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Connecticut Inland Fisheries

Habitat Conservation and Enhancement

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State of Connecticut

Department of Energy and Environmental Protection
Bureau of Natural Resources
Inland Fisheries Division

Grant Title: Habitat Conservation and Enhancement
Job 1: Permitting and Monitoring
Job 2: Habitat Restoration and Enhancement
Job 3: Public Outreach and Technical Assistance

Period Covered: April 1, 2013 to March 31, 2014

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Cover photo: As part of a project to replace a bridge over the Quinnipiac River in Plainfield, root wads were installed along the stream bank to help stabilize the bank and enhance fish habitat.

Summary

During the 27th year of the Habitat Conservation and Enhancement Program, we reviewed 490 projects and activities that had the potential to affect fish habitat and fish populations. This included 275 projects that required permits or approval from CT DEEP regulatory programs and federal licensing or approvals, and 215 applications to stock grass carp for aquatic plant control (144 new applications and 71 applications for re-stocking). For many of these projects we made recommendations to applicants and regulatory staff that protected, restored or enhanced fish habitat and ensured that fish populations were not harmed. We also worked with partners on the funding, planning and implementation of four stream habitat restoration projects and assisted municipalities, individuals and conservation organizations with a variety of fisheries issues, such as fish stocking, pond management, aquatic plant control strategies, assessments of projects that could affect fish habitat, fisheries resource inventories, habitat restoration and enhancement, and shore-based fishing access.

Background

The Habitat Conservation and Enhancement program (HCE program) began in 1987 as the Technical Assistance Program within the Fisheries Division of the former Department of Environmental Protection.[1] The purpose of the program was to assist the regulatory programs of the department, municipalities and the citizens of Connecticut with fish habitat and management issues in inland waters. The program quickly expanded to include similar issues in Long Island Sound and tidal rivers and streams. The program continued to evolve as new impact assessment and habitat related responsibilities were assumed and staff developed technical assistance relationships with state, municipal and federal agencies.

In 1992, the name of the program was changed to the Habitat Conservation and Enhancement (HCE) Program to better reflect what had become the main focus of the program. Since that time the Fisheries Division was divided into the Inland Fisheries Division (IFD) and the Marine Fisheries Division (MFD). The HCE program was placed within the IFD but retained the lead responsibility for addressing habitat related issues in estuarine waters, which are done in coordination with MFD staff.

[1] In 2011, the DEP was merged with the Dept. of Public Utilities Control and sections of the Office of Policy and Management to form the Department of Energy and Environmental Protection, or DEEP.

The primary goals of the HCE program are to:

1) ensure that functioning habitats are not degraded by human manipulations;
2) ensure that fish communities and species of sport fish are not adversely affected by various human activities;
3) restore and enhance degraded habitats to support fish communities and sport fish, and
4) enhance recreational angling opportunities by improving fish habitat and fish populations, as well as providing assistance with increasing angler access to the waters of the state.

Approach

To address the goals of our program, we engaged in five activities, described below.

1. Review and comment on project proposals regulated by Federal, state and town governments.

The HCE program has the lead responsibility for reviewing permit applications and requests for approval submitted to DEEP regulatory and environmental review programs for effects on fish and fish habitat. We are typically involved in the pre-application phase to ensure that fisheries related issues are addressed prior to the submittal of formal applications. Most reviews of applications for activities in inland waters are reviewed through the permitting programs of the Inland Water Resources Division (IWRD) of the Bureau of Water Protection and Land Reuse (BWPLR) and the Pesticide Program within the Bureau of Materials Management and Compliance Assurance (BMMCA). Activities in estuarine waters and tidally influenced freshwaters are reviewed through the programs of the Office of Long Island Sound Programs (OLISP) within the BWPLR.

Some of the major types of projects that we review are:

- **Bridges and culverts**. If improperly designed, bridges and culverts can block fish movement in streams. We ensure that all new state funded projects and many locally regulated projects are designed to allow the unrestricted movement of fish upstream and downstream and do not degrade aquatic and riparian habitat. Projects involving the replacement and repair of existing structures, many of which are not passable and have fragmented stream habitat, are reviewed for the opportunity to restore fish passage, and features that enhance or restore instream habitat are incorporated into the project when possible.

Example of a new bridge consisting of a double barrel box culvert that was installed according to HCE Stream Crossing Guidelines over Spruce Brook in Beacon Falls.

The I-95 Pearl Harbor Memorial Bridge over the Quinnipiac River is being replaced and the old bridge piers (shown in the picture) will be demolished with high energy hydraulic breakers and explosives. An HCE biologist is working with CT DOT and the contractors to ensure that measures are included in the demolition plan that will help prevent interference with anadromous fish migration and minimize the mortality of fish.

This dual culvert on a tributary of Lyman Brook in Marlborough prevents fish, including native brook trout, from moving upstream. As part of a CT DOT project to repair the culvert using a technique called sliplining, HCE staff recommended a fishway and baffle system within the culverts that will enable fish to pass through the culverts.

- **Bank and shoreline stabilization and stream channel modifications**. Owners of property along rivers, streams, and coastal shorelines are often faced with bank erosion problems that may threaten infrastructure such as roads and buildings. We are able to work with the property owners and consultants to design bank and shoreline protection measures and instream structures that create, enhance or protect fish habitat while also protecting the banks.

- **Habitat restoration and enhancement.** Projects that require permits are reviewed for opportunities to improve fish habitat. We recommend mitigation for unavoidable short-term or long-term impacts caused by a project. We also work with landowners, municipalities and government agencies to develop projects that improve aquatic habitats.

Habitat mitigation was required for impacts resulting from the replacement of the Metro North Railroad Bridge over Spruce Brook in Beacon Falls. Rock weirs were installed in the brook to create riffle and pool habitat, and a rock vane was installed at the confluence with the Naugatuck River to provide a thermal refuge for trout.

- **Dredging in coastal waters**. Dredging projects are reviewed for effects on fish and fish habitat. Seasonal work restrictions (a.k.a. environmental windows) are often recommended to prevent interference with anadromous fish migration and mortality of fish eggs and larvae. We work with project managers to minimize the degradation of aquatic habitats, such as beds of submerged aquatic vegetation.

- **Diversion of surface and ground water**. Water diversion applications are reviewed for their potential to reduce instream flow, which could adversely affect fish and invertebrate populations.

An example of what can happen to a stream if too much water is diverted for human uses during low flow conditions (Fenton River, Mansfield). (CONCERN NEEDS TO BE RESOLVED)

- **Use of herbicides to manage aquatic vegetation and lake drawdowns**. Applications for these activities are reviewed to ensure that the populations of fish and other aquatic biota are not significantly affected.

- **National Pollution Discharge Elimination System (NPDES) applications**. Pursuant to the federal Clean Water Act (CWA), facilities that discharge to the waters of the state require a NPDES permit. We review NPDES permit applications submitted to the DEEP BMMCA to determine if the proposed activities could affect fish populations or habitat.

- ***Review of DEEP land use-plans***. When developing plans for the management of activities on state owned lands, DEEP resource managers contact us for guidance on fisheries related issues. For example, the Forestry Division consults with us on the development of Timber Harvest Plans and Ten Year Forest Management plans. In those cases we examine the proximity of the proposed timber harvest to wetlands and the nature of wetland crossings, and recommend measures that will avoid degradation of aquatic resources. Opportunities for aquatic habitat enhancement are also included.

- ***Public water supply planning.*** We provide reviews and assessments of the potential effects on fisheries resources of public water supply strategies proposed by water supply districts, water companies and municipalities.

- ***Harbor Management Plans***. Harbor Management Plans are prepared by municipalities in accordance with the Connecticut Harbor Management Act of 1984. These plans are reviewed for consistency with fisheries regulations and policies, with emphasis on the maintenance and enhancement of recreational and commercial fishing opportunities within the designated harbor areas.

- ***Triploid grass carp stocking.*** Grass carp *(Ctenopharyngodon idella)* is an herbivorous species that was imported into the United States during the early 1960's to control aquatic plants. Stocking grass carp to control nuisance aquatic vegetation in Connecticut's ponds has become a popular alternative to chemical control. Due to the potential for grass carp to damage habitats by over consuming aquatic vegetation, the IFD developed an importation and liberation permit program. Only triploid grass carp, which are sterile, can be stocked. The HCE program is responsible for evaluating applications to determine if it is appropriate to stock grass carp in an applicant's pond, which typically involves a site visit.

- ***Other important Federal and State review processes.*** The DEEP Office of Environmental Review coordinates DEEP comments to a variety of state agencies, commissions and

federal regulatory agencies. Examples are hydropower licensing under the jurisdiction of the Federal Energy Regulatory Commission (FERC), federal projects that require a National Environmental Policy Act (NEPA) scoping, state projects that require a CT Environmental Policy Act (CEPA) scoping, and energy infrastructure proposals requiring approval from the State of Connecticut Siting Council. We are responsible for providing comments on fisheries related issues, which are included in the overall DEEP comments.

Some of the habitat benefits that result from our reviews are quantified using three metrics:

Riverine Habitat is the total area (acres) of aquatic habitat protected and/or restored. It is estimated by summing the area of aquatic habitat within each project footprint. Types of projects included are bridges, culverts, stormwater outfalls, dams and habitat restoration/enhancement.

Riverine Habitat Continuity is the number of miles of habitat continuity that is maintained or restored. Continuity means there are no artificial barriers to the movement of fishes and other organisms. For bridge, culvert and dam projects, continuity is measured from the project area to the next barrier upstream, whereas for diversion projects it is measured downstream to the next watercourse of equal or greater size.

Lake and pond habitat (lentic habitat) is measured by summing the acreage of the waterbodies that are maintained or restored. For aquatic herbicide applications and pond restoration (including pond dredging) initiatives, the area of treatment or restoration is summed. For winter drawdown requests, the area of each waterbody is summed.

2. Participate in the development of DEEP and interagency policy, regulations, guidelines and standards

We participate in the development of DEEP policy and regulations when there are implications for fish habitat, as well as policy affecting inter-agency issues. Examples of past and continuing contributions include development of instream flow regulations (Public Act 05-142, An Act Concerning the Minimum Water Flow Regulations), policy for addressing fisheries issues at electric power facilities regulated under the CWA, review of proposed General Permits prepared by DEEP regulatory programs, and policy and procedures for addressing Applications for Aquaculture submitted to the Department of Agriculture, Bureau of Aquaculture and U.S Army Corps of Engineers (USACE).

The Interagency Drought Working Group, which comprises State of Connecticut and federal agencies, is tasked with preparing drought preparedness and response plans. Our continued involvement in drought planning, along with the implementation of instream flow standards for Connecticut's rivers and streams, will ensure that stream flows support aquatic animals and plants, including important sport fish sought by recreational anglers.

We participate on the Instream Flow Council (IFC), an organization comprised of representatives from fish and wildlife management agencies in the United States and Canada that and is dedicated to improving the effectiveness of agency member instream flow programs. Participation with the Instream Flow Council ensures that we have the necessary tools and knowledge to provide a scientific basis for Connecticut's instream flow and water allocation policy that is protective of fisheries resources and enables us to provide science based reviews of permit applications and water supply plans.

3. Conserve, restore and enhance fish habitats through partnerships and other interactions with private citizens, conservation groups, DEEP programs and the programs of other government agencies.

- ***Habitat restoration and enhancement projects.*** We provide a range of services to a variety of agencies and organizations that facilitate fish habitat restoration and enhancement projects in inland waters. Services include assistance with permit requirements, conceptual planning and project design, identifying and acquiring funding, and organizing volunteers.

- ***Participation on habitat restoration committees.*** We serve on committees and workgroups dedicated to the enhancement and restoration of estuarine and coastal habitats. Examples are the Habitat Restoration Workgroup (HRW) of the EPA Long Island Sound Study (LISS), which comprises biologists, coastal ecologists, geologists, and other technical experts from the states of Connecticut and New York, various federal agencies, New York City, and several conservation organizations, and the LISS Riverine Migratory Corridor Workgroup, which concentrates on the restoration of habitat continuity from Long Island Sound to freshwater reaches of coastal streams.

- **Participation on Wetlands Restoration committees.** We participate on the Wetland Restoration Steering Committee and Wetlands Site Plan Review Committee. The activities of the committees are coordinated by OLISP. The main function of these interagency and interdisciplinary committees is to ensure that proposed tidal wetland restoration and enhancement projects and other projects that affect tidal wetlands are properly designed

and meet DEEP and USACE policy and permitting standards. We focus on fisheries aspects of the proposed projects, providing technical advice on design and project implementation that will enhance and protect fisheries resources.

4. Provide technical assistance and information about fish habitat to municipal government and Connecticut's citizens

- We respond to inquiries concerning the protection, restoration and enhancement of the state's fish habitat and fisheries resources. HCE biologists are available to meet with individuals and organizations, give lectures and presentations, and participate in resource management coalitions.

- We provide technical guidance and assistance to private landowners in Connecticut who wish to actively manage the aquatic habitats on their property but lack the necessary knowledge. Help may be provided in a variety of ways, ranging from providing information over the phone or email to conducting an on-site inspection and consultation.

- We conduct fisheries resource inventories and provide assessments of projects under consideration by town commissions. This kind of assistance often occurs within the framework of an interdisciplinary Environmental Review Team (ERT). The ERT works under the guidance of the Connecticut Resource Conservation and Development Areas, a federal and state sponsored program for the efficient and beneficial use of Connecticut's natural resources.

- We assist municipalities, as well as other organizations, with the design of shore-based fishing facilities and general fishing access on properties under their control.

5. Assess habitat quality

- We conduct long-term monitoring of biological communities and stream health to determine the long-term effects of certain permitted activities and the effectiveness of habitat restoration efforts,
- We investigate many of the fish kills reported to the IFD, often in cooperation with the Permitting and Enforcement Division of the BMMCA. Investigations may involve biological (e.g., dead fish counts, observations of vertebral damage, observations of live organisms), chemical (e.g., dissolved oxygen and pH), and physical (e.g., stream length, width and depth) sampling within the impacted area and from unaffected areas nearby.

Key Findings

- Reviewed a total of 275 projects regulated or needing approval by DEEP and other agencies. Of this total, we reviewed:
    - 13 DEEP projects and activities on state lands (Table 1);
    - 252 projects and activities requiring permits from DEEP regulatory programs (Table 2);
    - NPDES permit renewals or ongoing issues (i.e., entrainment, impingement and thermal discharge) at seven power generating facilities with once-through cooling systems;
    - two FERC license applications, including a significant proposal by Spectra Energy to increase natural gas pipeline service across the State of Connecticut, which would require crossings at 77 streams, rivers and wetlands; and
    - one municipal water supply plan for the potential of water use to affect fisheries resources.
- Of the 275 projects and activities reviewed, bridge and culvert projects were by far the most common project type reviewed (86 projects, 31.6% of total). The next four most common project types were dredging in tidal waters (39 reviews, 14.2%), docks in tidal waters (23 reviews, 8.4%), projects involving dams (13 reviews, 4.7%) and bank stabilization projects (12 reviews, 4.4%).
- Reviews of certain kinds of projects resulted in the protection, restoration and enhancement of habitat as follows:

- review of regulated projects involving bridges, culverts, dams, stormwater outfalls, bank stabilization, habitat enhancement and habitat restoration resulted in maintaining or restoring the continuity of 94 river miles and the restoration or protection of six acres of riverine habitat (Table 3);
- review of eight DEEP Forestry Division timber harvest plans and one forest management plan resulted in maintaining an additional two riverine corridor miles as well as four linear miles of riparian zone habitat; and
- review of ten aquatic herbicide applications, eight lake drawdown requests and seven pond dredging projects resulted in the protection or restoration of 3,794 acres of lake and pond habitat (Table 3).

- Reviewed 144 applications for first-time stocking of triploid grass carp and 71 renewal (restocking) applications (Table 4). Of the 144 new applications, 123 were approved and 21 were deferred pending the resolution of issues such as inadequate containment measures.
- Worked with partners on four stream habitat restoration and enhancement projects (Table 5).
- Monitored five watercourses and one lake as part of efforts to assess the effects of various projects.
- Assisted with the implementation of PA 05-142, An Act Concerning the Minimum Water Flow Regulations. Specifically, we assisted with the classification of all watercourses within the Thames River, Southeast Coastal and Pawcatuck River watershed basins.
- Assisted town governments with 19 project assessments (e.g., bridge work) and performed one fisheries resource inventory (Table 6).
- Provided technical guidance to 42 private landowners with questions about fish stocking, pond management, aquatic plant control and habitat enhancements.
- Responded to 12 requests for information about, or the investigation of, a range of fisheries related issues, such as unusually low flows in streams, effects of salt used to maintain roads in winter and fishing access problems.
- Attended meetings of 24 town committees, commissions and public organizations dedicated to water resource and riverine issues in Connecticut and provided technical information and assistance.
- Investigated 16 fish kills. Half of these incidents were due to spawning related stress and half were caused by various types of environmental stress (Table 7).
- Made two presentations on stream habitat restoration and enhancement at Connecticut College and Three Rivers Community College.

Discussion

A considerable number of projects were proposed in aquatic habitats of Connecticut this past year, and many of them had significant potential to degrade aquatic habitats or diminish fish populations. We were able to work with regulatory program staff and our partners to avoid these negative outcomes, and many of these projects presented us with opportunities to correct past alterations and further enhance fish habitat. In addition, we continued to successfully partner with private individuals, groups and organizations to restore previously degraded habitats and enhance existing habitat.

Interest in using grass carp to control aquatic plants in private ponds and lakes remained high. While control of aquatic plants, some of which are invasive, is often desirable from a fish habitat perspective, it is essential that these applications be carefully examined to be sure that fish habitat is not diminished by overgrazing and that these fish cannot escape from the waterbody in which they were stocked.

Our involvement in the development of state and interagency environmental policy greatly expands the ability of the HCE program to promote the conservation, protection and restoration of fish habitat and resources in Connecticut. Participation with organizations such as the Instream Flow Council ensures that we have the necessary tools and knowledge to inform policy development and enabled us to provide science based reviews of permit applications.

We received many requests from governments, conservation organizations and private landowners for technical assistance and guidance on fish habitat issues and projects. We believe that providing this assistance contributes significantly to the conservation and restoration of fish habitats and populations in the estuaries, rivers, streams, lakes and ponds of Connecticut, and so should remain a priority for the HCE program.

Recommendations

No modifications to this job are recommended at this time.

Expenditures

Total Project Cost: $433,173
Federal Share: $324,879
State Share: $108,294

Appendix

The following tables include information referenced in the report.

Table 1. List of 13 internal DEEP projects reviewed by HCE biologists. DEEP project proposals on state properties are reviewed for their potential effects on fish populations and fish habitat through an internal review process developed with DEEP offices (the number of projects reviewed of the same type on a property is provided in parenthesis if greater than one).

Major Watershed Basin	Property	Waterbody	DEEP Office*	Project/activity
Connecticut River	Cockaponset State Forest	various	FD	Timber harvest plan (2)
	Mesohomasic State Forest	various	FD	Timber harvest plan
	Tunxis State Forest	Various	FD	Timber harvest plan
Housatonic River	Camp Columbia State Forest	Whittlesey Brook	FD	Timber harvest plan
	John Minetto State Park	various	ASSD	Cross country run event
	Kent Falls State Park	Kent Falls Brook	ASSD	Electric utility line crossing
	Naugatuck State Forest	Various	FD	Timber harvest plan
	Naugatuck State Forest	Spruce Brook	ASSD	Bridge replacement
Southwest Coast	Centential Watershed State Forest	Various	FD	Timber harvest plan
	Ridgefield Land Trust	Unnamed wetland	ASSD	Phragmites control
Thames River	James L Goodwin State Forest	various	FD	Timber harvest plan
	Natchaug State Forest	Various	FD	Forest Management Plan

*ASSD = Agency Support Services Division;
FD = Forestry Division

Table 2. List of 252 projects and activities reviewed by HCE biologists through DEEP regulatory programs.

Major watershed	Waterbody	Project or activity reviewed
Southeast Coast	Anguilla Brook	Bridge replacement
	Black Hall River	Bridge replacement
	Bride Brook	Dredging; groundwater withdrawal
	Center Brook	culvert replacement
	Jordan Brook	bridge replacement
	Latimer Brook, Tributary	Culvert replacement
	Long Island Sound	bank stabilization; install revetment; stabilize inlet; beach nourishment (2); install dock (7); dredging (3)
	Mystic Harbor	install dock; dredging
	Niantic River	bridge replacement; dock (3); dredging
	Pawcatuck River	bridge replacement
	Shewville Brook	Culvert replacement
	Stonington Harbor	dock
Thames	Angell Brook	Culvert replacement
	Beach Pond	Winter drawdown
	Columbia Lake	Dam repair
	Eagleville Lake	Dam repair
	Five Mile River	Bridge replacement
	Fox Brook	Culvert replacement
	Fry Brook	Culvert slipline
	Gardner Lake	Winter drawdown
	Glasgo Pond	Dam repair
	Hop River	Bridge replacement

Major watershed	Waterbody	Project or activity reviewed
Thames (cont.)	Horse Brook	Culvert rehabilitation
	LaFramboise Pond	Surface water withdrawal
	Little River	Bridge replacement (2); surface water diversion
	Lower Bolton Lake	Winter drawdown
	Mashapaug Lake	Winter drawdown
	Middle Bolton Lake	Winter drawdown
	Natchaug River	Bridge replacement
	Pachaug Pond	Winter drawdown
	Pachaug River	Bridge replacement
	Quaddick Reservoir	Herbicide treatment
	Quinebaug River	Bridge replacement; surface water withdrawal; groundwater withdrawal
	Quinnitisset Brook	Surface water withdrawal
	Skungamaug River	Bridge replacement
	Sugar Brook, tributary	Culvert rehabilitation
	Talbot Pond	Dam removal
	Ten Mile River	Bridge replacement
	Thames River	aquaculture; install boat launch; bridge repair (2); install bulkhead, pier; dredging (2); shorefront development w/ dredging, bulkhead, piers (2)
	Upper Falls Mill Pond	Dam removal
	Willimantic River	Bridge replacement
Connecticut	Abbey Brook	Groundwater withdrawal
	Amston Lake	Aquatic herbicide application

Major watershed	Waterbody	Project or activity reviewed
Connecticut (cont.)	Bashan Lake	Dam repair; winter drawdown; aquatic herbicide application
	Beaver Meadow Brook	Culvert slipline
	Beseck Lake	Dam repair
	Broad Brook Millpond	Dam repair
	Burlington Brook	Bank stabilization, habitat enhancement
	Cabin Brook	Culvert replacement; culvert slipline
	Candlewood Hill Brook	Bridge replacement; boat launch
	Coginchaug River	Bridge replacement
	Connecticut River	Dock installation (5); dock repairs; dock modification; dredging (6); gas line repair (3); sewer line install
	Coppermine Brook	Flood control modification
	Cromwell Creek	Habitat enhancement
	Eight Mile River, E.B.	Bridge replacement
	Farmington River	Bridge replacement, habitat enhancement
	Filey Pond	Pond dredging, habitat restoration
	Goodwin Park pond	Pond dredging, habitat restoration
	Great Brook	Culvert slipline
	Harris Brook	Bridge installation (3)
	Hemlock Valley Brook	Culvert replacement
	Highland Lake	Aquatic plant control
	Hockanum River	Bridge replacement (3)
	Hop Brook, South Fork	Channel alteration; channel restoration
	Hungerford Brook	Bridge replacement
	Lieutenant River	Bridge scour protection

Major watershed	Waterbody	Project or activity reviewed
Connecticut (cont.)	Long Hill Brook	Bridge replacement
	Lyman Brook	Culvert rehabilitation
	Lyman Meadow Brook	Culvert replacement
	Mad River	Bridge replacement, habitat enhancement
	Mallory Brook	Bridge replacement, habitat enhancement
	MDC Reservoir #1	Dam rehabilitation
	Moodus River	Bridge replacement
	Pequabuck River	Bridge replacement, habitat enhancement
	Pickerel Lake	Winter drawdown
	Pope Park Pond	Pond dredging, habitat restoration
	Still River (Winsted)	Bridge replacement, habitat enhancement
	Sumner Brook	utility crossing-sewer
	Tankerhoosen River	Stream channel/riparian alterations
	Tiley Pratt Pond	Herbicide treatment
	Turkey Hill Brook	Culvert slipline
	Unnamed stream	Habitat enhancement
	Walkers Reservoir	Herbicide treatment
South Central Coast	Beaver Brook	stormwater outfall
	Branford River	bridge replacement; bridge installation; dredging
	Broad Brook	Bridge replacement, habitat enhancement
	Calf Pasture Creek	dredging
	Clinton Harbor	aquaculture (2); dredging (2)
	Hammonasset River	Bridge replacement
	Hammonasset, Tributary	Bridge replacement
	Hanover Pond (Quinnipiac R)	Hydroelectric power development

Major watershed	Waterbody	Project or activity reviewed
South Central Coast (cont.)	Hoadley Creek	Culvert replacement
	Honeypot Brook	Bridge replacement and habitat enhancement
	Indian River	Culvert replacement
	Long Island Sound	aquaculture; beach nourishment (2); boardwalk; dredging
	Meetinghouse Brook	Railroad bridge rehabilitation, stream channel restoration
	Mennunketesuck River	bulkhead; dock, bulkhead
	Mill River	bridge scour protection
	New Haven Harbor	dredging (4)
	Quinnipiac River	Bank stabilization; bridge replacement; dredging (remediation); habitat enhancement; linear trail development
	Race Brook	Bridge replacement
	Turtle Creek	Culvert replacement
	Unnamed	Channel relocation
	Wepawaug River	Bridge rehabilitation and habitat enhancement
	West River	Dredging (2); stormwater outfall
	Wharton Brook	Bridge replacement and habitat enhancement
	Wood Pond	Dam reconstruction
Housatonic	Ball Pond Brook	Bridge replacement, habitat enhancement
	Bantam Lake	Aquatic herbicide treatment
	Beardsley Brook	Bridge replacement, habitat enhancement
	Bladens Brook	Bridge replacement, habitat enhancement
	Bloody Brook	Bridge replacement, habitat enhancement

Major watershed	Waterbody	Project or activity reviewed
Housatonic (cont.)	Bullet Hill Brook tributary	Stream relocation
	Deep Brook Tributary	Stream relocation
	East Twin Lake	Aquatic herbicide treatment
	Echo Lake	Habitat enhancement
	Greenwoods Brook	Bridge replacement, habitat enhancement
	Heminway Pond	Dam breach, stream channel restoration
	Housatonic River	bank stabilization; dredging (remediation)
	Lake Quassapaug	Aquatic herbicide treatment
	Lake Wauramaug Brook	Hydroelectric power development
	Leadmine Brook	Bridge rehabilitation, habitat enhancement
	Mad River	Dam breach, stream channel restoration
	Means Brook	Bridge replacement, habitat enhancement
	Morgan Curtiss Brook	Bridge replacement, habitat enhancement
	Mountainside Spillway	Bridge replacement, habitat enhancement
	Naugatuck River	Bridge replacement, habitat enhancement
	Pomperaug River	Bank stabilization, habitat enhancement
	Unnamed stream	Culvert installation
	West Aspetuck River	Bridge replacement, habitat enhancement
Southwest Coast	Aspetuck River	Bridge rehabilitation, habitat enhancement (2)
	Bridgeport Harbor	dredging
	Cedar Creek	dredging
	Converse Pond Brook	Culvert replacement
	Cos Cob Harbor	dock
	Horseneck Brook	bridge scour protection; culvert replacement
	Long Island Sound	aquaculture (4); revetment repair; beach nourishment (5); breakwater repair; dredging

Major watershed	Waterbody	Project or activity reviewed
Southwest Coast (cont.)	Mill River	dam repair; dredging (remediation)
	Norwalk Harbor	dredging (2)
	Norwalk River	Instream and riparian habitat enhancement
	Pequonnock River	bank stabilization; Instream and riparian habitat enhancement
	Pine Creek	dredging
	Saugatuck River	install revetment; dredging
	Southport Harbor	dredging
	Stamford Harbor	install dock system, bank stabilization (2); dredging; dredging, beach nourishment; tidal wetland creation
	Tannery Brook	Flood control modification
	Unnamed ponds	Pond dredging w/habitat restoration (4)
	Unnamed stream	Bridge rehabilitation, habitat enhancement

Table 3. Habitat benefit metrics. Some of the benefits resulting from reviews of particular projects listed in Table 2 are quantified using three habitat benefit metrics. For riverine habitat, two metrics are estimated for projects that involve bridges, culverts, stormwater outfalls, dams and habitat restoration or enhancement. One habitat benefit metric is calculated for lake and pond habitat that is maintained or restored through the review of aquatic herbicide applications, winter drawdown requests, pond restoration, and pond dredging initiatives. See text for further explanation.

	Habitat Benefit Metric		
Major watershed basin	**Riverine Habitat (acres)**	**Riverine Continuity (linear miles)**	**Lake/pond Habitat (acres)**
Pawcatuck	0.1	3.7	0.0
Southeast Coast	0.3	11.1	71.0
Thames	0.8	61.0	2,912.5
Connecticut	4.3	12.1	809.0
South Central Coast	0.5	3.5	1.0
Housatonic	0.1	0.0	0.0
Southwest Coast	0.1	3.0	0.0
Statewide total	**6.2**	**94.4**	**3,793.5**

Table 4. Number of ponds by town that were inspected to determine the suitability of stocking triploid grass carp for aquatic vegetation control.

Town	Number of inspections	Town	Number of inspections
Ashford	1	Manchester	1
Avon	1	Meriden	2
Bethel	2	Milford	1
Bolton	1	Monroe	1
Branford	2	New Canaan	3
Bridgewater	1	New Fairfield	1
Brooklyn	3	New Hartford	1
Burlington	1	Newtown	3
Canaan	1	Norfolk	1
Canterbury	1	North Canaan	3
Canton	2	Plainville	1
Colebrook	1	Plymouth	1
Cornwall	4	Redding	3
Danbury	2	Ridgefield	8
Darien	2	Sherman	1
Deep River	1	Simsbury	1
East Granby	2	Southbury	4
East Haven	2	Stafford	1
Easton	2	Stamford	6
Ellington	6	Stonington	1
Essex	1	Suffield	1
Farmington	1	Thomaston	1
Franklin	1	Trumbull	1
Goshen	3	Union	1
Granby	2	Warren	1
Greenwich	12	Washington	4
Griswold	1	Waterford	1
Guilford	2	Watertown	1
Hamden	1	Westbrook	1
Harwinton	1	Weston	6
Kent	1	Westport	3
Killingly	2	Willington	2
Lebanon	1	Wilton	3
Litchfield	3	Woodbury	3
		Woodstock	1
		Total:	**144**

Table 5. List of four collaborative habitat restoration and enhancement projects active during the project year.

Watercourse	Project description	Project partners	Local sponsor	Status*
Hillard Pond	Dam removal, fish passage restoration, habitat enhancement	HCE, Town of Manchester	Yes	P
Leadmine Brook	Fish passage restoration, habitat enhancement	HCE, Town of Ashford, Yale University, Trout Unlimited-Thames Valley Chapter	No	C, M
Dickinson Creek, Lyman Viaduct	Roughened ramp to culvert, fish passage restoration	DEEP Parks Division, and ASSD	No	C, M
Moosup River	Compensatory mitigation project, restore fish passage	HCE, USDA NRCS, American Rivers, Inc	No	I

* P = planning, I = initiated, C = completed, M = monitored.

Table 6. List of 18 project assessments and inventories prepared for town governments.

Town	Waterbody	Project/Inventory
Ashford	Eno Brook	Natural resource inventory
Bozrah	Gardner Brook	Barrier placement
Cheshire	Brooksvale Stream	Culvert replacement
Coventry	Creaser Park Pond	Nature center update
Clinton	Hammonassett River	Large woody debris management
Durham	Allyn Brook	Stream restoration
East Haddam	Eight Mile River	Culvert rehabilitation
East Lyme	Darrow Pond	Open space
Guilford	Quonnipaug Lake	Aquatic vegetation control
Kent	Kent Falls Brook	Bridge replacement
Litchfield	Bantam Lake	Bridge rehabilitation
Litchfield	Butternut Brook	Bridge rehabilitation
Litchfield	Northfield Brook	Bridge replacement
Marlborough	Lyman Brook	Culvert rehabilitation
Salem	Harris Brook	Bridge installation
Simsbury	Bissell Brook	Bridge rehabilitation and streambank restoration
Willington	Roaring Brook	Truck stop development
Winchester	Still River	Bridge replacement

Table 7. List of 16 fish kills investigated by Inland Fisheries Division staff.

Town	Waterbody	Suspected Cause
Ashford	Chaffee Lake	Spawning stress related
Avon	Secret Lake	Spawning stress related
Berlin	Paper Goods Pond	Spawning stress related
Bristol	Page Park Pond	Environmental stress
New Milford	Candlewood Lake	Spawning stress related
Danbury	Candlewood Lake	Spawning stress related
Danielson	Cowell Pond	Environmental stress (winterkill)
East Haddam	Bashan Lake	Spawning stress related
East Haddam	Lower Moodus Reservoir	Spawning stress related
Manchester	Hop Brook	Environmental stress
New Haven	Quinnipiac River	Environmental stress
New Milford	Powerhouse Brook	Environmental stress
Newtown	Deep Brook	Environmental stress
Shelton	Means Brook	Unknown
Thompson	Quaddick Lake	Spawning stress related
West Hartford	Woodridge Lake	Environmental stress