important habitat for wildlife, often serving as breeding grounds and nurseries for a wide variety of aquatic and terrestrial life, including great blue heron, little green heron, and American bittern, (Table B). One outstanding example of marsh in the corridor is the one that supports a heron rookery in Simsbury.

Wet meadows are semi-wetland grasslands which are saturated throughout much of the year, because of poor drainage and/or frequent flooding from the river. Unlike a marsh or swamp, a wet meadow does not have standing water except for brief to moderate periods during the growing season. Instead, the ground is typically damp, like a well-soaked-sponge. Vegetation includes a wide variety of herbaceous species including sedges, rushes, forbs and grasses. Wet meadows support the largest reported New England population of state listed Davis Sedge. (SC) (Table P). Wet meadows can be found along the corridor in Farmington, Avon, and Simsbury.

In areas were the current slows, the sand held suspended in the water settles out and forms ***sand bars***. These are important habitats for mussels, and other invertebrates as well as nesting and migratory birds. As the current slows even further, the lighter and finer silts drop out and form ***mud flats***. These are even more important habitats for interstitial fauna (animals that live between the particles) and form important feeding areas for migratory and nesting waterfowl. The National Fish and Wildlife Service found these bars and flats contained all the species of mussels native to New England and the largest reported concentration of the endangered dwarf wedgemussel (SC) (Table 2). Mussel habitat is an important resource value because mussels are one of the most highly endangered animal groups in North America. Their presence is not only indicative of good water quality but also of a diverse array of fish species on which the mussels depend for transport of their larval forms. The robust mussel population may be partially responsible for recruitment of the charismatic river otter to the Lower Farmington River mainstem. The spotted sandpiper, and state listed Virginia rail and upland sandpiper have also been observed. Sand bars and mud flats typically form throughout the lower Farmington wherever the current slows down and drops its load of fine sediments.

Sediment deposited on riverbanks during flood events can form ***levees***, which gradually recruit ***floodplain forest*** species such as silver maple, white ash, green ash, black willow, and poplar. Because they have few woody shrubs, floodplain forests can have a dense understory of rapidly-growing herbaceous plants. An unusual aspect of the floodplain forest is the many vines which festoon the trees (Table P). The back of a levee may be the site of ***wetlands*** and ***vernal pools***. These areas support a wide diversity of resident and transient species including 19 state listed species of concern. Levees and floodplain forest provide habitat for bald eagle and other fish dependent raptors such as the state listed northern harrier and osprey (Table B). Some of the most dramatic examples of levees occur in the corridor between Rainbow Dam and the confluence with the Connecticut River; however floodplain

forest is found in areas throughout the lower Farmington and Salmon Brook.

In contrast to the biodiversity of an entire watershed, diversity within a river corridor could be severely restricted or compromised through residential development and historical and present industry. That the Lower Farmington River System allows for such outstanding resource biodiversity along its course in ecoregions, habitats, and species assemblages is remarkable. Major factors for this outstanding example of wildness within a highly populated region are the establishment of federal and state, and local exclusionary zones, the commitment of the ten Lower Farmington River towns and land trusts to water quality and open space acquisition, and a regional watershed association which fosters stewardship, recreation and scientific study of the river.

Biodiversity Threats and Goals

Threats

1. Increased turbidity.
Continued construction upslope of the river and its tributaries produces a stripped soil condition that allows for fine particulates to run off into storm water catch basins. Some of these ultimately discharge into the river with substantial silt loads. The silt can mask visual and olfactory cues for fish and invertebrates, and can reduce dissolved oxygen due to a rise in water temperature through silt absorption of sunlight. This may affect the finfish and invertebrate dynamics, and reproductive success.

2. Invasive Plants
The riparian system is under constant pressure from native and non-native invasive plants. These include Asiatic Bittersweet, Japanese Barberry, European Privet, and Honeysuckle. While they do provide habitat for smaller mammals and birds, the fact is they occupy the niches of many more beneficial native species and reduce the biodiversity of the system.

3. Loss and fragmentation of habitat
The continued development within the watershed and the riparian zone either with new construction, or projects that increase the footprint of existing structures, continues to result in habitat loss and fragmentation. This is especially important in the riparian ecoregions. Present wetland and watercourse statutes only protect the riparian zone from actual impact to the watercourse or wetlands themselves, not the riparian habitats.

4. Nutrient loading
With increased development come increased areas of maintained groundcover. Excess fertilizer containing phosphate and nitrates create problems for both the river and ultimately the ocean when carried both by surface and groundwater flow to the main stem or its tributaries. Phosphate, which is the limiting factor for algal growth in freshwater systems, when anthropogenically supplied can result in an overabundance of algal growth both in species compositions and biomass. This has a dramatic effect on the biotic and abiotic constituents of the ecosystem.

Management Goals

1. Review Biodiversity Data and Update the Ecoregion Nomenclature

Currently the biodiversity data on the river corridor system is not in line with the present designation of EPA Level IV Ecoregion identification. According to the EPA, the New England region is lagging in compliance. We should update present biodiversity assignment and provide additional study to those ecoregions that have been insufficiently reviewed.

2. Expand Biodiversity Study
Implement biodiversity study and natural resource inventories within those towns/areas not already a part of the FRWA Biodiversity Project.

3. Encourage Regional Planning and Acquisition of Open Space
Frequently large unfragmented portions of buildable land cannot be funded by an individual town. Regionalization of this funding can provide a solution. The Fisher Farm cooperation between Farmington and Avon is one example this. Extending this to cooperative purchase of critical open space within the corridor will be a huge step in preservation of the biodiversity.

4. Mitigation of Increased Turbidity
a. Support the establishment of the new EPA turbidity discharge levels from construction sites in local Inland Wetland and Watercourse Regulations.
b. Support for IWWA Regulations that would require direct discharge turbidity standards be applied to discharges from any storm water catch basin outlet that discharges directly into the river system or ancillary tributaries.
c. Provide a base line study of turbidity along the entire LFRS.
d. In projects or areas where fine particulates cannot be traditionally mitigated encourage polymer binding.

4. Invasive Plant Control
a. Provide assistance to Land Trusts and other private landowners in the corridor to apply for USDA/NRCS Wildlife Habitat Improvement Contracts and other grant/incentive programs for removal of invasive plants and restorative plantings.
b. Maintain a current database and review of contractors who engage in invasive removal and restoration that have been contracted under the WHIP Program or other grant/incentive programs.
c. Provide an in-house resource person among whose responsibilities would be to monitor invasive plant/habitat restoration projects.
d. Develop an invasive management project that is based on the flow direction of the lower Farmington and Salmon Brook (upstream to downstream).

5. Loss of Habitat
a. Assist in the private transfer of land either through easements in favor of local Land Trusts, gifting, or purchase that will create a 150' riparian greenway along the river system.

6. Nutrient Loading
Educate municipalities, nurseries and golf courses regarding benefits of 0% phosphate fertilizers. Work with local Land Trusts to develop a distribution program for corridor landowners.

5. Monitoring Bioindicators
Continue to monitor the mussel population in the river as a bioindicator of water quality.

6. Fund a Wild and Scenic River Resource Person.
This individual could work with the town planners, Land Trusts, and other boards and organizations to provide assistance as required.

NotesFigures for Biodiversity (not included with this draft)

Figure 1: Ecoregions with legend identifying the six ecoregions in the text: Sand Plain, Rift Gorge, Highlands, Glacial Lake, and Alluvial Plain.
Figure 2: Alluvial Plain Habitats: Emergent Marsh, Wet Meadow, Shrub, Flood Plain Forest, Sand Bars, Mud Flats, Wetlands, Vernal Pools,

Bird Observation Locations:
Farmington, North Flats (Meadow Road)
Farmington, Tunxis Mead (New Britain Avenue/Red Oak Rd.)
Farmington, Apricots Restaurant
Farmington, Route 10 Cemetery?
Farmington, 1527 Farmington Avenue
Avon, Nod Brook WMA (on the river between the two ponds)
Canton, E side, Town Bridge
Simsbury, Pinchot Sycamore
Tariffville, Rt 315 Bridge
Windsor, River Street Park
Windsor, Rt 159 Boat Launch to Ct. River

Outstanding Resource Value: Cultural Landscape

The Study Committee has contracted with Leah S. Glaser, PhD, Assistant Professor of History at Central Connecticut State University to research the cultural resources of the study area. We expect to receive her final report in November 2009.

The Farmington River is a beautiful, historic river with a continuing sense of history and preservation.

Thousands of years ago, not long after the melting of the last great glacier, ancient hunters and gatherers followed herds of animals along the fast and winding little river we call the Farmington. Artifacts have been found all along the river and its tributaries. Some artifacts have been found from the Paleolithic Period, and many from the Archaic and Woodland Periods. Ancient campsites, village sites, rock shelters, and trading sites have been discovered near the river. There is evidence of fishing camps, and when Colonists came into the area they found Indians spearing fish at a natural rock step dam in present Collinsville. The river continues to support an abundant supply of fish. Fishing continues as a major recreational activity. The Farmington River is known as one of the best cold water fisheries in Connecticut and beyond. It has become a destination place. People come from many parts of the United States and other countries to fish for trout in the cold, fast water of the upper Farmington River, and the Salmon Brook tributary as well. Fish management efforts are

supported by a local fish hatchery in Burlington, fish stocking, a trout management area, water monitoring, and habitat preservation.

Major Indian trails followed the river and a large trading network developed along them. Ancient trading centers have been discovered and preserved. Near where the Farmington and Pequabuck Rivers meet is an archaeological site where over a hundred fire hearths have been identified, and piles of stone materials. The site was visited again and again by ancient people over thousands of years. It was most frequented in the Middle Archaic Period. A valuable commodity was soapstone quarried from outcroppings in rock ridges which rise up from the river valley. When English Colonists came they wanted soapstone too. Thus trading continued, with Indian soapstone, furs, and corn being traded for such things as iron kettles, cotton cloth, and iron axes. The Europeans traveled along the Indian trails, and later when roads were constructed, they generally followed the Indian trails. Present Route 44 approximately follows the old North West Path. In the 1700's wagon loads of goods from points North and West moved to boats on the Connecticut River and later to the Farmington Canal, the largest canal in New England, for distribution far and wide.

During the Revolutionary War soldiers responding to the Lexington alarm marched along the river and over the bridge at Satan's Kingdom on their way to Boston. Near the end of the Revolution troops under the command of General Burgoyne followed the same route to Saratoga, where they later surrendered. As they traveled they camped along the Farmington River, and left artifacts of Revolutionary times buried in the soil.

Indians living along the Farmington River when Colonists arrived called the river Wattunkshausepo, which in Algonquin language means "fast flowing and winding little river or steam ". Early settlers shortened it to Tunxis, and finally it became the Farmington River. Because of the fast flowing nature of the river, with steep and rocky banks, its character has remained intact. Settlement patterns and business areas are set back from the river, and land bordering the river is largely undeveloped. In the Woodland and Contact Periods meadow areas near river bends and calmer places were village sites and planting places. Examples are Tunxis meadow in Farmington, Massaco meadow in Simsbury, and the meadow in Windsor. The alluvial soils of these meadows were full of nutrients from the river and provided excellent crops. Deeds were arranged that gave the Indian planting fields to the new settlers who continued planting, in some cases for several generations. Much of this land is now protected by town ordinances, Farmland trusts, easements, conservancies, or development rights contracts, and farming continues to provide a local source of fruits, vegetables and wines. Farms along the river include The Pickin' Patch in Avon and Rosedale Farm in Simsbury.

Most of the signs of early industries and mills have long gone and the river flows freely. However, the Collins Company, built at the site of the old Indian fishing rocks in Collinsville, still stands. In 1826 Samuel Collins, together with his brother and cousin, set up a factory for the manufacture of sharp edged tools. Collins Company tools were purchased world wide. The Collins Company became so important that the first railroad trains came into Collinsville as early as 1850. The old railroad track through Collinsville has been transformed to "Rails to Trails ", enjoyed by many as they follow the trail along the river. (See Recreation Descriptive Summary) The Collins Company complex is on the National Registry of Historic Places.

A decade before the Civil War free African American stone workers came to Canton to help move rocks from local quarries and build stone structures for the Collins Company. Runaway slaves

moved from ports in Eastern Connecticut toward the North and West. In secrecy they moved from place to place at night, following signs and clues. The Farmington River was significant as they moved through the Underground Railroad. Historians consider Farmington to be the Grand Central Station of Connecticut's Underground Railroad. Prior to the Civil War, John Brown, the Abolitionist, who was often at his grandfather's house in the Farmington Valley, made a contract with the Collins Company to manufacture pikes which were used in the battle at Harper's Ferry.

Recreational uses of the Farmington River are non-polluting. The Farmington River does not lend itself to power boat travel, but canoe paddling, kayaking, and tubing are popular sports. Fast water sections of the river provide opportunities for experts to test their skills. The races at Tariffville Gorge have international acclaim. April, 2009 saw the T-ville Triple Crown Kayak races in the Gorge. People have come from far and wide to compete in this unique and spectacular white water. Flat water sections of the lower river attract families and less adventurous people who enjoy looking for wildlife and taking in the scenery as they paddle.

The Lower Farmington River, as with the previously designated upper River, has outstanding cultural resource value, bringing a continuing sense of history, recreation, and livelihood, preserved for future generations.

Source: Cynthia Griggs, local historian

Outstanding Resource Value: Recreation

Based on an Economic and Use Study of the Lower Farmington River and Salmon Brook, the river, the brook and their corridors are highly valued by residents and recreational users who strongly support a Wild & Scenic Rivers designation as a way to further their protection. Survey respondents' support is based on the sense of place that the lower Farmington River and Salmon Brook provide, and more strongly on the diverse recreational options which the watercourses offer. Local residents are the main users of the Lower Farmington River and Salmon Brook and their corridors. A conservative estimate of the number of visits from mid-May to mid-September made to these venues is over 124,000 per year. Most visits are short, two hours being average. Because the people who use Salmon Brook and the lower Farmington River are mainly local, the economic impact of the waterways is lower than that of the upper Farmington River. The upper Farmington River, a widely recognized trout fishing venue, has an economic impact of about $3.6 million per year compared to $1.2 to $1.6 million for the lower Farmington and Salmon Brook. This is understandable since there are few lodging and food costs associated with the many short local visits. However, the recent Tariffville Triple Crown Whitewater Races, which drew competitors and spectators from a wide area suggests that the lower Farmington River has an untapped economic potential. Additionally, some local businesses, for example Collinsville Canoe and Kayak depend on the river for their success. Most small businesses seem less connected to the river, but some owners have suggested that a Wild & Scenic designation could attract visitors and enhance their profits.

This section of the Lower Farmington River/Salmon Brook Management Plan describes a few of the recreation highlights offered by the streams and their corridors. A more comprehensive list of recreational activities within the river corridor will be included in the appendix.

Paddling: The lower Farmington River offers a range of boating activities - from flat-water to mild moving waters to sections of class II and III white water for experienced paddlers. It is easy for people to take advantage of these activities, since there are many public access points.

From the Collinsville Dams to the Rte. 4 bridge in Farmington the river provides a series of Class II drops and pools, passing under an iron former railway bridge (now part of the Farmington River Trail), and flowing across an old gravel pit (evidence of glacial activity). In Farmington, the river abruptly turns northward, deflected by a terminal moraine deposited in the last Ice Age that blocked the river's southward path. An important spot along the river in Farmington is the Lewis Walpole site, located just east of the confluence of the Farmington and Pequabuck rivers. This is one of the most important archeological sites along the lower Farmington and, in fact, it is one of the most significant sites in all of southern New England. Stone artifacts recovered at the site indicate that this site was selected repeatedly by Native American groups throughout prehistory exhibiting what is, perhaps, the deepest record of a nearly continuously occupied site in our region. Evidence indicates that this location was occupied beginning as much as 10,000 years ago and intermittently from that time right up until European contact in Farmington in 1640. The Lewis-Walpole site is of national significance, commonly cited by archaeologists in their discussion of continuously occupied sites. [(1)]

From the Rte 4 Bridge to Tariffville Park in Simsbury, the river is flat-water, with ample access points. This is an excellent river section for beginning paddlers. Local river outfitters provide rental boats and transport to make this truly an accessible stretch of river. Landmarks include ruins of the Farmington Canal and trails along Fisher Meadows in Avon. Wildlife viewing opportunities may include the rare yellow-billed cuckoo and hooded warbler, or sunbathing turtles, including the uncommon musk and wood turtles. There are views of Talcott Mountain and the Gifford Pinchot Sycamore tree, largest tree in CT. Salmon Brook enters the river along this stretch.

The reach from Tariffville Park in Simsbury to Rainbow Reservoir in Windsor includes Tariffville Gorge, a spectacular rapid that can be run year-round. There are very few rivers in New England and beyond where running world-class white water throughout the summer months is possible. It has been the location of National and Olympic Trials, New England Championship competitions, and National Canoe Poling competitions. In 2009, the New England Whitewater Triple-Crown Championships brought world-class canoe and kayak competition back to Tariffville Gorge with three different whitewater events: wildwater, slalom, and freestyle.

Of historical interest along this reach are the remnants of the HELCO (Spoonville) Dam. This breached dam is a paddling feature for only the most expert kayakers that are familiar with the associated dangers. Additionally, there was another dam a half mile downstream that powered a water wheel for the nation's first commercially successful electroplating operation. The Cowles Manufactory produced silver-plated utensils, hence giving rise to the name Spoonville. Bald eagles winter near this section of the river.

Walking, hiking, and biking: There are a number of outstanding trail systems within the study area including five State of CT officially designated greenways: Farmington River Trail, Farmington Canal Heritage Greenway, Metacomet Ridge System, Blue Blazed Trail system and the Shade Swamp Sanctuary. Not surprisingly, part of what makes each unique is their connection to other Outstanding Resource Values.

The Farmington Canal Heritage Trail and the Farmington River Trail are two popular multi-use "Rails-to-Trails" which pass through seven of the ten study towns (Burlington, Canton, Farmington, Avon, Simsbury, East Granby, and Granby).

The Farmington Canal Heritage Trail has been designated a Community Millennium Trail under the Federal Millennium Trails Initiative based on its special value to the communities it passes through. It forms part of the East Coast Greenway, which, when completed, will stretch from Florida to Maine. (An eighth town in the study, Bloomfield, is beginning work on its section of the East Coast Greenway, and is considering a route within the Farmington River corridor to "connect up" with neighboring study towns.)

The Farmington River Trail is an eighteen-mile loop trail that links to the Heritage Trail at points in Farmington and Simsbury. For roughly half its length the trail runs directly alongside the river. Since both trails are built along abandoned rail corridors and canal towpaths, each passes through a rich cultural landscape of historic buildings, canal locks, iron bridges, stone arches, and other landmarks.

Additionally, the ridgelines and parks within the River's and Brook's watershed and corridor offer a multitude of hiking and walking options. One of the most notable is the Metacomet Trail, part of the MMM (Metacomet Monadnock Mattabassett) Trail system, designated as the "New England National Scenic Trail" on March 30, 2009. This outstanding trail follows the traprock ridge in Connecticut from Meriden to the Massachusetts border, passing through 5 of the 10 Study Towns (Farmington, Avon, Simsbury, East Granby, and Bloomfield).

Another easily accessible resource with respect to hiking and walking is McLean Game Refuge in Granby and Simsbury. The West Branch of Salmon Brook flows through the refuge, which consists of more than 4,200 acres of forests, hills, and streams and includes the easternmost trap rock ridge summit of the Barndoor Hills.

Fishing: The activity of fishing the lower Farmington River has long been part of the Cultural Landscape. The Massaco Indians harvested salmon navigating the ledge-rock staircase falls at the Collinsville factory site. The Indian Hill Site in Bloomfield is an important archeological site located on a terrace west of a series of rapids and the fall line at the Tariffville Gorge. Artifacts found there indicate that "Native American groups occupied Indian Hill repeatedly throughout prehistory. Sturgeon plate/scute fragments, spines and vertebrae of smaller fish, stone weights, and semi-lunar knives (used to clean fish) all support the notion that the site was selected for the fishing opportunities it afforded." [(2)]

Local residents continue to enjoy fishing along the lower Farmington today. The section of the river between Collinsville and Unionville is especially popular with local anglers since it is designated as "no-kill" after the fishing season closes, hence offering the potential of more fish to "catch and release" for the recreational angler.

Tunxis Mead in Farmington offers a different type of recreational fishing because excavation of sand and gravel from the glacial deposits created a pond-like environment. This section of the river offers a warm-water fishery, as well as ice-fishing in the winter. Crew teams also practice in this flat water stretch of the river.

There are numerous access points for fishing within the study area, including three handicapped access sites (Farmington Land Trust near Unionville, Rte 4 Bridge project in Farmington, Rte 20 Bridge in Granby on east branch Salmon Brook.)

Birding: Birding is the fastest growing outdoor recreational activity in America, and the river corridor presents exceptional opportunities for this activity. The study area is the best and most varied bird habitat in Connecticut for two main reasons: (1) the state overlaps the southern boundary of northern species and the northern boundary of southern species, so species abundance is unusually high, (2) the river corridor provides good nesting habitat and is a migration corridor as part of the Atlantic flyway.

As a result, exceptional birding areas are abundant within the study area:

- Northwest Park in Windsor is designated an Important Bird Area (IBA) by the National Audubon Society. A variety of upland, grassland and wetlands species are found within the Park. Over 60-acres of grasslands are managed for the Grasshopper Sparrow - a Species of Special Concern in Connecticut.
- Nod Brook Wildlife Management Area is a tremendous place to view spring and fall migrations of hawks, including nighthawks.
- The 2.2 mile River Walk in Simsbury provides easy viewing access to migratory and nesting waterfowl, including a great blue heron rookery.
- The Farmington Canal Heritage Trail and Farmington River Trail (mentioned above) provide easy access for viewing birds, including migratory waterfowl.
- Fisher Meadows, Avon
- Tunxis Mead/Farmington Meadows, Farmington
- McLean Game Refuge in Granby and Simsbury (Hartford Audubon leads bird trips there frequently.)
- Windsor Meadows State Park at the mouth of the Farmington River as it flows into the Connecticut River. This Park is at the edge of the study area, on the shore opposite Station 43 in South Windsor, Connecticut, regarded as one of the premier birding location in north-central Connecticut.[3]

The wide variety of birds found within the study area is discussed in greater detail in the Biodiversity section along with the results of a recently conducted bird survey that revealed the presence of 105 species.

Other recreational activities associated with the lower Farmington River and Salmon Brook includes photography, painting and drawing, and wildlife (other than birds) watching.

Although river users are generally satisfied with conditions along the river, they have noted the following problems they would like to see addressed: Litter, lack of restrooms, lack of control over traffic and development along the river.

Threats to Recreation

The most obvious threat to recreation is lack of public access to the waters of the Farmington River and of Salmon Brook and to land within the corridor area. "Access" can be viewed simply as

physical access to the waters and land, or more broadly, to also include public knowledge about what recreational activities are available and to direct the public to existing points of access. Existing protections and gaps with respect to this broader notion of public access will be discussed below.

Other threats are more indirect for recreation, but are direct for other ORVs, particularly Water Quality. Examples include:

- Pollution based restrictions on fishing/swimming/boating
- High levels of bacteria from non-point source pollution runoff
- Waste water treatment failures or overflows
- For birding, loss of appropriate habitat
- For fishing, reduced water quality
- Diversions and impoundments
- Fluctuating releases from dams
- Bank erosion from non-established access points

Existing Protections – Public Access

To understand the existing level of recreation protection and potential need for additional measures at the local, state and federal level a comprehensive review of all applicable regulations within the study area was undertaken. At the local level there is limited regulatory protection directly related to recreation across the ten towns. In general, local regulations permit limited recreational use within the Floodplain or Farmington River Protection Overlay; however, four of the ten towns' floodplains regulations are silent on the matter.

Existing protections for public access to the water and land within the corridor more generally take the form of public-private partnerships. One example of this is the planned stewardship of the recently designated New England National Scenic Trail. The Trail passes through 5 of the 10 study towns, and within the river corridor in 2 of the towns (Bloomfield and East Granby.) The National Park Service (NPS), Connecticut Forest and Park Association (CFPA) in Connecticut, and the Berkshire Chapter of the Appalachian Mountain Club (AMC) in Massachusetts are working together to manage the trail. The primary role of the NPS is to assist the CFPA and AMC in their stewardship role, and to coordinate the expenditure of federal funds for trail management and protection with the Stewardship Council. The entire trail system is predominantly managed and maintained by volunteers, and much of it relies on the generosity and commitment of landowners who voluntarily allow it to cross their lands.[4]

The Farmington Canal Heritage Trail and Farmington River Trail likewise benefit from public-private partnerships. Five towns in the study area administer the sections of the trails that pass within their borders. Several non-profit organizations (including Farmington Valley Trails Council (FVTC), Farmington Valley Visitors Association (FWA), and Simsbury Main St Partnership) have supported the Trails by funding the actual building of the trials and trail enhancements such as kiosks, signage, benches, landscaping. Enthusiastic public support for the Trails was evident at the September 20, 2009, dedication ceremony of the latest trail enhancement - a new bridge crossing Salmon Brook in East Granby. An excellent trail guide was also recently published by the FVTC utilizing funding from multiple private, state, and federal sources.[5]

Protections also exist within the corridor via Land Trust and Private Conservation Group holdings. Some of these groups promote public use of their land holdings.

Gaps in Protection

- Lack of regulatory protections
- Lack of Funding (at Federal, State, Local, Private levels)
- Reliance on Volunteers for stewardship activities

Recreation Management Priorities

- Provide river access that is compatible with river protection.
- Provide information on recreation resources (paddling, greenways, birding, hiking) to encourage local use and tourism. Support and partner with existing groups such as paddling organizations, anglers' organizations, greenway and trail associations.
- Promote sound waste management strategies through clean-ups, portable toilets, education & regular housekeeping at recreation sites.
- Provide education on safe, responsible recreation use by publishing a Safety and Etiquette guide. This could include information on water quality safety as well as typical paddling guidelines.
- Facilitate public-private partnerships that provide river access that is compatible with river protection.
- Promote area tourism by supporting the connection of the river corridor with the five State of Connecticut-designated Greenways and New England National Scenic Trail. Work with the ten towns to promote opportunities for local businesses related to the river, brook, and trails.
- Promote volunteer opportunities for river stewardship such as river cleanups.
- Conduct a follow up economic study focusing more specifically on the economic impacts of the Tariffville Gorge area.

Sources:
Fishing: Larry Schlegel
Birding: Brian Toal, Jay Kaplan, Roger Preston, Patrick Comins (via e-mail)
Salmon Brook: Greg Sotille
Connecticut Walk Book
(5) Farmington Canal Heritage Trail & Farmington River Trail Guide
(1) And (2) Archaeological Assessment of the lower Farmington River and Salmon Brook (Feder and Banks)
(4) National New England Scenic Trail website (http://newenglandnst.org/)
(3) Connecticut Birding Guide by Buzz Devine and Dwight G. Smith