Department of the Interior
Hurricane Sandy Mitigation Funds Proposal Form

PROJECT IDENTIFICATION INFORMATION

Project #: _____ *(to be assigned by DOI staff)*

Project Title:

Collaboratively Increasing Resiliency and Improving Standards for Culverts and Road Stream Crossings to Future Floods While Restoring Aquatic Connectivity

DOI Bureau: **U.S. Fish and Wildlife Service**

Point of Contact
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National Disaster Recovery Framework Recovery Support Functions *(check all that apply):*
___ Community Planning and Capacity Building   ___ Housing
___ Economic Development   _X__ Infrastructure Systems
___ Health and Social Services   __X_ Natural and Cultural Resources

Geographic Scope: *(as relevant, include unit names, cities, states, congressional districts, Stafford Area, and project locations)*

Coastal watersheds in NJ (NJ-00, 04, 05, 06, 07), DE (DE-00), CT (CT-00, 02, 03, 04), RI (RI-00, 01, 02), MA (MA-00, 04), MD (MD-00, 01, 07) and VA (VA-00, 05, 06, 09, 11). All of these coastal watersheds are in the Hurricane Sandy Stafford Area.

Project Summary *(1-2 sentences)*

This project will develop a partner-driven, science-based approach for identifying and prioritizing culvert road stream crossings in the Hurricane Sandy area for increasing resilience to future floods while improving aquatic connectivity for fish passage. The resulting information and tools will be used to inform and improve decision making by towns, states and other key decision makers.

Total Requested Funding: $ 1,270,000

PROJECT PROPOSAL NARRATIVE
Please describe the following: Project goals, project summary, project benefits, definition of project success and plan to assess results, time schedule including milestones, budget summary, project team and qualifications, including institutional capacity. *(limited to 2 pages, single spaced)*

Goals
    (1) Identification, survey, mapping and prioritization of road crossing/culvert repair and replacement projects to maximize stream connectivity and post-flood resiliency in States impacted by Hurricane Sandy;
    (2) Improved road crossing/culvert replacement standards to withstand future flood events including predicted future storm discharges due to climate change;
    (3) Improved fish passage in streams in the Hurricane Sandy affected area; and
    (4) Improved understanding, knowledge, and support for culvert/road crossing replacement implementation that is designed to withstand floods and improve fish passage.

Summary
Hurricane Sandy along with other recent storms including Tropical Storm Irene had major impacts on poorly-designed or undersized road stream crossings. Aquatic systems in the northeast are extremely fragmented as many of these crossings provide little or no aquatic organism passage (AOP) for fish and other aquatic organisms. This project will develop a science and partner-driven approach to identify and prioritize culvert and road stream crossing repair and replacements in the Hurricane Sandy area to increase resilience to future floods and improve fish passage. Building on previous efforts, this project will develop a database and maps of road stream crossings based on existing data and models, support additional surveys of road stream crossings, predict future storm discharge levels and develop models to prioritize crossing improvements and assess risk based on multiple ecological factors. The project will also include support for training and capacity to work with local and state users. The project will be guided and supported by partners and users from the conservation, transportation and state and municipal planning sectors. The project will be facilitated by the North Atlantic LCC and the Fisheries Program of the U.S. Fish and Wildlife Service with broad partner involvement and support.

Benefits
    (1) Maps and tools for prioritization will focus restoration efforts for aquatic connectivity on those potential projects that have the greatest benefit through a collaborative effort between Federal, State, local and non-government organizations;
    (2) Local community receives estimated socio-economic return estimated at $500,000 per mile access restored (based on Conserving America's Fisheries, *An Assessment of Economic Contributions from Fisheries and Aquatic Resource Conservation*);
    (3) Fish-friendly and flood-resistant culverts improve (federal, state and local) road and infrastructure resilience. A resilient infrastructure will reduce impacts to commerce from flooding, protect human health and safety, increase aquatic species resilience and foster ecosystem health in river, floodplain and coastal reaches;
    (4) Training promotes best management implementation; and
    (5) Implementation saves tax dollars that would be spent on future road repair and maintains commerce and economic vibrancy through such activities as ecotourism.

Definition of Success
    (1) Robust culvert/road crossing database in Sandy impacted states used by a collaborative partnership that includes the conservation, transportation and municipal communities;
    (2) Functional model identifying priority dam and road crossing survey and implementation priorities under current and predicted future conditions based on the objectives of the user team;
    (3) Identification of best practices and standards for culvert/road crossing replacement;
    (4) Training module fully developed and available for continued implementation and used by federal state, and local partners and partnerships.

Project Proposal Narrative *(continued)*

Plan to Assess Results
The results will be assessed by a team of users representing the conservation, science, planning and transportation sectors based on the four elements of the Definition of Success listed above. They will evaluate the utility and robustness of the database; the ability of the model developed to prioritize road stream crossings for fish passage and infrastructure improvements under current and predicted future conditions; and the utility of the best practices and the effectiveness of training and use of the tools by partners. This user's team will guide the development, testing and evaluation throughout the project.

Time Schedule
Year 1: Use existing prioritizations (Northeast Aquatic Connectivity, UMass-Critical Linkages) to identify culverts for field surveys. Coordinate field survey teams and begin road crossings field surveys. Expand capacity of the River and Stream Continuity Crossings Database to receive data from additional states. Develop methodologies to incorporate culverts into Northeast Aquatic Connectivity work, develop pilot training module.
Year 2: Continue data collection, refinement and entry into model. Initiate development of web-based assessment tool. Initiate modeling of hydraulic responses to climate change and risk-based framework for analysis of priorities. Initiate identification of robust designs for road crossings. Initiate pilot training.
Year 3: Complete data entry. Complete hydraulic response models and robust designs. Rerun Critical Linkages analysis based on field-derived data, model testing, and ground-truthing for results and launch revised Connectivity Tool. Franchise training (train the trainers).

Budget Summary

FWS and States: Coordination, Oversight, Data Collection	$400,000
• UMass (central coordination of culvert assessment: protocols, database, scoring algorithm, training materials, and train the trainers)	$60,000
TNC, UMass Amherst, Climate Science Center Model Development	
• Identify crossings for field surveys	$120,000
• Incorporate surveyed crossing data into models	$90,000
• Develop web-map based connectivity tool	$50,000
• Hydraulic responses and risk assessment to climate change	$250,000
FWS and States Ground-truthing	$200,000
FWS and DataBasin Information Management	$50,000
Trout Unlimited and States Training	$50,000
Totals	$1,270,000

Project Team
(1)   Oversight: Andrew Milliken (USFWS Science Applications, North Atlantic LCC Coordinator) & Jan Rowan (USFWS R-5 Fisheries Regional Fish Passage Program Coordinator)
(2)   Modeling: Colin Apse & Erik Martin (The Nature Conservancy), Scott Jackson (University of Massachusetts Amherst), Rick Palmer and Casey Brown (UMass/Northeast Climate Center), Keith Nislow (U.S. Forest Service/ Northeast Climate Center)
(3)   Coordination & Data Collection: Phil Herzig (USFWS R-5 Fisheries), Scott Jackson (UMass)
(4)   Training: Keith Curley (Trout Unlimited), Susan Wells (FWS HQ)
(5)   Transportation: Kevin Moody (Federal Highways Administration)

This collaborative project will combine the institutional capacity of the Fish and Wildlife Service Regional and National Fisheries program and Science Applications staff with the field capacity of state fish and wildlife agencies with the expertise and resources of Universities and NGOs. The North Atlantic LCC partnership is made up of 32 member agencies including six DOI agencies, other federal agencies, state agencies, tribes and NGOs. The DOI Northeast Climate Science Center will coordinate closely on relevant research conducted by the CSC network, and Northeast CSC investigators will contribute specified project tasks related to modeling and decision support.

SUPPORTING INFORMATION
Please refer to proposal guidance memo for description of evaluation criteria. Please answer all sections below and address relevant questions.

1. Contributing to DOI Mitigation Funding Objectives *(max. 300 words)*

How does this project contribute to restoring and rebuilding national parks, national wildlife refuges, and other Federal public assets? How does this project promote, to the extent possible, the integration of natural and built infrastructure? How does this project increase the resilience and capacity of coastal habitat and infrastructure to withstand storms and reduce the amount of damage caused by such storms?

This project is designed to increase the capacity and resiliency of coastal and aquatic habitat by improving infrastructure to withstand storms and reduce the amount of damage caused by flooding. A science and partner driven approach will be employed to prioritize road stream crossings based on their potential to improve resiliency and aquatic connectivity if repaired or replaced.

National Wildlife Refuges (NWRs), National Parks, DOD lands and federally-funded state lands have a vast network of roads with road stream crossings. NWRs will be an integral part of this project to prioritize restoration and train users.

Aquatic connectivity is key to the conservation of Federal aquatic trust species. These species have historic value in commercial and recreational fisheries. Their decline is linked to habitat destruction and degradation associated with dams, culverts and other obstacles to movement. Reconnecting coastal, riverine and wetland habitats by removing barriers promotes ecosystem function through the improved movement of fish, floods, and sediment. Additionally, because crossings with functioning AOP are also better able to handle storm flows, road infrastructure and property are protected and human health and safety are preserved. Beyond their in-stream benefits, fish-friendly culverts increase natural ecosystem resilience in wetlands and floodplains while they nourish coastal beaches with sediment.

This project is designed to evaluate and prioritize projects such that future project selection can be simplified, and completion of one project will enhance outcomes at the next maximizing benefits to both the natural and human resources. Further, it will serve as a tool for educating decision-makers and implementers at the community level where highway crews will be informed prior to and in the State-of-Emergency that follows extreme weather and flooding events. Training will help them make better replacement and repair choices, promoting future resilience and save money in the replacement and long-term maintenance of projects.

2. Youth and/or Veteran Engagement *(max. 150 words)*

What is the expected level of youth/veteran engagement? If there is youth/veteran engagement, what are the post-project benefits to youth/veteran participants? If there is youth engagement, what is the plan to ensure safety during their participation in the project?

An important component of this project will involve prioritized field visits to inventory and describe existing road crossing structures, which is an important data gap that prevents efficient targeting of resources for restoring aquatic connectivity. This project will utilize youth and veterans in collecting required field data using existing protocols. Likewise, extended involvement may be facilitated by internships that will enhance classroom experience and provide on-the-job experience that may assist in obtaining future employment. Volunteer involvement may lend value via in-kind assistance from various local non-government groups including Trout Unlimited.

Personnel and volunteers will follow existing protocol for office and field data collection to include Job Hazard Analysis, personal protective equipment and training, as needed (OSHA, MOC, electrofishing, CPR, First Aid and etc.)

3. Funding Leverage *(max. 150 words)*

What other funding is being contributed to this project (include contributor, amount, and description)?

This project will leverage completed and ongoing projects and partnerships. The Northeast States and The Nature Conservancy have already developed a Northeast Aquatic Connectivity project ($200,000) that addresses connectivity relating to dams. The University of Massachusetts and North Atlantic LCC have adapted that data to a finer scale hydrography and developed a model to prioritize aquatic connectivity.

The North Atlantic LCC will contribute funding (estimated at $150,000) to extend this project into the entirety of the watersheds in other states feeding into the North Atlantic to complement this project's focus on the coastal areas most affected by Hurricane Sandy and to provide overall coordination and web development of this project with partners. The Northeast Climate Science Center will contribute significant in-kind services of three P.I.s.

This project will leverage Trout Unlimited and the Forest Service expertise and funding to implement best management practices for culvert replacements training workshops.

4. Collaboration and Partnerships *(max. 150 words)*

Who are the collaborators/partners for this project and what role are they playing?

USFWS – Science Applications, Fisheries and Ecological Services staff will assist in developing and assessing protocols, providing existing culvert connectivity data, guiding field data collection and coordinating the overall project. Northeast State biologists will assist in providing existing data, collecting new data and ground-truthing results.

The Nature Conservancy will expand their existing Northeast Aquatic Connectivity model to include culverts. The University of Massachusetts will use this information to improve the aquatic connectivity portion of the LCC project - Designing Sustainable Landscapes.

The North Atlantic LCC will coordinate this effort with overall aquatic connectivity and resiliency projects in the northeast and engage a broad set of partners. The DOI Northeast Climate Science Center will coordinate closely on relevant research conducted by the CSC network.

Trout Unlimited and the U.S. Forest Service will assist with the educational, training and use component working locally with highway crews, town administrators and heavy equipment operators.

5. Significance *(max. 150 words)*

Which components of significance criteria does this project fulfill? Please identify all that apply and explain.

This project fulfills seven of eight significance criteria including: **1) Impact a large percentage of the public** by benefitting taxpayers who pay for emergency flood response; residents whose safety is at risk from flooding; tourists and visitors whose travel can be disrupted by damaged infrastructure; and recreationalists who will benefit from improved aquatic health. **3) increase sustainable economic activity** through restored habitat access for improved fishing, boating, and tourism ($500,000 per mile restored). **4) Have broad spatial impact** across the Sandy-affected area. **5) Provides an essential foundation** for future connectivity work. **6) Have the ability to substantially restore function in the coupled human-natural system**, by benefiting both human infrastructure (roads) and natural ecosystems (fish passage). **7) & 8) Redefines best practices and substantially advances science** - project provides an essential foundation for future restoration work - will redefine best practices for culvert replacements and increase scientific information related to aquatic connectivity.

6. Leverage *(max. 150 words)*

How does this project increase the benefits of other proposed projects? How does this project accelerate the resilience of natural or cultural/socio-economic system functions? How does this project enhance ongoing resilience efforts? How does this project enhance the resilience of spatially linked projects? If applicable, how does this project increase scientific understanding of the coupled human-natural system and underlying processes?

This project will utilize information from past and proposed connectivity projects to better define best management for human and system related resilience by establishing benchmarks for need, culvert replacement standards given climate projections, and systems-wide assessment and prioritization for ecological success within a watershed given multiple obstructions to fish passage. This project will directly benefit the passage projects being proposed for hurricane mitigation funding FWS AC projects). Many of the organizations involved with these prior and current projects (e.g., TNC; UMass; Trout Unlimited) will participate in this project. Passage at one obstacle on a river increases access to stream habitat upstream promoting population resilience and system health and function which reduce risk from flood. It also assists in justification for additional upstream fish passage projects. By including a training and education component, the benefits will be multiplied among a cadre of users among multiple local, state, federal, and NGO partners.

7. Risk *(max. 150 words)*

If applicable, does the project meet ABFE+1 or ABFE+2 standards (or if these are not achievable, will the project incorporate flood mitigation measures to the fullest extent possible)?

By building on existing projects (e.g., The Nature Conservancy and UMass connectivity databases and models) and working with a broad group experienced partners and experts including the LCC and Climate Science Center using tested approaches, this project has a low risk of failure. This project is designed with the goal of providing positive, synergistic benefits to the coupled human-natural system including fish passage and increased flood resilience of culverts and roads. Although the ABFE standards do not apply directly, the project is designed to increase flood mitigation measures for future projects.

8. Return on Investment (*max. 150 words*)

What is the return on investment to DOI? To taxpayers? To the coupled human-natural system?

A small investment in prioritizing efforts for both flood resilience and improved fish passage will have large returns for coupled human-natural systems and will reduce costs for taxpayers.

This project will result in reduced road crossing and culvert repair, maintenance and replacement costs if road crews use appropriately sized culverts in key locations. Towns will see fewer catastrophic road blow-outs and infrastructure damage from extreme weather events and changing precipitation and flow patterns.

Improved fish passage will improve the condition of Federal trust fish species for the benefit of the American public. Functioning aquatic systems return to a stable state more quickly when they are not dramatically altered by storm events and subsequent human alterations that further perturb the environment. There is an estimated $500,000 socio-economic benefit for every mile stream access restored through fish passage (Conserving America's Fisheries, *An Assessment of Economic Contributions from Fisheries and Aquatic Resource Conservation*).

9. Speed to Functionality (*max. 150 words*)

How long will it take for each of the project's benefits to be functional (i.e., have positive impacts on the resilience of the region to future storms)?

Benefits that will increase the resilience of the region to future storms will accrue before the project is fully completed through the use of the improved database and identification of sites where river connectivity poses risk to the human and natural resource communities. Best practice recommendations will be conveyed through the training programs in the second and third year. All of these actions can impact flood resilience by setting up local communities for proactive investment in their roads infrastructure before the next extreme weather event or hurricane can have a negative impact. Then, in the event of another hurricane, local communities will be more secure from flood damage where these initiatives have been implemented and better able to respond during the emergency with fixes that FEMA can pay for even when repairs actually upgrade system resilience and increase fish passage.

10. Sustained Benefits (*max. 150 words*)

How long will each of the project's benefits be sustained and measurable? How much additional investment and/or operational costs will be required to sustain each of the benefits over time? How will the project's benefits be impacted by projected changes in environmental stressors, e.g., climate change (including sea level rise), and changes in land use and urbanization? Where applicable, what is the scientific basis for the project and its potential benefits? What are the long-term funding implications?

Culverts that meet the standards survive about twice as long as undersized culverts and require significantly less maintenance. In many cases, no routine maintenance will be required. These projects will withstand the expected flood size and frequency predicted by climate change models and they are designed to fit their location in terms of urbanization/development. This science saves money. And, it has a reasonable history, especially in the Northeast, demonstrating that correctly-engineered projects survive 500-year storm events, events larger than the projects were even designed to withstand. By including the results in an overall landscape change modeling framework, the project will accommodate changes in land use and precipitation patterns. Healthy well-connected fish populations will be sustained and measurable. The project will have sustained benefits because of broad and ongoing support from fish passage partners, the Landscape Conservation Cooperative, and the Northeast Climate Science Center.

11. Pervasiveness (*max. 150 words*)

Which of the first-tier consequences of Hurricane Sandy will this project benefit and how? (Please see list of first-tier consequences in Pervasiveness criterion

This project will benefit multiple at least five first tier consequences including **1) positive ecological change** through restoration of functional flows, ecological integrity, fish passage and sediment transport for beach and marsh nourishment; **4) reduced flood damage** to the built environment through appropriately-sized culverts that are resilient to future storm floods; **7) improved commercial and recreational fishing** through fish passage benefits to fish populations; **9) altered storm preparedness and response activity** through information, training and standards on culverts needed and **12) increased voluntary activity** associated with fish passage restoration and recreational fishing.
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12. Permits and Approvals *(if applicable, max. 150 words)*

What is the project plan for obtaining necessary permits and approvals*?*

Project involves data collection, data entry, data assessment, development of recommendations and reporting and training. Project P.I.s have years of experience in data collection and surveys on public and private lands. Approvals for surveys will be obtained as needed.

13. Safety *(if applicable, max. 150 words)*

What is the project plan for ensuring safety (e.g., of personnel, equipment, and construction sites)?

Fish and Wildlife Service will ensure that personnel will follow existing protocol for office and field data collection to include Job Hazard Analysis, personal protective equipment and training, as needed (OSHA, MOC, electrofishing, CPR, First Aid etc.)