Upper White River Habitat Restoration Project, White River, Rochester, Vermont

Project Location: Town of Rochester, Windsor County of Vermont
Congressional District of Project: VT00
Congressional District of Applicant: VT00

EBTJV/NFHAP Funding Requested: $50,000
Total Project Cost: $756,800
Total Federal Matching: $685,000
Total Non-Federal Matching: $21,800

APPLICANT
Organization: White River Partnership
Project Officer: Mary Russ
Street: PO Box 705
City, State, Zip: S. Royalton, VT 05068
Telephone Number: 802-763-7733
Facsimile Number: 802-763-7733
EMail Address: mary@whiteriverpartnership.org

SPONSORING FISH AND WILDLIFE SERVICE FISHERIES OFFICE
Fish and Wildlife Service Office: Lake Champlain Fish and Wildlife Resources Office
Project Officer: Christopher Smith
Street: 11 Lincoln Street
City, State, Zip: Essex Junction VT 05452
Telephone Number: 802-872-0629
Facsimile Number: 802-872-9704
EMail Address: chris_e_smith@fws.gov

U.S. Fish and Wildlife Service FONS Database Project Number: 2012-082

Coordination Completed with US Fish and Wildlife Service Fisheries Office (Check One):
_____Yes _____Date Coordination Began
_____No

I. PROJECT DESCRIPTION, SCOPE OF WORK, AND PARTNER INFORMATION

A. Project Description and Scope of Work

The White River Partnership (WRP) is seeking $50,000 from the Eastern Brook Trout Joint Venture (EBTJV) to implement an Upper White River Habitat Restoration Project (Project). The goal of the proposed Project is to protect and enhance brook trout populations impacted by habitat modifications on four tributaries to the Upper White River in Rochester, Vermont.

Flooding and flood recovery from Tropical Storm Irene in August 2011 degraded brook trout habitat in several major tributaries to the Upper White River in the town of Rochester, including the West Branch and Howe, Marsh, and Nason Brooks. More specifically, extensive gravel mining to restore Vermont Route 73 devastated in-stream and riparian habitat along the West Branch. On Howe, Marsh, and Nason Brooks a series of under-sized culverts washed-out during the flood and temporary replacements are barriers to fish passage.

To accomplish the proposed Project goals, the WRP is collaborating with federal, state, and local partners to implement on-the-ground projects in five locations:

1. West Branch of White River – Project partners will mitigate impacts from extensive post-flood gravel extraction through the implementation of in-stream and riparian habitat enhancement projects on Green Mountain National Forest land and up to 13 privately-owned parcels.
    a. CCC Camp – In a 1.5-mile stretch of the West Branch, extending from King Farm Road downstream to the mouth of Corporation Brook, project partners will reconnect floodplain; restore pattern dimension and profile; recreate pools; employ “engineered large woody structures” to stabilize streambanks; and restore riparian habitat.
    b. Lion’s Bridge – In a 1.0-mile stretch of the West Branch, extending from the Wing Farm downstream to the second residence below the bridge, project partners will restore channel dimension and planform; employ “engineered large woody structures” to stabilize streambanks; remove berms to restore floodplain access; restore riparian habitat; and upgrade an under-sized culvert 0.25-miles up Wing Brook at Wing Farm Road.

2. Upper White River tributaries – Project partners will replace 7 under-sized culverts that failed during flooding from Tropical Storm Irene with stream-crossing structures designed to be both flood-resilient and fish-friendly. In addition, the stream bed will be rebuilt through each structure using the US Forest Service “Stream Simulation” guidelines.
    a. Howe Brook – Along the 1.6-mile brook, Project partners will replace the failed 5-foot culvert at Fiske Road with a 14-foot open-bottom arch culvert; and the failed 4-foot culvert at Oak Lodge Road with a 14-foot open-bottom arch culvert.
    b. Marsh Brook – Along the 3.4-mile brook, Project partners will replace the failed 15-foot open-bottom arch culvert at Marsh Brook Road with a 22-foot open-bottom arch culvert; and 2 failed 30-inch culverts at North Hollow Road with a 22-foot open-bottom arch culvert.
    c. Nason Brook – Along the 3.1-mile brook, Project partners will replace the failed 11-foot, 3-inch culvert at Woodlawn Cemetery with a 32-foot Braley Bridge; the 3 failed culverts (1.7-feet, 2.0-feet, and 2.5-feet) at South Hollow Road with an 11-

foot open-bottom arch culvert; and the failed 4-foot culvert at Moose Run with a 12-foot open-bottom arch culvert.

To accomplish Project objectives along the West Branch, Project partners have surveyed the entire project area, and will spend winter 2012/2013 securing landowner contracts, designing on-the-ground projects, and applying for state and federal permits. The Green Mountain National Forest will monitor long-term impacts to brook trout populations annually.

To accomplish Project objectives along the Upper White River tributaries, Project partners are working through the FEMA Public Assistance Improved Project Program (IPP). The IPP allows the expenditure of FEMA Public Assistance dollars on the implementation of projects that exceed FEMA standards. In this case, Project partners are replacing flood-damaged culverts with culverts or bridges that are designed to accommodate a 100-year flood along with the passage of debris, ice, and aquatic organisms; FEMA standards only require replacement structures to accommodate a 25-year flood. We have a signed "Cooperative Road Agreement" in place with the Town of Rochester; we have complete engineering designs in-hand for 2 projects; and we will spend winter 2012/2013 designing the remaining 5 projects. The US Fish & Wildlife Service will monitor brook trout populations pre- and post-project implementation.

B. Proposed Methods (350 characters)

Projects will be designed, permitted, and managed by local contractors and state and federal agency and WRP staff. Implementation of projects will be conducted by landowners, local contractors, and WRP volunteers in cooperation with town officials and state and federal agency staff. Federal agency partners will monitor long-term impacts to brook trout populations.

C. Project Timeline

August – September 2012: Implement 2 culvert replacement projects on Marsh Brook; conduct fish population assessments

October 2012 – June 2013: Project outreach, planning, design, and administration

July – September 2013: Implement in-stream habitat restoration projects on the West Branch and 5 culvert replacement projects on Howe and Nason Brooks; conduct fish population assessments

October 2013 – March 2014: Project outreach, planning, design, and administration

April – June 2014: Implement riparian habitat restoration projects on the West Branch

July – September 2014: Implement in-stream habitat restoration projects on the West Branch; conduct fish population assessments (continue on annual basis)

D. Proposed Accomplishment Summary (500 characters)

The proposed Project will address flood- and flood recovery-related habitat modifications on four tributaries to the Upper White River in Rochester, Vermont by utilizing active instream management and design; establishing riparian buffers; and removing barriers to fish passage in order to restore brook trout habitat and the natural hydrologic regime. This project is in alignment with EBTJV and with state brook trout management goals as described in the

Vermont Wildlife Action Plan and the *Vermont Management Plan for Brook, Brown and Rainbow Trout.*

E. State the importance of the project to the resource (350 characters)

The Project will result in the protection and enhancement of 2.75 miles of in-stream habitat (5.5 miles of stream frontage) and over 30-acres of floodplain and riparian habitat on the West Branch as well as 8.1 miles of in-stream habitat in Howe, Marsh, and Nason Brooks.

F. Problem and specific cause of the problem (350 characters)

Flooding and flood recovery from Tropical Storm Irene in August 2011 degraded habitat conditions in the proposed Project area. Extensive gravel mining to restore Route 73 devastated in-stream and riparian habitat along the West Branch. A series of under-sized culverts washed-out on Howe, Marsh, and Nason Brooks during the flood, and temporary replacements are barriers to fish passage.

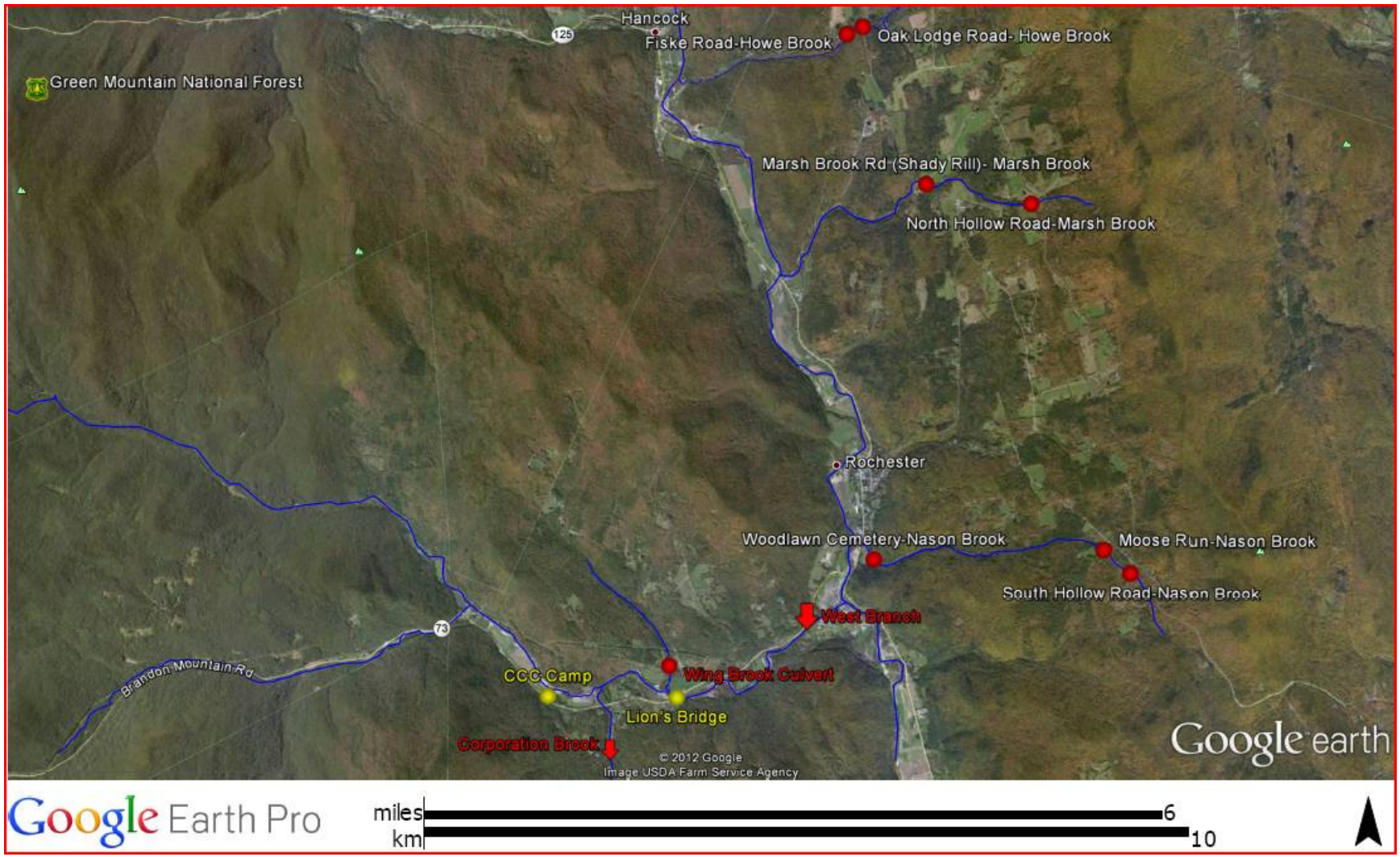
G. Objective of the project with reference to the problem (350 characters)

The proposed Project will address flood-related habitat modifications by utilizing active instream management and design; establishing riparian buffers; and removing barriers to fish passage in order to restore brook trout habitat and the natural hydrologic regime.

H. Partner Information

Partner Name	Contribution In Kind	Contribution Cash	Federal or Non- Federal	Partner Category	Role of Partner
FEMA	-	$185,000	Federal	Federal Agency	Project funding
USFS Green Mountain National Forest	$73,000	$300,000	Federal	Federal Agency	Project planning, design, and implementation; brook trout monitoring
USFWS	$2,000	$100,000	Federal	Federal Agency	Project planning and implementation; brook trout monitoring
VT FWD Fish and Wildlife Dept	$1,400	-	Non-Federal	State Agency	Project permitting and implementation oversight
Town of Rochester	-	$10,000	Non-Federal	Municipality	Project funding
WRP White River Partnership	$8,320	$25,000	Non-Federal (in-kind), Federal (cash)	Local Conservation Group	Project planning, design, permitting, implementation, and administration; volunteer coordination
Landowners	$2,080	-	Non-Federal	Private Landowner	Project implementation
Total	**$86,800**	**$620,000**			**$706,800**

II. MAP OF PROJECT AREA



III. PHOTOGRAPHS OF PROJECT AREA

West Branch post-gravel extraction (Dan McKinley, Green Mountain National Forest)

Nason Brook culvert at Woodlawn Cemetery (Greg Russ, White River Partnership)

III. PHOTO RELEASE – photo 1

U.S. Fish & Wildlife Service

Agreement for Use of Non-Service Products (Copyright)

Instructions
A signed release is required from Non-Service photographers, videographers, and artists stipulating conditions for use of each product obtained by the Service. Completed forms are maintained at the originating office and copies are sent to the Regional External Affairs Office prior to use in any Service Product.

Service Representative:

Office and Phone: _____

I hereby grant permission to the U.S. Fish and Wildlife Service to use my photograph, artwork, graphic design, image, or video product in official Service publications, productions, displays, the Internet and its World Wide Web Site without further consideration. I acknowledge the Service's right to crop, edit, or treat the product at its discretion. These images are for public domain use, or with the restrictions noted below. They are for general information uses, media, education, and the Internet. I also understand that a computer user in or out of the Service can download the product. Where appropriate the product will be credited to the source and to the U.S. Fish and Wildlife Service unless otherwise noted below.

Therefore, I agree to indemnify and hold harmless from any claims the following:

- U.S. Fish and Wildlife Service
- U.S. Department of the Interior
- All employees or agents of the Department of the Interior

I agree to the above full copyright release: Daniel B McKinley **(Signature)**

Special Agreement Instructions (purchase information, usage restrictions, etc.):

None

Product Description (image number, subject, horizontal/vertical, location, title, etc.):

Photo of West Branch White River Post TS Irene Dredging.

Name: Dan McKinley

Address: 231 North Main Street Rutland VT

Phone: 802-747-6738

Signature: Daniel B McKinley Date: 8/28/12

FWS Form 3-2259 10/03

III. PHOTO RELEASE – photo 2

U.S. Fish & Wildlife Service

Agreement for Use of Non-Service Products (Copyright)

Instructions
A signed release is required from Non-Service photographers, videographers, and artists stipulating conditions for use of each product obtained by the Service. Completed forms are maintained at the originating office and copies are sent to the Regional External Affairs Office prior to use in any Service Product.

Service Representative:

Office and Phone: _____

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- U.S. Department of the Interior
- All employees or agents of the Department of the Interior

I agree to the above full copyright release: _____ 6/3/12 **(Signature)**
or

Special Agreement Instructions (purchase information, usage restrictions, etc.):

_____

Product Description (image number, subject, horizontal/vertical, location, title, etc.):

_____

Name: _____

Address: _____

Phone:

Signature: _____ Date:

FWS Form 3-2259 10/03

IV. PROJECT BUDGET

Partner Name	Partner Category	Activity of Partner	Budget Category	EBTJV	Non-Federal Contribution	Cash or in-kind	Federal	Total Contribution	Acres/Miles Affected
FEMA	Federal agency	Culvert replacement	Contractual	$ -	$ -	cash	$ 185,000	$ 185,000	6.1 miles
USFS Green Mountain National Forest	Federal agency	Culvert replacement	Contractual	$ -	$ -	cash	$ 250,000	$ 250,000	8.1 miles
		Restoration - design	Personnel	$ -	$ -	in-kind	$ 30,000	$ 30,000	5.5 miles
		Restoration - in-stream	Contractual	$ -	$ -	cash	$ 50,000	$ 50,000	2.75 miles
		Restoration - in-stream	Supplies	$ -	$ -	in-kind	$ 40,000	$ 40,000	5.5 miles
		Monitoring	Personnel	$ -	$ -	in-kind	$ 3,000	$ 3,000	5.5 miles
USFWS	Federal agency	Monitoring	Personnel	$ -	$ -	in-kind	$ 2,000	$ 2,000	8.1 miles
		Culvert replacement	Contractual	$ -	$ -	cash	$ 100,000	$ 100,000	5.7 miles
VT Fish & Wildlife	State agency	Restoration - permitting	Personnel	$ -	$ 1,400	in-kind	$ -	$ 1,400	16.9 miles
Town of Rochester	Local government	Culvert replacement	Contractual	$ -	$ 10,000	cash	$ -	$ 10,000	6.1 miles
WRP	Local conservation group	Culvert replacement	Personnel	$ -	$ 8,320	in-kind	$ -	$ 8,320	8.1 miles
		Culvert replacement - design	Contractual	$ -	$ -	cash	$ 25,000	$ 25,000	4.7 miles
		Culvert replacement	Contractual	$ 10,000	$ -	cash	$ -	$ 10,000	3.3 miles
		Restoration - planning	Personnel	$ 4,000	$ -	cash	$ -	$ 4,000	5.5 miles
		Restoration - in-stream	Contractual	$ 35,000	$ -	cash	$ -	$ 35,000	2.75 miles
		Restoration - planning	Travel	$ 1,000	$ -	cash	$ -	$ 1,000	5.5 miles
Landowners	Local landowners	Restoration - riparian	Personnel	$ -	$ 2,080	in-kind	$ -	$ 2,080	5.5 miles
			TOTAL	**$ 50,000**	**$ 21,800**	**-**	**$ 685,000**	**$ 756,800**	**-**

V. EVALUATION QUESTIONS

1. **Please provide the GPS Coordinates for the project in UTM NAD 83.**
   a. CCC Camp on West Branch: 43.8495, -72.8583
   b. Wing Brook, Wing Farm Road culvert: 43.8531, -72.8389
   c. Lion's Bridge on West Branch: 43.8495, -72.8381
   d. Howe Brook, Fiske Road culvert: 43.9254, -72.8106
   e. Howe Brook, Oak Lodge Road culvert: 43.9262, -72.8081
   f. Marsh Brook, Shady Rill culvert: 43.9083, -72.7980
   g. Marsh Brook, North Hollow Road culvert: 43.9059, -72.7817
   h. Nason Brook, Woodlawn Cemetery culvert: 43.8652, -72.8063
   i. Nason Brook, South Hollow Road culvert: 43.8636, -72.7662
   j. Nason Brook, Moose Run culvert: 43.8665, -727702

2. **Please list the type of project. Examples include: in-stream habitat, riparian planting, fencing, acid mine drainage restoration, fish passage, reintroduction, assessment, etc.**
   a. CCC Camp on West Branch – in-stream habitat, off-channel habitat, streambank stabilization, riparian habitat, floodplain reconnection
   b. Lion's Bridge on West Branch – in-stream habitat, streambank stabilization, riparian habitat, floodplain reconnection, fish passage
   c. Howe Brook – fish passage, in-stream habitat
   d. Marsh Brook – fish passage, in-stream habitat
   e. Howe Brook – fish passage, in-stream habitat

3. **Are brook trout currently present at the project site or in the project stream? If not, were brook trout historically present? Is the habitat known to be suitable for restoration / reintroduction of brook trout?**
   a. CCC Camp/Lion's Bridge – The West Branch and its feeder streams support naturally-reproducing brook trout populations. US Forest Service annual trout population sampling at the CCC Camp showed that catchable size trout in that section were as high as 514/mile in 2004 (Dan McKinley, USFS, Personal Communication).
   b. Howe/Marsh/Nason Brooks – All three streams support naturally-reproducing brook trout populations. Pre-project monitoring by the US Fish & Wildlife Service in Marsh Brook found 90 catchable brook trout in the ¼-mile below the North Hollow Road culvert project site.

4. **Please describe how the project will provide for the expansion or improvement of existing habitat?**
   a. CCC Camp/Lion's Bridge – The Project will restore critical habitat damaged during recovery activities after Tropical Storm Irene, linking the main stem of the Upper White River to cold-water refugia streams in the Green Mountain National Forest.
   b. Howe/Marsh/Nason Brooks – The Project will re-establish fish passage and brook trout connectivity through the removal of barriers.

5. **Does the project include a protection component? If so, explain how the project sufficiently protects brook trout habitat. Does the project include fee simple land purchase or easements?**
   a. CCC Camp/Lion's Bridge – Portions of the Project will be completed on Green Mountain National Forest land; private landowners will be invited to participate in a federal, state,

or private program (e.g. CREP, WHIP, Partners for Fish & Wildlife Program, WRP Trees for Stream Program, etc), all of which require a long-term contract.

b. Howe/Marsh/Nason Brooks – The Town of Rochester has signed a Cooperative Road Agreement with the Green Mountain National Forest. The Town of Rochester will operate and maintain the structures in good working order.

6. What percentage of the watershed above the proposed project is protected in perpetuity?

a. CCC Camp/Lion's Bridge – 84% of the West Branch watershed is owned by the Green Mountain National Forest and therefore protected in perpetuity. Most of this public land is located upstream of the proposed Project area.

b. Howe/Marsh/Nason Brooks – 11% of the Nason Brook watershed is owned by the Vermont Department of Fish & Wildlife and therefore protected in perpetuity. All of this public land is located upstream of the proposed Project area. While the watershed above the proposed Howe and Marsh Brook projects is privately-owned, a large percentage is enrolled in Vermont's Use Value Appraisal (UVA) program (Jon Bouton, Windsor County Forester, Personal Communication). The UVA program enables landowners who practice long-term forest management to have their enrolled land appraised for property taxes based on its value for forestry, rather than its fair market value.

7. List the specific regional EBTJV habitat objectives addressed by the project and describe how the project will contribute towards them.

The proposed Project will address 4 regional habitat objectives: 1) maintaining the status of subwatersheds classified as healthy; 2) strengthening brook trout populations in subwatersheds classified as healthy; 3) strengthening brook trout populations in subwatersheds classified as reduced; and 4) maintaining reduced subwatersheds in existing condition. The West Branch projects will maintain or strengthen brook trout populations in a subwatershed classified as healthy by restoring in-stream and riparian habitat as well as fish passage. The Upper White River tributaries project will maintain or strengthen brook trout populations in a subwatershed classified as reduced by restoring in-stream habitat and fish passage.

8. State which, if any, EBTJV priority the project addresses:

a. CCC Camp/Lion's Bridge – The West Branch project components strive to protect and enhance brook trout populations in this "best of the best" subwatershed that already supports healthy, stable brook trout populations.

b. Howe/Marsh/Nason Brooks – The Upper White River tributaries project components strive to improve and reconnect habitats adjacent to the "best of the best" that also have a high likelihood of supporting stable brook trout populations.

9. What is the EBTJV subwatershed number and priority ranking for the proposed project watershed for the type of project (enhancement, restoration or protection) being proposed?

Watershed # = 500247 (West Branch)
Priority Score = 0.56
Map = Vermont Subwatersheds Best for Protection

Watershed # = 500245 (Upper White River from Hancock Branch to Tweed River)
Priority Score = 0.48
Map = Vermont Subwatersheds Best for Enhancement

10. Will the completed project benefit any federally listed threatened or endangered species?

The White River is the longest free-flowing tributary to the Connecticut River. A population of federally endangered dwarf wedge mussels (*Alasmidonta heterodon*) is located just down stream of the confluence of the White and Connecticut Rivers. The proposed Project will benefit the dwarf wedge mussel by reducing sediment and other pollutants flowing into the Connecticut River.

11. Will the completed project benefit any state listed threatened or endangered species?

The proposed Project will benefit the Vermont State threatened brook floater (*Alasmidonta varicosa*) and eastern pearlshell (*Margaritifera margaritifera*), and the state endangered pocketbook (*Lampsilis ovata*). All of these mussels occur in the White River below the restoration project.

12. Will the project provide or enhance connectivity to or within an intact subwatershed?

a. CCC Camp/Lion's Bridge – The Green Mountain National Forest has removed all barriers upstream of the Project area located on Forest Service land. The proposed Project will enhance brook trout habitat on the West Branch while restoring connectivity to cold-water refugia tributaries upstream of the project sites.
b. Howe/Marsh/Nason Brooks – The proposed Project will remove all barriers in each subwatershed, providing complete connectivity from mouth to source.

13. What are the root causes of the watershed degradation and which of these are addressed by the project?

a. CCC Camp/Lion's Bridge – The West Branch was historically straightened to accommodate transportation infrastructure and agricultural use. Severe in-stream degradation from post-flood alterations has left some of the West Branch with featureless, homogeneous channels offering little habitat value for older age classes of trout. The proposed Project will utilize direct and indirect stream restoration activities to restore natural hydrologic conditions that can sustain robust populations of brook trout.
b. Howe/Marsh/Nason Brooks – A series of undersized stream crossing structures disrupted stream connectivity in each subwatershed. Removing these barriers and replacing them with flood-resilient, fish-friendly structures will re-establish fish passage and brook trout connectivity while restoring natural hydrologic conditions.

14. Describe the plans for project monitoring and evaluation.

a. CCC Camp/Lion's Bridge – The Green Mountain National Forest maintains a long-term fish monitoring station on the West Branch to evaluate physical and biological conditions on an annual basis.
b. Howe/Marsh/Nason Brooks – The US Fish & Wildlife Service will conduct pre-Project monitoring above and below each culvert site as well as post-Project monitoring for at least 2 years following Project implementation.

15. Describe the expected effect on the brook trout population. To what degree will the project strengthen the brook trout population status?

a. CCC Camp/Lion's Bridge – Brook trout populations in feeder streams to the West Branch are in the 100-200 catchable brook trout/mile range (Dan McKinley, USFS, Personal Communication). After implementing in-stream habitat restoration projects on

the West Branch in the 1990s, brook trout populations in the West Branch rose 514 catchable trout/mile in 2004 (Dan McKinley, USFS, Personal Communication). Monitoring post-Tropical Storm Irene found less than 30 catchable trout/mile on the West Branch (Dan McKinley, USFS, Personal Communication). Based on the success of the 1990s restoration activities, Project partners anticipate that implementing in-stream habitat restoration projects on the West Branch will increase suitable habitat and brook trout population numbers.

b. Howe/Marsh/Nason Brooks – By removing barriers to fish passage, these Project components will enhance in-stream habitat and expand the range for brook trout.

16. Please describe the long term benefit of the project and provide an estimate of the length of time the project is expected to be effective. If a plan for long term maintenance is necessary, please describe it.

Given the focus on brook trout management by the Green Mountain National Forest and other partners, the probability of long-term success in supporting a sustainable fishable brook trout population is very good. All of the management agreements associated with the Project will be for a minimum of 15 years. Most of the practices associated with the Project will be sustainable for a minimum of 20 years – native tree establishment should provide lasting improvements for many decades. And projects on public land will be maintained in perpetuity.

17. Are other strains of brook trout, salmonids, or exotics present in the proposed watershed? Where (e.g. upstream, downstream, and distance from project site) does the stocking take place with respect to the project site?

Trout have not been stocked in the West Branch for over 10 years; naturally-reproducing rainbow trout are in the West Branch. Rainbow trout were not stocked in the Upper White River in 2012. However the State of Vermont stocked 1,200 rainbow trout in 2011 about 5.0 miles south of the project area as well as 1,300 rainbow trout in 2010 along the entire Upper White River.

18. Please describe the current status of the project. Is it planned, permitted and ready to begin? Please identify the targeted month and year for project completion.

a. CCC Camp/Lions's Bridge – The Green Mountain National Forest (GMNF) has initiated outreach to private landowners within the Project area. GMNF staff have surveyed the Project area, and are designing projects for implementation. Projects on GMNF land will be implemented starting in 2013; projects on private land will be implemented in 2013 and 2014.

b. Howe/Marsh/Nason Brooks – A Cooperative Road Agreement is in place between the GMNF and the Town of Rochester for the replacement of 4 stream crossing structures; a similar agreement is in process between the US Fish & Wildlife Service and the Town of Rochester for the remaining 3 structures. Design work is complete for 2 structures and in process for the remaining 5 structures. Projects on Marsh Brook will be completed in 2012; projects on Howe and Nason Brooks will be implemented in 2013.

19. Will public access be allowed at the project site? If so, what kinds of recreational activities are allowed - public fishing, nature trails, etc?

a. CCC Camp/Lions's Bridge – The GMNF maintains public parking and fishing access at both the CCC Camp and Lion's Bridge. The CCC Camp is also an interpretive and historic site.

b. Howe/Marsh/Nason Brooks – Each project is located at a town road crossing, so public access for fishing and other activities is allowed at each project site.

20. What is the recreational quality of the potential fishery?

Statewide angler surveys conducted in 1991, 2000 and 2010 indicate brook trout are the fish species most targeted by resident anglers and was their most preferred species for open-water fishing in Vermont (Rich Kirn, VT Department of Fish & Wildlife, Personal Communication). The tributaries of the Upper White River are currently managed as wild trout waters. Restoring habitat and connectivity to support wild brook trout populations in this watershed will enhance the recreational fishery in this area.

21. Describe any outreach or educational components of the project and how many individuals / students will be served.

a. CCC Camp/Lion's Bridge – The Project will be the first demonstration of the implementation of "engineered large woody structures" in the Northern Region. The GMNF will use this Project to educate other partners, like the US Fish & Wildlife Service (12 staff) the Natural Resources Conservation Service (12 staff), and Trout Unlimited (12 staff), about the use of "engineered large woody structures" for in-stream habitat restoration in combination with streambank stabilization. The WRP will recruit students and community members (100 volunteers) to implement riparian tree plantings, raising awareness about the importance of protecting and enhancing riparian habitat. Finally the GMNF will use the CCC Camp interpretive exhibit to share information about project implementation, monitoring, and outcomes (100 annual visitors).
b. Howe/Marsh/Nason Brooks – These projects will be the first demonstration of FEMA's Improved Project Program to replace culverts in the Northeast. FEMA has already produced a video highlighting the unique partnerships and projected outcomes. Project partners will use this project as a case study for replacing under-sized stream crossing structures with flood-resilient, fish friendly structures following a major flood disaster (100 individuals).

22. If applicable, please briefly describe how this project will promote adaptation to climate change.

The proposed Project will utilize management strategies recommended by the Vermont Water Quality Division for climate change adaptation and mitigation: 1) monitoring biological and physical conditions in the West Branch and Howe, Marsh, and Nason Brooks to establish baseline conditions and help maintain the health and quality of waterways; 2) protecting river corridor, floodplain, and shorelines to reduce encroachment and promote vegetated buffers; and 3) improving and protecting existing infrastructure near waterways (Climate Change and Vermont's Waters, page 3). In sum, these activities reduce the vulnerability of human and aquatic communities; improve flood resiliency; and provide connectivity between main stem habitat and cold-water refugia headwater streams.

23. Please explain how this project is a good investment of funds, using a quantitative approach where possible and the recreational and / or economic value of the project.

The proposed Project is a good investment of funds in several ways. First the proposed Project provides a 15:1 match for EBTJV funds requested. Second the proposed Project seeks to avoid the future costs of replacing under-sized culverts after each flood disaster; for a 20-40% up-front investment in a flood-resilient, fish-friendly culvert design, towns can avoid reinvestment in the

same structure and surrounding infrastructure multiple times. Finally the proposed Project seeks to enhance the recreational fishery in the area, which has a substantial economic value – according to the Vermont Forest Resource Plan, fishing brings an estimated $383 million to Vermont's economy each year (Vermont Stream Crossing Handbook, page 1).

VI. SUPPORTING DOCUMENTATION

Conserving the Eastern Brook: Action Strategies. EBTJV. 2011.

Eastern Brook Trout Status and Threats: Vermont. EBTJV. 2006.

Fichtel, C. and Smith, D. G. The Freshwater Mussels of Vermont. Tech Report 18. Nongame & Natural Heritage Program – Vermont Fish and Wildlife Department. 1995.

Pealer S. and Dunnington, G. Climate Change and Vermont's Waters. April 2011.

Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings. US Forest Service. 2008.

Vermont Forest Resource Plan. Vermont Department of Forests, Parks, & Recreation. 2008.

Vermont Management Plan for Brook, Brown and Rainbow Trout. Vermont Department of Fish and Wildlife. 1993.

Vermont Stream Crossing Handbook. Vermont Department of Fish and Wildlife. 2010.

Vermont's Wildlife Action Plan. Approved by U. S. Fish and Wildlife Service, 2005.