

Five Years of Accomplishments

Hudson River Estuary Action Agenda 2005-2009

Legacy Achievements for the Hudson-Fulton-Champlain Quadricentennial



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Hudson River Estuary Program
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Commissioner Pete Grannis
Governor David A. Paterson



About the Hudson River Estuary Program

The Hudson River Estuary Program protects and improves the natural and scenic Hudson River watershed for all its residents. The program was created in 1987 and extends from the Troy dam to upper New York Harbor. Its core mission is to:

- Ensure clean water
- Protect and restore fish, wildlife and their habitats
- Provide recreation in and on the water
- Adapt to climate change
- Conserve world-famous scenic vistas

The Hudson River Estuary Program is carried out through extensive outreach, coordination with state and federal agencies and public-private partnerships including:

- Grants and restoration projects
- Education, research and training
- Natural resource conservation and protection
- Community planning assistance

The Estuary Program implements the *Action Agenda* in partnership with federal and state agencies, as well as local municipalities, non-profits, academic and scientific institutions, businesses, trade organizations, landowners and dedicated volunteers. The Hudson River Estuary Management Advisory Committee provides guidance to the program, helps the state define goals and evaluate progress, and provides a communication bridge to a wider group of partners and stakeholders. Numerous government partners participate as ex-officio members to the committee, and they help deliver our *Action Agenda* results. Agency members include:

NYS Department of Health
NY-NJ Harbor Estuary Program
NYS Office of Parks, Recreation and Historic Preservation
Hudson River Park Trust
NY Sea Grant
NYS Department of State

US Army Corps of Engineers
US Environmental Protection Agency
Interstate Environmental Commission
New York City Department of Environmental Protection
Hudson River Valley Greenway



For more information go to: www.dec.ny.gov/lands/4920.html
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FINAL REPORT OF ACCOMPLISHMENTS

2005-2009 Hudson River Estuary *Action Agenda*

About this Report:

The following pages report on the collective accomplishments of state agencies and our community partners in meeting the 2005-2009 targets of the “*Hudson River Estuary Action Agenda*.” For each of the twelve goals of the *Action Agenda* adopted in 2005, we provide an overview of accomplishments. In addition, we repeat each of the 2005-2009 “targets” for these goals and report on the status of our actions to achieve each one of them. You will find both a narrative summary and a status report to show if the project is done, underway or not started. A summary table at the end of the report shows our overall progress in meeting these objectives.

Accomplishments Goal 1: Signature Fisheries

Goal

Restore the **signature fisheries** of the estuary to their full potential, ensuring future generations the opportunity to make a seasonal living from the Hudson's bounty, and to fish for sport and consume their catch without concern for their health.

Overview of Accomplishments to date

Of the more commonly known species, currently, American shad, Atlantic sturgeon, river herring, American eel and largemouth bass are in decline. Striped bass, having successfully recovered, face increasing fishing pressure, that requires careful management. Shortnose sturgeon may be at an historic high in the estuary. Blue crab and smallmouth bass continue to grow in popularity, but are less well understood, and are, therefore, at risk. Oysters, once sought after as a delicacy, are now found only occasionally in the estuary and are not edible due to biological contamination. The reason for their disappearance is not well understood.

Advisories regarding the consumption of fish taken from the Hudson continue. These public health warnings are based on persistent and unacceptable levels of toxic chemicals and heavy metals in fish and crabs, and pathogens in oysters. In addition, environmental factors affecting the survival of sensitive life stages in the water column at critical time periods must be addressed. Forage fish are needed as a food source and to help maintain a balanced ecosystem.

Atlantic sturgeon are now protected under a 1996 moratorium on possession while the population recovers. Interstate management plans have been adopted and are being updated for coast-wide recovery of American shad, Atlantic sturgeon, striped bass, and river herring. Data collected through the Hudson River Estuary Program assists interstate managers in assessing stock condition as these management plans are updated.

In 2009, in the face of a continuing decline in American shad, DEC biologists worked with the Hudson River Estuary Management Advisory Committee and the recreational and commercial fishing communities to design a program that reduces adult mortality but maintains a minimal fishery. New regulations established a three-day commercial fishing week (Sunday-Tuesday), prohibited commercial shad fishing north of the Rip Van Winkle Bridge in Catskill and reduced the number of American shad that recreational anglers can keep from six down to one per day. In light of the continued, alarming decline of American shad, DEC closed the commercial fishery for American shad in the Hudson, prohibiting commercial landings in marine waters and implementing a catch and release policy for recreational fishing in March 2010.

In 2009 studies to implement the newly adopted state shad recovery plan got underway, including spawning habitat analysis and gut content collections to enable predator-prey analysis. Biologist tagged 40 American shad to determine seasonal use of the river, identify spawning habitat and residence time. Preliminary data shows that the historic spawning area has been compressed to the upper portion of the river between Coxsackie and the Federal dam at Troy. While the habitat remains fairly stable, the compression of spawning appears to be a result of greater fishing pressure in the lower portions of the river. Data collected by DEC in 2009 suggests that adult shad may return to specific reaches of the Hudson where they were spawned. Tagging will continue in 2010. Predator-prey studies will begin in 2010 when gut content samples are analyzed. Ocean herring by-catch studies also started in 2009 and will continue in 2010 as a partnership project with the State of Maine.

In 2008, DEC piloted citizen monitoring of the arrival of glass eels and river herring (alewife and blueback herring). In early 2010, commercial fishers, recreational fishers and fishery biologists will begin discussion of new regulations to begin implementation of the Atlantic States Marine Fisheries Commission (ASMFC) amendment.

Striped bass populations are stable enough that no new regulatory action was taken in 2009.

Information on smallmouth and largemouth bass, crabs, and eel is currently being collected and will be enhanced to guide stock management decisions. In 2006, the Hudson River Estuary Program began sampling adult Atlantic sturgeon and attached tags to them to learn more about their habitat use and important areas used for spawning and congregation in the river. We also used tags that will help us learn more about the areas they use along the Atlantic coast. Sturgeon recovery in the Hudson appears to be making progress and should be on track to meet the 2016 target. Ongoing summer studies have developed a six year baseline of blue crab abundance, distribution, and size and sex composition in the estuary. These data can serve as a baseline to measure future change in blue crab population. We are also poised to identify migratory patterns, survival rates, and perhaps exploitation rates of blue crab in the river from ongoing tagging studies. A winter habitat study for blue crab in NY Harbor will add to our knowledge of factors that affect blue crab abundance. During this study we will also collect data on mitten crabs if they occur there.

DEC implemented size limits for hard crabs, soft crabs and peeler crabs in June, 2006. We also have an annual tagging program for blue crabs. We are learning about seasonal movement in the river through tag returns. We are also discovering that NY Harbor/Raritan Bay is an important over-wintering area for Hudson River blue crabs. A dredge project is needed to learn more about this area.

Barriers to eel migration are now being identified. Prototype eel passage devices have been successfully tested. Modified versions of the eel passage devices that will be temporary and easily installed are being developed for deployment at locations where eel migration is blocked by man-made barriers. When all barriers are inventoried, and the design of the passage device has been refined, a plan to deploy and maintain eel passage throughout the watershed will be created.

Temperature and salinity data have been collected and oyster sets have been placed in locations along the salinity gradient to determine growth, mortality and reproduction potential for re-establishing oyster habitat in the Haverstraw Bay region.

Annual sampling of fish for PCBs and crabs for cadmium continues. Since 1997, PCBs in striped bass caught below the Bear Mountain Bridge have been between 0.6 and 0.7 ppm. To meet the Food and Drug Administration (FDA) level that would allow their sale in the market place, such levels would need to reach 0.5 ppm or less. Riverwide, crabs show a continuing decline in cadmium as a result of the cleanup of contaminated sediment at the Foundry Cove Marathon Battery site. Dioxins, primarily entering the ecosystem from the Passaic River continue at low levels. The upper Hudson PCB clean up is expected to further reduce PCB levels in fish at the rate of 5% per year.

DEC is making a concerted effort to reduce fish mortality from impingement and entrainment at Hudson River power plants and other industrial facilities by imposing the "Best Technology Available (BTA) standard under 6 NYCRR Part 704.5 and the Clean Water Act (Section 316(b)). This has been accomplished at new plants (Athens and Bethlehem Energy Center), and one existing plant, Danskammer, and is being pursued for other existing power plants (i.e., Indian Point Units 2 and 3, Bowline Units 1&2, and Roseton). For reasons other than the impingement and entrainment of fish, the Lovett steam electric facility was decommissioned in 2009 and the Article X certificate for Bowline 3 was revoked. In addition, the BTA standard is being imposed at industrial facilities including but not limited to cement industry facilities and large office building complete.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. In accordance with the long-range (5-15 year) targets listed below for Hudson River populations of these species, by 2009 American shad and Atlantic sturgeon will show signs of recovery, while striped bass and shortnose sturgeon populations will continue to remain stable. This will be achieved by continuing to implement and update interstate management plans for these species according to schedules adopted for each, using up-to-date information on stock status and sources of mortality.

Status: DEC has been a leader in the development of the interstate fishery management plans for American shad, river herring, striped bass, and Atlantic sturgeon through ASMFC. We carry out the plans annually. Despite these efforts, shad have continued to decline, and river herring appear to be in decline. Striped bass remain at historic high levels but have declined somewhat from their peak in 2002. In March 2010 DEC closed all shad fisheries in New York and has also embarked on a shad recovery plan, which will guide the "2010-2014 Hudson River Estuary Action Agenda (see also narrative overview above and Target 13 below)", DEC has initiated a herring monitoring program. Stronger management measures have been adopted in Interstate plans in response to our monitoring data.

Atlantic sturgeon are showing signs that recovery is beginning, although two more years of data is necessary to show trends. Sturgeon protected under the 1996 moratorium are now reaching maturity, and reproduction of young sturgeon appears to be increasing, while the number of

reproducing adults appears to also be increasing. Shortnose sturgeon appear to be stable.

- Done
- Underway
- Not started

Target 2. Annually determine progress in maintaining or increasing populations of Atlantic sturgeon, American shad, striped bass, and periodically for smallmouth and largemouth bass.

Status: All annual monitoring program sampling has occurred for Atlantic sturgeon, American shad and striped bass. Annual surveys of smallmouth and largemouth bass tournament organizers or onsite monitoring have provided DEC with bass tournament catch statistics for all years between 1986 and 2009 (except 2006).

- Done
- Underway
- Not started

Target 3. By 2007, adopt measures to increase the catch of largemouth and smallmouth bass larger than 15 inches in length.

Status: Done. New 15” size limit was adopted for the Hudson River on October 1, 2006.

- Done
- Underway
- Not started

Target 4. By 2009, initiate studies to determine the feasibility of restoring oyster populations to the Hudson River estuary.

Status: A two year study of the habitat suitability of the lower Hudson River estuary for oysters began in spring 2008 and will be completed by spring 2010. It determined that conditions are suitable for oyster survival. In 2009, DEC and its partners documented the presence of live oysters in Haverstraw Bay. In 2008 research partners at the State University of New York at Stony Brook also found that oysters are growing and surviving well when placed in cages in a number of localities in Haverstraw Bay. These larvae likely came from living natural oyster populations nearby. This research is part of an initiative to study the feasibility of restoring oyster populations and reef habitat in the Hudson, and it completed the second and final year of a study of the feasibility of restoring oysters to the Tappan Zee region of the Hudson River. It will provide valuable information needed to determine most productive locations for oyster restoration in the region. Additional studies are planned in the “2010-2014 Hudson River Estuary Action Agenda” to assess other factors affecting the feasibility of oyster restoration.

- Done
- Underway
- Not started

Target 5. By 2009, develop a method to monitor status of river herring in the Hudson River estuary.

Status: In 2008 a volunteer herring monitoring program was initiated and 10 tributaries were monitored for presence or absence of river herring. The program was continued in 2009 and 13 tributaries were monitored. This method has proved to be successful in collecting basic information at a very low cost. It will be continued under the “2010-2014 Hudson River Estuary Action Agenda”.

- Done**
- Underway**
- Not started**

Target 6. By 2009, determine existing threats to American eels.

Status: Community and student monitoring programs of migrating glass eels began in 2006 and has been expanded over the last 3 years. The project, which is funded by the Hudson River Estuary Program and Cornell University’s Water Resources Institute, utilizes volunteer students and community members to set and monitor eel nets during the spring migration. Several potential sites for establishing eel passage at man-made barriers to migration have been identified and will be the subject of eel passage projects in the near future. Threats to eels are being studied coast wide, and these studies have contributed to coastal eel management programs. Locally, threats to eel are thought to be:

- a. Barriers on streams
- b. Illegal harvest of glass eel
- c. Land use patterns that affect stream water quality

Studies by SUNY ESF are underway to assess land use impacts, and projects to provide eels with a means to swim past stream barriers are being launched

- Done**
- Underway**
- Not started**

Target 7. By 2009, reduce, or have schedules to reduce fish kills at the six existing power plants by imposing the “best technology available” standard pursuant to 6 NYCRR §704.5 and § 316(b) of the Clean Water Act, which both call for minimizing adverse environmental impact. Effective immediately, provide that future Hudson River power plants reduce fish kills over 2001 levels at once-through cooling plants, and reduce fish kills for all types of future water withdrawals compared to the impacts of unmitigated intake structures.

Status: DEC continues to make a concerted effort to reduce fish mortality from impingement and entrainment at Hudson River power plants and other industrial facilities by imposing the “best technology available” (BTA) standard available under 6 NYCRR §704.5 and the Clean Water Act (§316(b)). In a draft SPDES permit, DEC is requiring closed-cycle cooling for Indian Point Units 2 and 3. This requirement is being challenged by the permittee and a Permit Hearing is scheduled to commence in September 2010. For reasons other than the impingement and

entrainment of fish, the Lovett steam electric facility was decommissioned in 2009 and the Article X certificate for Bowline 3 was relinquished by the owner. In addition, the BTA standard is being imposed at industrial facilities other than steam electric powerplants including but not limited to cement industry facilities and large office building complexes.

- Done
- Underway
- Not started

Target 8. Track the responses of aquatic organisms to contaminants. Document changes in PCB concentrations (annual monitoring) and undertake special efforts to describe mercury and cadmium conditions.

Status: Annual sampling of fish for PCBs and crabs for cadmium and mercury continues. PCBs in striped bass taken from Bear Mountain Bridge to NY Harbor have had average total PCB levels below 2.0 ppm since 1997. The 2.0 ppm tolerance is one criterion that has to be met to permit sale of fish in the commercial marketplace. To reopen a fishery, the criterion is more stringent. A Food and Drug Administration composite sample (10 fish/composite) must have a likelihood of meeting the tolerance at least 95% of the time. Since NY analyzes individual fish, a Monte Carlo analysis is conducted by generating a large number of random FDA composite samples using the data generated for individual fish. Typically 800 or 1000 random samples are used. If the samples are below 2.0 ppm 95% of the time, then the fishery may qualify for use in the commercial market. To achieve compliance with the 95% criterion, the average PCB concentration must be about 0.5 ppm, or less. The current average PCB concentration for striped bass at and below Bear Mountain Bridge is now between 0.6 and 0.7 ppm based on data for 2008 collections. There are no 2009 collections for the lower reach of the estuary because of budgetary constraints. PCBs are being released as a consequence of dredging in the upper Hudson River - such releases were expected. Based on the initial year of data, the impact of the dredging on PCBs in resident fish has been local but we do not yet have data for collections of striped bass from the lower river subsequent to the 2009 dredging season. The 2010 striped bass collections from the lower estuary have been completed but await approval of funding for chemical analyses. The Phase 2 dredging is scheduled commence in 2011 and is currently scheduled to continue through 2015.

DEC assessed mercury and cadmium in blue crab during 2003 (Hudson River) and 2004 (Long Island waters). Mercury levels in blue crab are low and are not of concern at this time. We participated in publication of the Hudson River findings (Levinton *et al.*, 2006) in which it was shown that removal of Cd contaminated sediments from Foundry Cove (at the former Marathon Battery Superfund site) caused a 70% reduction of cadmium in blue crab taken throughout the Hudson River estuary. However, cadmium levels at about 2.0 ppm in the hepatopancreas remain above the DOH criterion of 1.0 ppm which would permit consideration of relaxation of the health advisory recommendation to restrict consumption of blue crab. For Long Island waters, the cadmium levels in the hepatopancreas remain elevated - generally averaging about 4.0 ppm. Significant source identification and control activities would be required to reduce the levels observed.

This monitoring will continue over the next 5 years to show progress in reducing contaminants in fish and crabs.

- Done**
- Underway**
- Not started**

Target 9. By 2009, initiate studies to determine seasonal habitat use of shortnose sturgeon.

Status: No work has been done on this project. Other projects and species have taken precedence due to limitations of time and funds. This project has been delayed to 2012.

- Done**
- Underway**
- Not started**

Target 10. In 2009, release a report on the status of signature fisheries on the Hudson River estuary.

Status: Hudson River Fisheries Unit is compiling all data and plans to have a report available in 2010.

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 11. By 2016, ensure the return of the first mature and fully protected female Atlantic sturgeon to the Hudson River estuary, with a long term goal of establishing the Hudson River Atlantic sturgeon population at a fishable level that would encourage its re-emergence as a regional gourmet delicacy.

Status: The commercial Atlantic sturgeon fishery in the Hudson was closed in 1996 and coastwide in 1998. Annual monitoring of juvenile abundance has occurred since 2000. In 2006 the Hudson River Estuary Program began sampling adult Atlantic sturgeon and attached tags to them to learn more about their habitat use and important areas used for spawning and congregation in the river. We also used tags that will help us learn more about the areas they use along the Atlantic coast. Sturgeon recovery in the Hudson appears to be making progress and should be on track to meet the 2016 target.

- Done**
- Underway**
- Not started**

Target 12. Maintain a broad age-structure of striped bass and a self-sustaining spawning stock at appropriate levels of abundance to provide a quality and economically viable fishery.

Status: Annual sampling of spawning stock has been done to monitor Hudson River striped bass stock status. Monitoring shows that striped bass remain at historically high levels but are declining somewhat from their high in 2002, which may require management action.

- Done
- Underway
- Not started

Target 13. Re-establish Hudson River American shad roe as a gourmet specialty in Northeast restaurants by 2020, with a long term goal of restoring the population to pre-World War II levels.

Status: American shad production is at its lowest ever on the Hudson. Regulations to close all harvest of American shad on the Hudson went into effect in March of 2010. Lack of progress in meeting this shad recovery target is likely due to a number of factors that are currently being evaluated, including possible ocean fishing impacts, changing food webs due to zebra mussels and predators, and in-river harvest of depleted spawning stocks. DEC does not expect to meet this goal by 2020. However a shad recovery plan is currently being implemented and will point to priority actions which can be taken to recover the species in the long term.

In 2009, studies to implement the newly adopted state shad recovery plan got underway, including spawning habitat analysis and gut content collections to enable predator-prey analysis. Biologist tagged 40 American shad to determine seasonal use of the river, identify spawning habitat and determine residence time. Preliminary data shows that the historic spawning area has been compressed to the upper portion of the river between Coxsackie and the Federal dam at Troy. While the habitat remains fairly stable, the compression of spawning appears to be a result of greater fishing pressure in the lower portions of the river. Data collected by DEC in 2009 suggests that adult shad may return to specific reaches of the Hudson where they were spawned. Tagging will continue in 2010. Predator-prey studies will begin in 2010 when gut content samples are analyzed. Ocean herring by-catch studies also started in 2009 and will continue in 2010 as a partnership project with the State of Maine.

- Done
- Underway
- Not started

Target 14. Restore the smallmouth and largemouth bass fishery, by 2010, to the nationally renowned levels of the mid-1980s.

Status: Implemented a 15” size limit, but restoration response has not yet been observed in annual monitoring programs. Additional studies may be required to determine bass growth requirements on the Hudson.

- Done
- Underway
- Not started

Target 15. By 2010, determine threats to blue crabs and implement management measures to assure sustainability.

Status: The 2010 target has been met, but additional work needs to be done. Ongoing summer studies have developed a six year baseline of blue crab abundance, distribution, and size and sex composition in the estuary. These data can serve as a baseline to measure future change in blue crab population. We are also poised to identify migratory patterns, survival rates, and perhaps exploitation rates of blue crab in the river from ongoing tagging studies. A winter habitat study for blue crab in NY Harbor would add to our knowledge of factors that affect blue crab abundance. Such a study is needed to also collect data on mitten crabs if they occur there. DEC Implemented size limits in June of 2006 for hard crabs, soft crabs and peeler crabs. We also have an annual tagging program for blue crabs. We are learning about seasonal movement in the river through tag returns. We are also discovering that NY Harbor/Raritan Bay is an important over-wintering area for Hudson River blue crabs. A dredge project is needed to learn more about this area, however winter sampling has been postponed indefinitely due to scarce funds.

- Done
- Underway
- Not started

Target 16. By 2010, determine where healthy oyster populations could become viable, and by 2020 re-establish the seed oyster industry in the Hudson to 1950s levels of abundance.

Status: By spring 2010 a two-year feasibility study will be complete. The study will provide valuable information needed to determine most productive locations for oyster restoration in the region (See also Target 4). Temperature and salinity data have been collected and oyster sets have been placed in locations along the salinity gradient to determine growth, mortality and reproduction potential in the Haverstraw Bay region.

- Done
- Underway
- Not started

Target 17. Develop an American eel restoration plan by 2010.

Status: ASMFC requires that glass eel be tracked, and New York is implementing this requirement of the interstate planning process (See also Target 6). In addition, barriers to eel migration are being identified. Prototype eel passage devices have been successfully tested. Modified versions of the eel passage devices that will be temporary and easily installed are being developed for deployment at locations where eel migration is blocked by man-made barriers. When all barriers are inventoried, and these passage devices have been refined, a plan to deploy and maintain eel passage throughout the watershed will be created.

- Done
- Underway
- Not started

Target 18. Determine status and trend in relative abundance of resident and migratory forage fish species (river herring, white perch, Atlantic tomcod, killifish, spot tail shiners, silversides and bay anchovies) of the Hudson River estuary by 2010.

Status: An initial project is in progress to analyze existing data sets to identify current distribution, and look for changes in distribution of some forage species. Further analysis on relative abundance has not been done. Other higher priority projects have taken precedence. Funding has not been available.

- Done
- Underway
- Not started

Target 19. By 2020, reduce fish kills for all types of water withdrawals compared to the impacts of unmitigated structures.

Status: The BTA standard is being imposed at industrial facilities other than steam electric including but not limited to cement industry facilities and large office building complexes which will achieve the 2020 target when implemented (See also Target 7).

- Done
- Underway
- Not started

Target 20. By 2016, measurably reduce levels of contaminants in commonly eaten fish and blue crabs.

Status: The upper Hudson PCB clean up is expected to further reduce PCB levels in fish at the rate of 5% per year.

- Done
- Underway
- Not started

Target 21. By 2010, explore methodology for tracking abundance changes in the shortnose sturgeon population.

Status: A method for tracking has been established, using sonic tags, however no work has been done on this due to competing priorities. Since populations of this fish are thought to be stable, staff and funding resources were directed to other species considered to be at greater risk. The next step is to learn more about their seasonal use of the river, through tagging studies which are planned for 2012.

- Done
- Underway
- Not started

Accomplishments Goal 2: River and Shoreline Habitats

Goal

Conserve, protect, and, where possible, enhance **critical river and shoreline habitats** to assure that the life cycles of key species are supported for human enjoyment and to sustain a healthy ecosystem.

Overview of Accomplishments to date

The diverse and varied habitats of the estuary have changed dramatically since 1609, when Henry Hudson first sailed up the river to Albany. Wetlands and shallows have been filled, miles of shoreline have been altered, and changing land use patterns in the watershed have contributed to degraded water quality. The key habitats of the estuary—the wetlands, the aquatic plant beds, the shoreline, and the very bottom of the river itself— are being characterized, so that, where necessary, they can be conserved or restored. Key habitat types – including shorelines, tidal wetlands, aquatic vegetation beds, and the river bottom – are being mapped with many baseline maps now completed, as of 2009.

- a. Detailed mapping of estuary wetlands greater than one-half acre has been completed in geographic information system (GIS) format and will be incorporated into the DEC's Master Habitat Data Base. Software for non-GIS users is being developed to allow the public to view this wetland information electronically. This coverage spans the Hudson River from the Troy dam to the Tappan Zee Bridge.
- b. All Hudson River submerged aquatic vegetation beds were mapped and have been placed on the DEC's Master Habitat Data Base.
- c. Detailed maps of the river bottom have been completed for two-thirds of the estuary. Efforts are underway to make all these data available on the web.

In addition, invasive species, such as water chestnut and zebra mussels have displaced native species, disrupting food webs and the complex ecosystem. Preventing the introduction of invasive species is critically important, because once they are established, it is difficult or impossible to eradicate them. In 2007, Chinese Mitten crab were found in the estuary. Following the recommendations of a statewide invasive species task force final report, the state is working with many partners to establish a network of partnerships for regional invasive species management to prevent and control invasive species. A habitat restoration plan has been drafted and several habitat restoration and enhancement projects are underway.

Climate change also poses a significant threat to river habitats. Data collected at gauges in New York Harbor indicate that sea level in our region has risen more than 15 inches during the last 150 years due to a combination of geological forces, expansion of ocean water as it warms, melting of glaciers and polar ice sheets. Scientists expect this trend to continue, potentially inundating tidal marshes and sensitive shallow habitats that support many species of fish and

wildlife. Shoreline hardening and other attempts to buttress shorelines against flooding will damage critical aquatic habitats and prevent them from migrating inland with rising water levels.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Conserve key aquatic habitat types, including submerged aquatic vegetation (SAV), tidal wetland, intertidal area, and natural shoreline and river bottom, through the measures identified below:

By 2006, map natural and engineered shoreline habitats, and by 2012, complete mapping of all submerged habitats for the entire estuary, and make all habitat mapping products available in electronic form to the public.

Complete assessment of how SAV and tidal-wetland habitats are changing over time.

By 2009, advance our understanding of the seasonal use of habitats, such as spawning, nursery and wintering areas of key species of fish and crabs, such as shad, striped bass, Atlantic sturgeon, short-nose sturgeon, blueback herring, alewife, white perch, tomcod, American eel, winter flounder, killifish, shiner (various species) and blue crab.

Characterize the functional roles of shoreline habitats, intertidal areas, and vegetated shallows in the ecosystem.

By 2007, complete updates to existing conservation measures, including the state's Open Space Conservation Plan and Significant Coastal Fish and Wildlife Habitat designations that benefit a wide range of species, to reflect habitat information gained to date, including projections of shoreline land buffer needs to accommodate wetland migration inland as sea level rises.

Develop a strategy and tools for assessing and protecting significant coves and the mouths of Hudson River tributaries, provide technical assistance to municipalities in identifying and protecting significant natural resources, and develop a demonstration project where inter-municipal cooperation has resulted in conservation of important habitats.

By 2009, work with partners to develop high-resolution digital elevation maps of the entire estuary shoreline from New York City to the Troy dam. Use these maps to help shoreline communities understand and plan for threats associated with rising sea levels. Conduct a 'risk assessment' for SAV, wetlands and shorelines under various sea level rise scenarios.

Status: The Hudson River Estuary Program in partnership with Hudson River Research Reserve and many partners conducted several studies identifying distribution of habitat types within the estuary and use of some of those habitats by fish and other aquatic communities. Several inventories of important habitat types and other projects included:

Shoreline Classification and Inventory- An inventory of shoreline types was completed in 2005. Shorelines were identified in the field using a 3-tier classification scheme developed at the Hudson River Research Reserve. The resulting inventory and mapping products were used to inform further studies of shoreline habitats and their distributions in the estuary.

Building on this mapping and inventory work, as part of the Sustainable Shorelines Project, the Cary Institute for Ecosystem Studies and DEC staff sampled invertebrates, fish and other physical and biological attributes of shorelines to identify the functional ecosystem roles of different shoreline types. This information is being developed to inform local and regional decision-makers who are regulating, designing and implementing shoreline development projects.

Hudson Estuary tidal wetland habitat mapping –To conduct an inventory and analysis, 2007 air photos have been used as a data source for a second Hudson River tidal wetland inventory, to re-map all tidal wetlands larger than one-half acre from Hastings to the Troy dam. Maps will be completed in 2010, and change from the first wetlands inventory will be analyzed. In addition, detailed vegetation maps were completed from 2005 aerial photos of the four HRNERR component sites (Piermont Marsh, Iona Island, Tivoli Bays, and Stockport Flats). Data are currently being packaged for public distribution in the form of an ArcReader CD. This data set will expand upon two similar Reserve wetland vegetation inventories completed from 1991 and 1997 aerial photos.

Submerged aquatic vegetation (SAV) mapping – The third in a series of SAV inventories was completed in 2009 using 2007 aerial photos extending from Hastings to the Troy dam. Data are currently being packaged for public distribution in the form of an ArcReader CD. This data set will expand upon two similar inventories completed from 1997 and 2002 aerial photos. Change analysis for the SAV data set is underway through a partnership with the Cary Institute of Ecosystem Studies.

Riverbottom mapping - The digital mapping products that resulted from the 1998-2003 field seasons of the benthic mapping project have been placed on the internal NYSDEC GIS Data Selector and on the public NYS GIS Clearinghouse. Working with NOAA's Coastal Services Center in 2009 we began another phase of benthic mapping focused on the shallow waters (water shallower than 4 meters) north from Saugerties to Troy.

Seasonal use of habitats by fish - In cooperation with scientists from Rutgers University and in partnership with the Hudson River Fisheries Unit (See goal 1), we conducted pilot experiments in 2008 and 2009 to locate sturgeon within their spawning habitat in order to determine which parts of the spawning habitat are most frequently visited by spawning sturgeon. In 2008 we deployed an autonomous underwater vehicle REMUS to track sturgeon. In 2009 we deployed an array of tethered buoys to locate sturgeon with sonic tags. Baseline studies of juvenile American eel (*Anguilla rostrata*) "glass eels" migrations were conducted by teams of scientists, students, and community volunteers using net and trap devices on several Hudson River tributaries in spring 2008 and 2009. The juvenile fish were counted, weighed, and released alive, and other environmental data were recorded.

Updates to existing conservation measures – Staff contributed to the 2009 Open Space Plan amendments to insure that the latest Hudson River habitat information was reflected in its recommendations, and contributed information about climate change and the need for shoreline and near-shore land acquisition to enable migration of Hudson River tidal wetlands as sea level rises. Staff also prepared recommendations to the NYS Department of State for the update of the Significant Coastal Fish and Wildlife Habitat designations. This information is in review. Staff

also provided technical assistance and resource maps to the City of Kingston about significant natural resources along the tidal Rondout Creek.

- Done
- Underway
- Not started

Target 2. Cooperate with the Partnerships for Regional Invasive Species Management to detect, prevent, and control and/or eradicate aquatic invasive species, press for needed federal action and conduct a pilot study to experiment with management of water chestnut to enhance its habitat value in local settings.

Status: *Removal of Phragmites australis* - An experimental effort to eradicate *Phragmites* from Hudson River NERR sites began in 2006. *Phragmites* was treated with the herbicide Rodeo® in three stands within the Tivoli North Bay Wildlife Management Area. Four additional stands were added to the eradication process from 2007-2009. *Phragmites* has been treated annually as part of a maintenance regime to insure eradication. Recovery of the native plant community has been monitored annually. Similar *Phragmites* removal efforts began in 2008 at the Iona Island NERR site in partnership with the Palisades Interstate Parks Commission.

Mile-a-minute project of Hudson Valley – Staff coordinated and implemented an outreach and volunteer monitoring program to raise awareness, detect new infestations, conduct mechanical control projects, and create a database and map of known locations produced. Staff worked with the Partnerships for Regional Invasive Species Management (PRISM) to encourage pilot studies of goat and sheep grazing effectiveness in 2009, and worked with land managers to release weevils for biocontrol at three sites in 2009. Staff also helped with the submission of a grant application to APHIS for the use of weevils as a bio-control for mile-a-minute and for funding to continue the outreach and monitoring efforts of the Mile-a-Minute Project of the Hudson Valley; the award was received on March 29, 2010.

Chinese Mitten Crab - In 2007, the invasive Chinese Mitten Crab (*Eriocheir sinensis*) was first discovered in the Hudson River estuary. Due to its burrowing behavior, this injurious species could increase erosion, destabilize shoreline structures, and reduce vegetation if the population sustains large numbers. Staff partnered with the Smithsonian Environmental Research Center Marine Invasion Research Lab to document mitten crab distribution from New York Harbor to Albany extending upstream in at least 10 tributaries within the estuary.

Water chestnut: DEC will not consider applying herbicide, and given the life history of the plant and the fact that the seed stock is viable for many years, the current thinking is that we may just have to live with this plant. As of now, the only 'control' method is harvesting. This is done using a specialized piece of equipment that cuts and collects the plants in mid-summer and is in use in areas where the plant interferes with human uses such as swimming.

DEC is considering pilot projects to reduce the extent of water chestnut in specific areas of the Hudson where we could introduce greater flow to low flow areas, such as backwaters behind peninsulas. Our hope would be that increased current, increased depth and altered bottom

characteristics, will make a location less supportive of water chestnut and hopefully give native vegetation a chance to re-establish.

- Done**
- Underway**
- Not started**

Target 3. Annually provide training to user groups, resource managers, and other decision-makers on how to adopt best management practices that conserve aquatic habitat. By 2009, train 1,000 decision-makers on best management practices for habitat protection, including shoreline and habitat management, invasive species control, visitor impact assessment, habitat restoration, water quality protection strategies, and climate change.

Status: From 2005-2009, staff trained over 2400 decision-makers, in above issues, including process skills which enhance decision-makers capacity to engage stakeholders and plan and evaluate projects.

- Done**
- Underway**
- Not started**

Target 4. By 2008, complete a Hudson River estuary habitat restoration plan that identifies restoration priorities and provides for a restoration process that is goal-driven, adaptive, and based on site-specific monitoring and clear success criteria, and begin implementation.

Status: Drafts of the Hudson River Habitat Restoration Plan have been completed, reviewed and revised. The scope of the document and the restoration actions proposed have been modified as information about restoration feasibility is developed. In partnership with DEC staff in Albany, analyses of historic maps identified dramatic changes to the shape and potential function of habitats in the upper third of the estuary. The resulting understanding of scale of loss of habitat in the upper Hudson has been critical to formulating conceptual restoration plans identified in the plan. Habitats that are important to the health of the ecosystem and have been greatly influenced by human activity are: vegetated shallows, shorelines, oyster reefs, and migratory fish habitats. Strategies for restoring each habitat type are proposed.

- Done**
- Underway**
- Not started**

Target 5. By 2009, begin a small-scale pilot oyster habitat restoration demonstration project to determine the feasibility of re-establishing oyster reef habitat in the lower estuary. Conduct a pilot project to restore access to up-stream habitat for eels on one tributary stream.

Status: A State Wildlife Grant (SWG) was awarded to study the feasibility of oyster reef restoration in the Tappan Zee region of the lower Hudson River estuary. DEC and SUNY Stony Brook signed a memorandum of understanding to conduct the feasibility study. The project was

nearly completed in this reporting period, and will be completed in the spring of 2010; final deliverables are due December 2010. (See also Goal 1 Targets 4 and 16)

- Done**
- Underway**
- Not started**

Target 6. Study the feasibility of restoring or enhancing natural shoreline, tidal wetlands, access to historically accessible habitat on tributaries with man-made barriers, and habitat for shad spawning and other estuarine species. Identify options for disposal and/or beneficial reuse of Hudson River dredge spoil associated with habitat restoration projects.

Status: Through analysis of historic maps, staff identified specific areas and physical habitat elements that have been modified, destroyed or eliminated from the estuary ecosystem. These areas represent potential restoration sites for shad spawning and other estuarine species. Disposal options, including on-site disposal and/or beneficial reuse of Hudson River dredge spoil associated with restoration projects were explored. An experimental American eel ladder was installed at a dam on the Saw Kill on the Bard College campus in 2005 and has been successfully operated by Bard faculty and staff for four years.

- Done**
- Underway**
- Not started**

Target 7. By 2007, develop and disseminate guidance on shoreline engineering options that provide high habitat value, and by 2009, develop two demonstration projects to return the river shoreline to a more natural condition.

Status: An analysis of Hudson River estuary engineered shoreline options was completed by Alden Research Labs in 2006. Since the workshop the written report, *Hudson River Estuary Shorelines: Soft Engineering Solutions to Shoreline Stabilization*, was disseminated through a training program in March 2006, attended by 42 decision makers (378 contact hours), and continues to be downloaded from a Reserve website.

Staff has continued to participate in collaborative efforts to identify shoreline management options for communities seeking to protect waterfront property, encourage human use and protect natural resources. These efforts, including the Rising Waters project with The Nature Conservancy, now incorporate projected climate change and sea-level rise in their planning scenarios.

In 2008, the Hudson River Research Reserve and several partners launched the first phase of the Sustainable Shorelines Project with major funding from NOAA. The first phase of the project will identify ecological, economic, and engineering performance tradeoffs between different natural and engineered shoreline types factoring in projections of sea level rise and climate change. Through this work the project seeks to inform shoreline management policy and climate change adaptation. This project will culminate in the development of guidance for municipalities

on the best shoreline treatments to use as sea level rises.

- Done
- Underway
- Not started

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 8. By 2020, if feasible, restore or enhance key habitats including: 10 shoreline habitat enhancement projects; 30 acres of tidal wetlands; access to historic fish habitat on 5 tributaries with man-made barriers; and 20 acres of shallow water habitat re-created from dredge spoil uplands.

Status: These projects are contingent on the implementation of the Hudson River Estuary Restoration Plan identified in Target 4.

- Done
- Underway
- Not started

Target 9. By 2015, work with 50% of Hudson River municipalities to explore opportunities for protecting highest priority aquatic habitat within their boundaries.

Status: not started

- Done
- Underway
- Not started

Target 10. By 2015, train 3,000 decision-makers on best management practices for invasive species control, visitor impact assessment, habitat protection, habitat restoration, water quality protection, and climate change.

Status: Trained 324 decision makers (1100 contact hours) on mitigating climate change, invasive species and assessment of habitat vulnerability to climate change in first quarter of 2010. (See also Target 3)

- Done
- Underway
- Not started

Accomplishments Goal 3: Plants and Animals of the Hudson River Valley

Goal

Conserve for future generations the rich diversity of **plants, animals and habitats** that are key to the vitality, natural beauty and environmental quality of the Hudson River Valley.

Overview of accomplishments to date

The Hudson River Estuary Program has made tremendous progress in better understanding the locations and health of wildlife and natural areas throughout the Hudson Valley and in sharing this information with local governments and other conservation planners. We continue to identify and map significant habitats of the Hudson Valley at several scales, including assessment of biological resources on state lands. In addition, biologists have completed regional surveys of reptiles, amphibians, mammals, and breeding birds. With this biological information, communities can make more informed and comprehensive land use decisions that achieve community goals.

After gathering baseline information on biological resources, the Hudson River Estuary Program began providing technical assistance to land use decision-makers. Outreach has focused on smart-growth strategies that reduce habitat fragmentation and maintain environmental infrastructure. A number of documents and tools have helped planners and officials to develop local conservation programs. A *Biodiversity Assessment Manual for the Hudson River Estuary Corridor* has been published, and a training program implemented to teach communities to better understand, assess, and map habitats to support local goals and programs. Workshops have been offered to private landowners and resource professionals to encourage best management practices for stewardship of target habitats. A *Wildlife and Habitat and Conservation Framework* was developed to guide municipalities, landowners, businesses, and non-profits in conservation planning and practices. A conservation planning handbook specifically for municipalities was completed in 2008.

We set a target in the “*2005-2009 Hudson River Estuary Action Agenda*” to enlist 200 partners in developing and enhancing local conservation programs. We exceeded our expectations by reaching 475 municipalities, non-profits, and private landowners. Other accomplishments over the same period include educating 2,000 community leaders in biodiversity conservation and land-use planning; mapping 58,000 acres of significant habitats; training 785 land managers, and responding to several thousand requests for information on rare plants and animals, and significant ecosystems. These goals were achieved through outreach projects coordinated by Cornell University in partnership with the Hudson River National Estuarine Research Reserve, and the non-profit organizations Hudsonia, NY Natural Heritage Program, and Wildlife Conservation Society.

Over the 2005-2009 period, we developed new ways to share information with the public, including new maps, supporting conservation information, and websites. Community leaders who use this information and take advantage of trainings, partnerships, grants, and technical assistance have improved local planning and project review. Our work with local land use decision-makers is a model statewide, and complements NYS DEC's existing regulatory and open space conservation programs.

These efforts have resulted in more effective local government planning that reduces habitat loss and fragmentation. This includes development and implementation of inter-municipal biodiversity conservation plans; updates to local ordinances that incorporate natural resource protection, and improved understanding and management of habitats by both private landowners and natural resource professionals. The Hudson River Estuary Program has also worked with land trusts to improve acquisition and management of critical habitats on their properties. In total, technical assistance, grants, and/or training in plant and animal conservation have been provided to 59 towns, cities, and villages; 7 counties, and 14 land trusts.

Status of specific accomplishments in meeting 2005-2009 Targets.

Target 1. Enlist 200 partners in creating and enhancing local programs to conserve the following target habitats and representative species using methods such as: smart growth principles; planning and zoning updates; open space plans; natural resource inventories; local laws; federally funded incentive programs; site stewardship best management practices; conservation easements and open space acquisition; improved project review; model partnership agreements, and other means.

Target habitats:

- Seasonal woodland pools for animals that are declining throughout the Northeast: Jefferson, marbled, and spotted salamanders, wood frog, spotted turtle, fairy shrimp and others.
- Streams, shorelines, and corridors that provide essential habitat for river otter, wood turtle, cerulean warbler, wading birds, trout, stream salamanders and Hudson River water nymph.
- Unbroken forests needed by scarlet tanager, wood thrush, warblers, wide-ranging mammals, hawks, owls, box turtles, and fringed polygala flower.
- Unique natural areas that support at-risk plants and animals such as smooth cliff brake fern, grass pink orchid, bog turtle, peregrine falcon, and bald eagle.

- Scarce grasslands and shrublands that shelter northern harrier (marsh hawk), bobolink, eastern meadowlark, golden-winged warbler, short-eared owl and uncommon butterflies.
- Wetlands, including marshes, swamps, wet meadows, bogs and surrounding lands that support great blue heron, American woodcock, Blanding's turtle, northern leopard frog, and pitcher plant.

Status: The Hudson River Estuary Program exceeded its target of reaching 200 local partners with establishing conservation programs over the five-year period. The Hudson River Estuary Program and its partners reached out to 475 local partners, including 375 landowners and 40

non-profit organizations (e.g., land trusts) to share habitat data and information, forest management strategies, training, or funding. The Hudson River Estuary Program staff and program partners Hudsonia and Metropolitan Conservation Alliance assisted 58 municipalities with developing biodiversity conservation strategies, reaching over one-third of the communities in the 10-county estuary corridor. GIS data, habitat studies and maps, technical assistance and training, and grants were provided to support many local, regional, and watershed conservation plans and actions. For example:

- Biodiversity information and recommendations were incorporated into the Croton Bay Watershed Plan, Wallkill River Watershed Plan, Onesquethaw-Coeymans Watershed Plan, and Moodna Creek Watershed Plan.
- Intermunicipal biodiversity studies were completed and implementation initiated in the Towns of Bethlehem, Coeymans, and New Scotland (Albany Co.); Chester, Goshen, and Warwick (Orange Co.); North Salem, Lewisboro, and Pound Ridge (Westchester Co.); Putnam Valley, Yorktown, Cortlandt, and New Castle (Putnam and Westchester Co.); Lloyd and New Paltz and Village of New Paltz (Ulster Co.); Bedford and Somers (Westchester Co.); Rensselaerville and Berne (Albany Co.); Beekman, Fishkill, LaGrange, Poughkeepsie, Union Vale, and Wappinger (Dutchess Co.); and Ulster and City of Kingston (Ulster Co.).
- County-wide digital habitat data were provided to Orange County Department of Planning; Cornell Cooperative Extension of Dutchess County; Albany County Department of Economic Development, Planning, and Conservation; and Ulster County Department of the Environment, to build county agencies' capacity to support municipal and county planning efforts.
- Target habitat conservation was addressed in regional plans, including the Shawangunk Mountain Regional Open Space Plan (adopted unanimously by 11 municipalities), the Greene County Habitat Management Plan (involves Coxsackie, New Baltimore, and Athens), and a Hudson River Corridor Open Space Plan produced by Scenic Hudson. Target habitats were addressed through regional conservation initiatives in the Hudson Hills and Highlands, Black Creek/Swarte Kill watersheds, and the Rensselaer Plateau.
- Municipalities have now mapped 50,000 acres of ecologically significant habitat in Dutchess and Ulster Counties with estuary Grant funding (includes Town of Marbletown, Town of Poughkeepsie, Town of Beekman, and Town of Hyde Park).

- Done**
- Underway**
- Not started**

Target 2. Identify practices that can be adopted by municipalities, builders, businesses, non-profits, and individuals to manage their lands for habitat conservation as part of model partnership agreements.

Status: Projects that identified practices include:

- More than 20 conservation strategies for protecting biodiversity are regularly distributed by Hudsonia and the Hudson River Estuary Program. The strategies were first published in the “Biodiversity Assessment Manual for the Hudson River Estuary Corridor.”
- Specific recommendations for future development and economic growth, land

preservation, and local land-use planning were distributed in four biodiversity plans for inter-municipal regions of the Hudson Valley produced by the Metropolitan Conservation Alliance (MCA) of the Wildlife Conservation Society (plans are the “Eastern Westchester Biotic Corridor”, “Croton-to-Highlands Biodiversity Plan”, “Northern Wallkill Biodiversity Plan”, and “Southern Wallkill Biodiversity Plan”).

- Strategies and recommendations for biodiversity conservation were published in the “Wildlife and Habitat Conservation Framework”. The Framework identifies 23 significant biodiversity areas and six priority habitat types for the Hudson River estuary corridor.
- Biodiversity friendly stormwater practices were developed for the DEC Division of Water to incorporate into guidance for municipalities.
- Management practices for biodiversity and forest health were delivered at landowner workshops held by Cornell Cooperative Extension.
- Conservation guides with recommended management practices were completed for all 70 natural community types, and 50 rare animal and 85 rare plant species found in the Hudson Valley, and published online by the NY Natural Heritage Program (<http://www.acris.nynhp.org/>).
- Management practices for 80 priority bird species and a management decision tree were published online by Audubon New York (http://ny.audubon.org/BirdSci_HudsonRiverValleyConservation.html).
- Recommendations to protect wading bird habitat on islands in New York Harbor were developed by NYC Audubon after documenting 1,846 nests of nine species of wading birds located on 10 islands.
- Diverse Hudson Valley stakeholders evaluated climate change adaptation practices through a workshop series that considered potential outcomes of climate change over a 20-year period. The workshops were led by The Nature Conservancy.
- Practices and guidelines to protect the NYS Threatened Blanding’s turtle were distributed in fact sheets and presentations to residents and landowners; state, county, and town agencies; and developers and consultants.
- Nearly 75 practices for municipalities are described in *Conserving Natural Areas and Wildlife in Your Community*, a local government conservation handbook published by NYS DEC and Cornell University in 2008.

- Done
- Underway
- Not started

Target 3. Conserve 10 local-scale wildlife-migration routes through partnerships and voluntary programs.

Status: Local-scale habitat corridors were identified in reports, including those produced by Cornell University, MCA, and Hudsonia. However, there was inadequate staffing and a current lack of methodologies for verifying conservation of local-scale migration routes.

- Done
- Underway
- Not started

Target 4. Establish a plan for assessing progress in conservation of native wildlife and habitats and begin monitoring progress.

Status: Working with the Hudson River Estuary Program, Cornell University developed a wildlife monitoring plan for the Hudson Valley and began monitoring breeding bird populations, land-use change, and the relationship between habitat modification and population trends starting in 2006. The Monitoring Program developed and piloted approaches for tracking species of conservation concern in the Hudson Valley that will be useful statewide. In 2008, Hudson River Estuary Program funds leveraged \$140,000 of federal State Wildlife Grants to continue piloting the monitoring program in the Hudson Valley.

- Done**
- Underway**
- Not started**

Target 5. Train 50 educators and 150 community leaders to recognize and understand native wildlife and habitat, and to effectively communicate their importance to decision-makers.

Status: The Hudson River Estuary Program and program partners, especially Hudsonia and Cornell University, educated over 2,000 community leaders (e.g., members of planning boards and environmental commissions, elected officials, etc.) to build understanding and capacity in biodiversity conservation and land-use planning. For example:

- Nearly 100 community leaders completed a 10-month Biodiversity Assessment Training offered in partnership with Hudsonia, in which they mapped nearly 58,000 acres of habitat in their communities, and 120 completed a 3-day Biodiversity Assessment short course. A Biodiversity Conservation Roundtable was held annually to encourage information transfer and networking between participants since the training began in 2001.
- 111 people were trained in the use of Geographic Information Systems (GIS) by faculty of Cornell University's Institute for Resource Information Sciences (IRIS), to increase their capacity to include digital maps and data in environmental review and planning.
- Nearly 200 planning board members attended a 2 or 4-hour training workshop on planning for biodiversity and/or using SEQRA more effectively to conserve habitat in the Hudson Valley.

- Done**
- Underway**
- Not started**

Target 6. Develop information and train public land managers to incorporate biodiversity into management plans.

Status: Since 2005, DEC and NYS Office of Parks, Recreation, and Historic Preservation (OPRHP) have hired biologists to enable both agencies to better conserve biodiversity on state land. The biologists manage invasive species and deer, restore critical habitats, and help update

public land management plans. In addition, the Hudson River National Estuarine Research Reserve coordinated trainings for Hudson River shoreline land managers, both public and private. Workshops on invasive and native plants, Canada goose management, ecosystem-based management, and managing visitors and recreational activity were completed by 785 land managers.

- Done**
- Underway**
- Not started**

Target 7. Develop strategies to promote additional wildlife-related recreation.

Status: Strategies developed include promoting hunter access on some state and locally owned park land (including parts of Minnewaska State Park Preserve and some Westchester County Parks), supporting the development of a Hudson River Birding Trail (www.hudsonriverbirdtrail.org), and creating additional access through an active land acquisition and easement program.

- Done**
- Underway**
- Not started**

Target 8. Develop strategies to prevent invasive and exotic species from being established in order to protect native species of plants and animals.

Status: This target is implemented by DEC's Office of Invasive Species Coordination (created in 2007). The mission of the program is to prevent or minimize the harm caused by invasive species on New York's environment by collaborating and coordinating efforts with all stakeholders across the State. This office works with local Partnerships for Regional Invasive Species Management (PRISMs), including three active in the Hudson River estuary watershed, the Lower Hudson PRISM, Catskill Regional Invasive Species Partnership (CRISP), and the Capital-Mohawk PRISM. These local partnerships will coordinate invasive species management including recruiting and training citizen volunteers, identifying and delivering education and outreach, establishing early detection monitoring networks and implementing direct eradication and control efforts.

- Done**
- Underway**
- Not started**

Target 9. Develop efficient methods to gather information on the status of plants and animals throughout the Hudson Valley and provide updated information to local conservation partners.

Status: With Hudson River Estuary Program funding, the New York Natural Heritage Program (NYNHP) has mapped and recorded an additional 841 occurrences of plants, animals, and natural communities since 1997 in the 10 counties of the Hudson Valley north of NYC. Overall,

the Heritage database contains 2,687 records for the Hudson Valley. From 2005 to 2009, NYNHP answered nearly 2,500 requests for information on locations of rare species and significant natural communities. Many of these requests came from municipalities during environmental project review, or from project applicants at the direction of municipalities.

Shrubland bird surveys were conducted in 2008 to assess habitat suitability, and a marsh bird sampling framework was piloted in 2009 in collaboration with DEC and USFWS to answer questions on the status and distribution of wetland-dependent species.

Citizen scientists were trained and began tracking the Hudson Valley's diverse and declining populations of calling frogs and toads. The data collected feeds into the national database of the North American Amphibian Monitoring Program. In 2009, over 120 citizen scientists collected data on calling frogs and toads between March and July. Citizen scientists were also recruited to contribute to our understanding of spring amphibian migrations, in a new project piloted in 2009. Over 30 volunteers reported on 40 road crossings where 16 amphibian species were observed, totaling 1,143 live frogs, toads, and salamanders, and 566 dead on road.

New methods for prioritizing field survey to complete habitat maps and improve efficiency were piloted in the Walkkill River Valley by the NY Natural Heritage Program in collaboration with the Orange County Land Trust. This work improved methods for classifying woodland pools that are habitat for uncommon and rare species.

Maps of important areas for maintaining rare and uncommon species and ecosystems have been distributed to local partners throughout the Valley. The maps were produced by the NY Natural Heritage Program using science-based models of suitable environmental conditions.

Maps of potential and known Blanding's turtle habitats were developed for six towns in southern Dutchess County. Hudsonia produced large-scale maps and reports that towns can use to identify priority areas, develop conservation goals, and establish conservation policies and procedures to protect Blanding's turtle.

- Done
- Underway
- Not started

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 10. Enlist 1,000 partners (municipalities, businesses, non-profits, and individuals) in conserving the target habitats and representative species listed in target number 1 above.

Status: We reached 475 partners through FY 09/10 (see Target #1 above).

- Done
- Underway
- Not started

Target 11. Identify and, where possible, conserve key missing links in regional-scale wildlife migration corridors for species moving northward and to higher elevations in response to climate change.

Status: The Hudson River Estuary Program is partnering with the NY Natural Heritage Program to identify and map habitat connections for 25 wildlife species in decline. The results of this study will be shared with municipalities to identify areas most vulnerable to wildlife loss from habitat fragmentation and climate change and will inform regional open space planning. The Hudson River Estuary Program funds leveraged \$145,000 from the US Fish and Wildlife Service for these projects.

- Done
- Underway
- Not started

Target 12. Have management plans in place or updated to maintain priority biological resources on state lands.

Status: DEC and OPRHP staff biologists are incorporating biological resource protection into new and updated management plans.

- Done
- Underway
- Not started

Target 13. Promote new and improved access to 5,000 acres for wildlife-related recreation.

Status: New access was created through land acquisition and promoting hunter access on some state and locally owned park land (including parts of Minnewaska State Park Preserve and some Westchester County Parks). We were not able to track the acreage.

- Done
- Underway
- Not started

Target 14. Continually update information on important plants, animals, and habitats to support local conservation programs. Begin a woodland pool mapping and outreach program.

Status: The Hudson River Estuary Program initiated a woodland pool conservation program to increase awareness and conservation of small, isolated wetlands that support breeding by declining amphibians and the surrounding upland forest habitat. Efforts to date include:

- Web pages and fact sheets were developed and added to the NYSDEC website.
- Six woodland pool workshops were attended by 173 landowners, local leaders, foresters, educators, and environmental consultants, and presentations on pool conservation were offered at several conferences and events.
- Over 1,000 mapped pool locations were collected from conservation partners to initiate a

database to inform local planning and conservation.

- An “Amphibian Migrations and Road Crossings” project was piloted to raise awareness of amphibian ecology and habitat needs, and to engage citizen scientists in collecting data on the timing and location of spring migrations of woodland pool-breeding species.

In addition, the NY Natural Heritage Program resurveyed and updated information on 781 locations of rare plants and animals, and natural communities in the Hudson Valley.

- Done
- Underway
- Not started

Target 15. Through best development practices, incentives, education and other voluntary measures, continually improve the overall habitat quality of the Hudson Valley.

Status: We developed and began a long-term monitoring program that will track trends and develop ecological indicators of the status of biodiversity in the Hudson Valley. The results will be used to identify priority areas and develop information for policy makers, land managers, and land-use planners to improve conservation outcomes. In addition, we began spatially tracking program activities and local actions to improve our ability to meet the needs of Hudson Valley communities.

- Done
- Underway
- Not started

Accomplishments Goal 4: Streams and Tributaries of the Hudson River Estuary Watershed

Goal

Protect and restore the **streams**, their corridors, and the watersheds that replenish the estuary and nourish its web of life —a system critical to the health and well-being of Hudson Valley residents and the estuary.

Overview of Accomplishments to date

Through extensive outreach efforts, the Hudson River Estuary Program has improved the public understanding of how the Hudson Valley's streams and rivers are interconnected to the Hudson River estuary ecosystem and related conservation concerns. The Hudson River Estuary Program has assisted in establishing and supporting the development of 10 watershed conservation groups and programs on the tributaries of the Hudson. Through these efforts, a river stewardship ethic has been instilled in many Hudson Valley communities to conserve Hudson River tributaries and their watersheds. Several of these watershed partners are being supported to develop watershed conservation and management plans.

Two intermunicipal watershed agreements have been adopted. The Wappinger Creek Intermunicipal Council and Saw Mill River Coalition, comprised of local elected officials and river advocates, have signed pilot watershed "agreements" to implement water resource protection goals. Similar intermunicipal efforts are planned for the Fishkill Creek, Moodna Creek, Fall Kill Creek, Wallkill River, Rondout Creek, and other tributaries where watershed planning is underway. Education and technical assistance are delivered region-wide through watershed groups, NY Sea Grant, and our partners in County Environmental Management Councils, Cornell Cooperative Extension, Soil and Water Conservation Districts, planning departments, and water authorities.

Citizen water quality monitoring is ongoing through school and adult programs by Hudson Basin River Watch. Colleges and universities are developing and implementing programs to assess local streams, and work with local communities to advance watershed conservation. The Hudson River Estuary Program has partnered with county and local governments to identify and adopt strategies for protecting water resources, such as inclusion of water resource and stormwater management considerations in comprehensive plans, riparian and wetland buffer protection ordinances and stormwater local laws. With the issuance of new stormwater regulations, education and technical assistance programs are underway to promote compliance and to educate municipalities, developers, consultants and contractors about better design principles that can be adopted as part of a stormwater program to promote on-site water resource conservation techniques.

With assistance from the Hudson River Estuary Program, the first pilot town has adopted 22 better site-design revisions to their local codes to reduce impervious surfaces, protect natural areas and better integrate stormwater treatment in development projects.

The Hudson River Watershed Alliance (HRWA) is a regional collaboration of more than 200 organizations and agencies sharing the common goal of protecting and restoring water resources throughout the Hudson River basin. It has evolved as a key partner in conservation efforts. Another partner project is a systematic regional planning process coordinated by The Nature Conservancy to help prioritize healthy tributaries and their watersheds for more rigorous watershed protection planning and action, helping focus some resources in meeting regional Hudson River tributary goals.

A healthy estuary requires a healthy watershed containing intact riparian corridors, floodplains, wetland complexes, limited impervious surfaces, and minimal dams and barriers. Intact riparian areas along the streams are transition areas between water and land supporting a wide variety of plants and animals, such as cottonwood trees, wood turtles, stream salamanders, river otter, and a variety of birds. Rainfall that recharges groundwater also feeds wetlands in the watershed and regulates the flow of streams. When water does not reach underground aquifers due to impervious cover, habitats of the watershed suffer and less groundwater is available for drinking. Practicing good watershed protection principles also serves to advance other natural resource conservation goals and human well being.

Through a partnership with the New York State Water Resources Institute at Cornell University, the Hudson River Estuary Program has conducted training programs, watershed monitoring and increased the capacity of local watershed groups over the last four years. Through collaboration with the Pace Land Use Law Center, the Hudson River Estuary Program trained more than 120 local leaders in ways to integrate natural resource conservation into land use decision making. A volunteer stream-monitoring program through Hudson Basin River Watch has resulted in approximately 250 sites being assessed for water quality conditions by hundreds of local volunteers, students and municipal decision-makers. A stream-barrier mitigation and dam removal program is under development, with funding being pursued for feasibility studies and construction costs. Cornell faculty and institutes of higher education have been engaged to increase scientific research in local water resource management.

Watershed groups have developed five watershed conservation and management plans on the Wallkill River, Croton Bay/Indian Gorge, Fishkill Creek, Wappinger Creek, and Fall Kill Creek. Two additional watershed plans, on the Moodna Creek and Onesquethaw Coeyman's watershed, are close to final development. These seven watersheds represent approximately 1,100 square miles, or 25%, of the watershed. Over 90 municipalities have been engaged in watershed conservation and management. Additional watershed stewardship, assessment, and outreach projects are underway in another seven creeks, including the Lower Esopus, Rondout, Casperkill, Catskill, Kinderhook, Patroon, and Quassaick. These watersheds efforts have cumulatively increased awareness and knowledge of watershed protection and restoration, and results in a heightened attention to stream and river conservation through land use planning decision making. A new effort to identify and focus Hudson River Estuary Program outreach and resources on pilot watershed is underway.

Engaging more than 600 volunteers on 55 projects, the Hudson River Estuary Program's Trees for Tribes project planted more than 7,000 shrubs and trees on close to 20,000 feet of streambank in spring and fall 2009. The Hudson River Estuary Program partnered with Cornell University to carry out a riparian buffer mapping and characterization project using methods developed by Cornell University to estimate stream health and vulnerability for 30m pixels in the estuary watershed. A study was conducted on the "Trees for Tribes" program by a Cornell University graduate student, examining the program in detail, as well as, possible integration with the biodiversity program. In partnership with the Hudson River Watershed Alliance, the Hudson River Estuary Program facilitated a gathering of all the watershed conservation groups in the Hudson River watershed to document collective needs and celebrate our mutual progress of elevating watershed awareness. The Hudson River Estuary Program has provided education for 2,340 people and more than 30 local governments and watershed groups on local laws and techniques to reduce stormwater impacts on local water resources through low-impact development, better site design and floodplain management. As evidence of the success of the Hudson River Estuary Program's support to local watershed capacity building, the Saw Mill River Coalition received a Targeted Watershed Grant from EPA for \$890,000.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Assist eight community-led watershed groups in developing and implementing watershed protection and restoration plans, while engaging municipalities to take a leadership role through such measures as intermunicipal watershed agreements and incorporating water resource considerations in comprehensive plans. Encourage municipalities to take action on goals that implement local watershed plan priorities, protect the ecological health of headwater streams, revitalize urban waterways, prepare for the water-related effects of a changing climate, and address the targets of this *Action Agenda*.

Status: Seven watershed management and conservation plans have been completed for the Wappinger Creek, Fishkill Creek, Fall Kill Creek, Croton Bay/Indian Gorge, Onesquethaw Coeymans, Moodna, and Wallkill watersheds. Intermunicipal watershed agreements have been adopted for the Wappinger and Saw Mill River watersheds, as well. Approximately 90 municipalities exist within these intermunicipal watershed planning and management efforts. Over 1,100 square miles of the 5,300 square mile estuary watershed are covered by these plans.

Additional watershed assessment, outreach, and stewardship efforts are underway in Lower Esopus, Rondout, Casperkill, Patroon, Catskill, Kinderhook, and Quassaick watersheds. These early watershed efforts may lead to watershed plans in the coming years.

- Done**
- Underway**
- Not started**

Target 2. By 2007, develop a framework to collect and assess trends for measuring key tributary inputs and water quality. By 2008, begin to implement this framework to demonstrate progress in meeting long-term targets and watershed health.

Status: The Hudson River Estuary Program is working with the Hudson River Watershed Alliance to finalize a framework for integrating water quality information into land use decision making. The project identifies ways for municipal officials to use the extensive water quality and stream assessment information that has been collected over time through the Hudson River Estuary Program, DEC, and its partners. An inventory of all organizations conducting water quality monitoring and stream assessments in the estuary watershed will also be developed, including detailed information such as monitoring frequency, objective, locations, and use of data.

- Done
- Underway
- Not started

Target 3. By 2006, develop a framework for characterizing dams and other stream barriers to identify potential barrier removal and stream restoration opportunities. By 2009, implement pilot dam-removal projects, where practical for stream restoration.

Status: Working with the Student Conservation Association (SCA), a methodology was developed to identify and characterize dams and ‘hanging’ culverts on Hudson River tributaries. The methodology includes an office component using aerial photos to identify potential barriers, and a follow-up component for field verification and site characterization. The methodology was piloted on the Fishkill and Moodna watersheds. The methodology needs to be refined using new information. Pilot dam removal projects have been identified on the Rondout and Moodna Creeks and will move forward if funding becomes available and land owners signify their agreement. Negotiations and fund raising efforts are underway.

- Done
- Underway
- Not started

Target 4. By 2008, map and characterize riparian buffer health of the Hudson River estuary watershed to assist in identifying opportunities for protection and restoration. By 2009, through partnerships, implement riparian tree-planting programs where practical, including projects along urban streams.

Status: Partnering with Cornell University, the Hudson River Estuary Program applied a streamside riparian mapping model to all mapped estuary watershed streams and rivers. The model, known as, Streamside Health and Vulnerability, predicts the health of the streamside vegetation and assess the streams’ vulnerability to water quality degradation with 30 meter resolution. Results are reported in a five tiered condition gradient from excellent to poor health. 75% of the streamside buffers were characterized by the best two conditions, while 25% represented the moderate to poor characterization.

The Hudson River Estuary Program also worked with a private consultant to map riparian areas using finer resolution aerial photos and hand digitizing of varying buffer widths. Through the “Trees for Tribs” program over 130 buffer restoration projects have been completed with more

than 18,000 native plants covering over 9 miles of stream length and with the help of more than 1,500 volunteers and 100+ project partners.

- Done**
- Underway**
- Not started**

Target 5. With the assistance of the private sector and other partners, identify and catalog demonstration projects on residential, commercial and government properties, showing a variety of successful habitat restoration/conservation practices and water quantity and water quality control techniques, and establish programs to assure that key groups, including municipal officials, see them in operation throughout the Hudson Valley.

Status: Working with the Chazen Companies, the Hudson River Estuary Program inventoried and described 30 case studies of better site design and stormwater best management practices throughout the Hudson Valley. Each case study includes description of the practice, site location, design, materials used, pictures, costs, operation and maintenance, and other details. Much of this information has been uploaded to the NYSDEC website, and there is plans to upload it to the National Nonpoint Source Education for Municipal Officials (NEMO) Low Impact Development (LID) inventory website.

- Done**
- Underway**
- Not started**

Target 6. Establish and implement programs to reduce the adverse effects of stormwater runoff from impermeable surfaces. Use new and existing technologies to maintain and restore wetland and stream hydrology and recharge aquifers by retaining and managing water on site. Work with local partners in selected watersheds to develop and deliver training and assistance to municipalities on adapting to the potential effects of climate change, including the management of activities which tend to increase stormwater runoff and local flooding. Promote protection of floodplains, natural habitats, vegetated areas and groundwater infiltration through smart growth practices such as conservation design, low-impact development or better site design practices.

Status: From 2005 to 2009 the Hudson River Estuary Program reached 2,340 people through 80 presentations and workshops on stormwater management, green infrastructure, low impact development and no adverse impact floodplain management. The Hudson River Estuary Program also provided technical assistance to the DEC Division of Water, including development of the Sample Local Law for Stormwater Management, assisting with the Stormwater Guide for Local Officials, and developing additional outreach materials. A 5-year contract with the Lower Hudson Coalition of Conservation Districts provided additional outreach and technical assistance on the stormwater Phase II program in 10 counties. Better Site Design Roundtables, an innovative approach to working with local governments to change their codes, was introduced through a pilot project in two municipalities. In 2007, one of the two pilot municipalities adopted 22 out of 36 local code change recommendations by unanimous vote of the Town Board. In 2008, four estuary grants

were awarded to a total of 13 additional municipalities to conduct Better Site Design Roundtables.

- Done**
- Underway**
- Not started**

Target 7. Collaborate with builders, businesses, landscapers, other nontraditional partners, as well as county Soil and Water Conservation Districts and municipal entities to create an incentive-based recognition approach to conserve water resources and wildlife in the Hudson River Valley.

Status: The Hudson River Estuary Program gathered information on builder recognition programs across the country and in New York State and researched programs that relate to better site design, low impact development, and green building techniques. The Hudson River Estuary Program, in cooperation with the DEC Region 3 office published principles for “green site design” and has piloted their use on a voluntary basis in Region 3.

- Done**
- Underway**
- Not started**

Target 8. Train 100 educators and 150 community leaders to recognize and understand the opportunities, optional methods, and benefits of Hudson Valley community planning and management in protecting the streams and tributaries of the Hudson River estuary watershed.

Status: The Hudson River Estuary Program, through partnership with Hudson Basin River Watch, have trained over 500 citizen scientists how to monitor streams using biomonitoring criteria at over 300 sites throughout the estuary watershed. Through the Land Use Law Center’s land use leadership program, we have trained over 100 elected/appointed officials, and community watershed leaders in developing local land use strategies that are protective of natural resources.

- Done**
- Underway**
- Not started**

Target 9. Develop guidelines for local governments and regional organizations to incorporate in-stream flow needs for fish and aquatic life into their public water needs planning.

Status: The Hudson River Estuary Program contributed to the publication “Tapped-Out”, published by Trout Unlimited, which highlights a number of localized examples where human influence has created unnaturally low stream and river flow. Although this doesn’t serve as guidance for local governments, it is a good baseline of existing low flow problems where fish and aquatic life may

be impacted. At a state-level, technical guidance is being developed by DEC to protect stream flow and implement the statewide narrative flow standard.

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

The following long range targets for the period 2010-2015 will be accomplished through local partners and implementation efforts, using local watershed planning efforts and intermunicipal agreements supported by this program, in addition to other initiatives.

Target 10. By 2012, improve habitat quality and river connectivity for migratory fish spawning and/or aquatic freshwater species in at least 25 miles of new free-flowing river by removing at least 2 in-stream barriers such as dams, inadequate culverts, or other obstructions.

Status: The Hudson River National Estuarine Research Reserve, Bard College, and other partners implemented a pilot eel passage project on the Saw Kill Creek. Other dam removal and barrier mitigation projects have been pursued, and in one case for a dam on Moodna Creek, design has been completed and permits have been approved, but the dam was breached during a storm and passage has been naturally mitigated. Funding for a dam removal project on Quassaick Creek is currently being pursued, as well. The Hudson River Estuary Program is currently keeping records of known natural dam breaches. (See also Target 3 and Goal 2, Target 6)

- Done**
- Underway**
- Not started**

Target 11. By 2015, protect and restore 750 miles of forest buffers through cooperative partnerships and local land use strategies to protect habitat, reduce flooding damage, and cleanse stormwater runoff. (See also Target 4)

Status: Over 1,300 miles of buffers are now protected in the estuary watershed while more than 10 miles of buffers have been restored.

- Done**
- Underway**
- Not started**

Target 12. By 2017, maintain existing water quality in Hudson Valley streams and rivers, while restoring to "best use," 25 percent of the waters listed as "precluded" or "impaired" by non-point sources, other than air pollution and contaminated sediments, on the state's most recent (1999) Priority Water bodies List.

Status: As part of the 2010 305b/303d water body assessment report, DEC will analyze this target to see how much progress has been made.

- Done**
- Underway**
- Not started**

Accomplishments Goal 5: The Landscape

Goal

Conserve key elements of the **human, pastoral landscapes** that define the character of the Hudson River Valley and its setting of history and mystique.

Overview of accomplishments to date

In ten Hudson Valley counties, state open space programs have conserved more than 46,133 acres since 1996. Many communities are developing open space plans and several have adopted funding mechanisms to conserve local open space. Federal funds are supporting forest stewardship on about 5,000 new acres per year. Additional lands have been conserved in the five boroughs of New York City. State grant programs through the Hudson River Valley Greenway, the DOS Coastal Program, the Hudson River Estuary Program and the Office of Parks, Recreation and Historic Preservation all support these efforts.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Conserve 75,000 forested acres by working with private land owners to retain the characteristic woodland landscape. Use existing regional, state and federal forestry programs to encourage private forest landowners to: a) practice sustainable forestry, or "forest stewardship" on 45,000 additional privately owned acres over and above the 2005 baseline; b) commit 30,000 new acres to forest management through the forest tax law and other programs; and c) provide access to hunting, bird-watching and other pursuits.

Status: Federal funds are supporting forest stewardship on about 5,000 new acres per year. From 2005-2009 this amounts to about 25,000 acres.

- Done**
- Underway**
- Not started**

Target 2. Support the development of a statewide cost-sharing program for private forest landowners—as recommended in the 2002 Open Space Conservation Plan—to obtain professionally developed "Forest Stewardship Management Plans" for their properties. Implement stewardship management practices to conserve and enhance forest resources, water quality, wildlife habitats, biodiversity, and aesthetic qualities.

Status: Statewide funding has not been made available for this target; however, federal cost share programs such as the Environmental Quality Incentives Program provide cost-sharing funding to landowners to implement stewardship projects.

- Done
- Underway
- Not started

Target 3. Retain the traditional agricultural landscape through the efforts of the State Department of Agriculture and Markets in supporting the viability of agriculture with regional, state and federal agriculture programs, including farmland preservation and stewardship programs.

Status: The Environmental Protection Fund continues and has included funding for both farmland preservation and stewardship programs for all state fiscal years from 2005 to 2009. Since the inception of this program in 1996, DEC has awarded nearly \$80 million to protect approximately 36,000 acres on 200 farms in 18 counties.

- Done
- Underway
- Not started

Target 4. Develop new tax incentives to encourage sustainable conservation management of private lands, and encourage landowners to more fully utilize existing incentive programs.

Status: A state conservation easement tax credit was passed in 2006 and has been implemented to provide an up to \$5,000 tax credit to offset the property tax burden of landowners who donate a conservation easement to a qualifying organization.

- Done
- Underway
- Not started

Target 5. By 2006, reach the goal established in 1996 of acquiring 4,000 acres along or in sight of the Hudson River, and by 2009, working with many partners, protect 2,000 additional such acres. Prioritize conservation of parcels that provide north-south connectivity between larger habitat areas or conserve natural shoreline.

Status: Since 1996 more than 3,500 acres of land along or in sight of the Hudson have been conserved. A list of these protected properties is available online. The Hudson River Estuary Program expanded GIS map coverage to include a data layer of the viewshed of the Hudson River, which can be combined with existing Scenic Areas of Statewide Significance data to identify potentially valuable acquisition target areas. In addition, more comprehensive records of lands currently protected by both public and private conservation organizations are being gathered and entered

into the GIS database. This will facilitate the analysis of sites which can help maintain habitat connectivity throughout the region.

- Done
- Underway
- Not started

Target 6. In partnership with local government, land trusts and others, permanently protect 40,000 acres of open space for wildlife-related recreation and for conservation of biodiversity, scenery and landscape character in the greater Hudson Valley, in addition to those protected from 1996-2006. Prioritize conservation of parcels that provide north-south connectivity between larger habitat areas or conserve significant ecological communities or pastoral landscapes.

Status: In the ten Hudson Valley counties that border the estuary north of New York City to the Troy dam, state open space programs have conserved more than 46,133 acres since 1996 including more than 3,500 acres of land along or in sight of the Hudson referenced in Target 5 above. Additional lands have been conserved in the five boroughs of New York City.

- Done
- Underway
- Not started

Target 7. Continue the Hudson River Estuary Grants Program support for local acquisition and open space planning by municipalities and conservation groups and for development of local open-space plans, site stewardship management plans, and local codes and ordinances that will allow the landscape objectives to be achieved.

Status: Since 1999, more than \$1.4 million dollars have been awarded in estuary grant funds for the protection of habitat, scenic resources and open space. Additional estuary grant funding has supported other objectives of the *Action Agenda*. Eight acquisition-easement grants projects have been completed or are underway to help protect valuable local open space resources. State grant programs through the Hudson River Valley Greenway, the state Coastal Program, the Hudson River Estuary Program, the Office of Parks Recreation and Historic Preservation and the New York State Conservation Partnership Program (administered by the Land Trust Alliance) all support these efforts.

- Done
- Underway
- Not started

Target 8. By 2009, 20 percent of Hudson River Valley communities' counties will have developed and implemented local open-space protection programs consistent with the state Open Space Conservation Plan.

Status: Another nine communities have completed or are developing open space plans through the Estuary Grants Program and several others have adopted funding mechanisms to conserve local open space.

- Done
- Underway
- Not started

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 9. Ensure that by 2020, at least 50 percent of Hudson River Valley communities develop and implement local open-space protection programs consistent with the state Open Space Conservation Plan.

Status: See target 8.

- Done
- Underway
- Not started

Target 10. By 2020, working with land trusts and local governments and using a combination of fee, easement and other conservation mechanisms, protect 200,000 acres in the greater Hudson Valley for wildlife-related recreation and for conservation of biodiversity, scenery and landscape character, and working farms, of which at least 10,000 acres should be along or in sight of the Hudson River. Prioritize conservation of parcels that provide north-south connectivity between larger habitat areas.

Status: See target 6.

- Done
- Underway
- Not started

Accomplishments Goal 6: River Scenery

Goal

Conserve the key features of the world-famous **river scenery**—the inspiration for the Hudson River School of American painting and for the tales of Washington Irving—and provide new and enhanced vistas where residents and visitors can enjoy Hudson River views.

Overview of accomplishments to date

This project focuses on views of and from the Hudson River. Since 1996, more than 3,500 acres of land along or in sight of the Hudson have been conserved through state open space programs. Hudson River Estuary grants to partner organizations have supported 9 vista projects, including: viewshed analyses for Olana State Historic Site, vista restoration for the historic Wilderstein property, Manitoga, Chapel of Our Lady (Putnam County), Untemeyer Park and Gardens, Village of Buchanan Walking Trail, NY Restoration Project: Harlem River Highbridge Park, Town of Cortlandt: Hillpoint Park, and removal of derelict utility poles along the Metro-North Hudson River railroad tracks. New York State has permanently protected 3,500 acres of Hudson River shoreline property since 1996. The Thomas Cole historic site has started to develop an inventory of vistas painted by the Hudson River School of Painters, as well as other areas of environmental and scenic significance.

The Hudson River Valley Greenway is working with NYSDOT and the Federal Highway Administration National Scenic Byways Program to explore the potential for a system of scenic byways in the Hudson River Valley. The NYSDOS Coastal Program encourages protection of scenic resources as a critical component of waterfront development, and continues to apply the coastal consistency requirements on scenic protection in the Hudson River Valley.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Encourage 15 municipalities to develop programs to inventory and protect important local river vistas.

Status: The NYSDOS Coastal Program continues to fund Local Waterfront Revitalization Programs which encourage protection of scenic resources as a critical component of waterfront development, and to apply the coastal consistency requirements on scenic protection in the Hudson River Valley. Since 1996, nine LWRPs have been fully approved. In addition, two new LWRPs, and four LWRP amendments, are underway.

- Done**
- Underway**
- Not started**

Target 2. Continue the annual Hudson River Estuary Grants Program support for local projects that protect or enhance scenic river vistas and promote the conservation of the scenic quality of the river.

Status: Grants to partner organizations have supported viewshed analyses/restoration projects for nine scenic vista sites including; Olana State Historic Site, the historic Wilderstein property, Manitoga, Chapel of Our Lady (Putnam County), Untemeyer Park and Gardens, Village of Buchanan Walking Trail, NY Restoration Project: Harlem River Highbridge Park, Town of Cortlandt: Hillpoint Park, and the removal of derelict utility poles along the Metro-North Hudson River railroad tracks.

- Done**
- Underway**
- Not started**

Target 3. Protect key scenic properties, as described under the “Landscape” goal.

Status: New York State has permanently protected 3,500 acres of Hudson River shoreline property since 1996. See Goal 5 target 3.

- Done**
- Underway**
- Not started**

Target 4. Develop a program to designate and conserve 400 scenic viewpoints of the Hudson Valley by the 400th anniversary of Henry Hudson’s voyage.

Status: Due to state fiscal issues resources for this target were not available.

- Done**
- Underway**
- Not started**

Target 5. Through partnership with the Hudson River Valley National Heritage Area, develop an inventory of the key vistas painted by the Hudson River School of Painters and viewsheds associated with public recreational and historic sites, and develop a program for their conservation.

Status: The Thomas Cole Historic Site has started to develop an inventory of vistas painted by the Hudson River School of Painters.

- Done**
- Underway**
- Not started**

Target 6. Provide training and technical assistance for local government in the use of tools for scenic conservation.

Status: The Hudson River Valley Greenway is working with NYSDOT and the Federal Highway Administration National Scenic Byways Program to explore the potential for a system of scenic byways in the Hudson River Valley. The NYSDOS Coastal Program continues to fund Local Waterfront Revitalization Programs which encourage protection of scenic resources as a critical component of waterfront development, and to apply the coastal consistency requirements on scenic protection in the Hudson River Valley.

- Done**
- Not started**
- Not started**

Target 7. Secure the conservation of one or more key scenic vistas, and showcase the community river vistas that have been protected.

Status: In 2008, DEC acquired 320 acres of the Livingston property in the Town of Livingston which provides scenic vistas and protects the view from Catskill Point.

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 8. By 2012, implement the program to designate and conserve 400 scenic viewpoints of the Hudson Valley, and designate an additional 600 scenic viewpoints.

Status: See Target 4.

- Done**
- Underway**
- Not started**

Target 9. By 2015, conserve the key viewsheds from publicly accessible parks and historic sites, and their cultural landscapes and set a long term target of permanently conserving 25 vistas painted by the Hudson River School of Painters.

Status: See Target 5

- Done**
- Underway**
- Not started**

Accomplishments Goal 7: Public Access

Goal

Establish a **regional system of access** points and linkages so that every community along the Hudson has at least one new or upgraded access point to the river for fishing, boating, swimming, hunting, hiking, education, or river watching.

Overview of accomplishments to date

Since 1996, improvements for river access are underway or complete in virtually all river communities, and plans are in place to fully meet this access goal in the next few years. Trailered boating access has been created or upgraded at 10 locations. New boating access sites have been established at Haverstraw, Schodack and Bethlehem. Upgraded sites for trailered boat launching include Beacon, Newburgh, Peekskill, Athens, Coxackie, Norrie Point and Yonkers. Access for small craft has been established at 14 locations including several in NY Harbor. Nine projects to create access across the railroad tracks are underway or completed. A study of potential sites for swimming beaches has been completed. Improvements to Kingston Point beach are now completed, and a new floating swimming pool for toddlers is actually used in Beacon. Two new fishing piers have been opened, one in Irvington and one in Rensselaer and three others are in the planning, design or construction phases. Fishing access has been mapped along the entire estuary and the information is available on-line. The Hudson River Greenway Water Trail is nearing completion, and 190 miles of the riverside hiking trail have been designated by the Hudson River Valley Greenway. In addition, fishing and water quality management targets have improved conditions for fishing and swimming.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Improve public access to the water and the shoreline so that by 2009 every river community has at least one new or improved access opportunity.

Status: Since 1996, improvements for river access are underway or complete in virtually all river communities, and plans are in place to fully meet this access goal in the next few years.

- Done
- Underway
- Not started

Target 2. By 2008, survey and map current public access points along the river and tidal portions of the tributaries. Make this information available to the public and update on a regular basis. Identify locations where additional access is needed.

Status: A map of river access is available on CD and is posted online at <http://www.dec.ny.gov/lands/41728.html>.

- Done**
- Underway**
- Not started**

Target 3. In addition to sites already improved since 1996, create and/or upgrade at least four boating access sites in areas of greatest need to support trailer and hand launching as well as community boating needs, such as floating docks in New York City, rowing facilities for crew, and docking for educational and research purposes using grants and municipal agreements.

Status: New access for trailered boat launching is now available at Bethlehem, Schodack Island State Park, and Haverstraw. Improved access for trailered launching is complete at Newburgh, Peekskill, Athens, Coxsackie, Norrie Point, Beacon and Yonkers. New small craft access is Glasco, Ingalls Avenue, Cold Spring, Little Stony Point and Normanskill Car Top Launch as well as numerous locations in NY harbor. More than four of these were funded or built since 2005.

- Done**
- Underway**
- Not started**

Target 4. By 2008, develop and implement plans for a system of fishing access sites. Continue to educate the public about safe fishing practices, including health advisories.

Status: Educational signage is now in place.

- Done**
- Underway**
- Not started**

Target 5. Identify potential swimming areas, and provide assistance to interested partners in developing those sites for such use.

Status: A feasibility study is complete and is posted online <http://www.dec.ny.gov/lands/5452.html>. Funding assistance has enabled beach improvements in Kingston and a floating swimming pool for toddlers at Beacon.

- Done**
- Underway**
- Not started**

Target 6. By 2009, substantially complete the Greenway Water Trail for small non-motorized water craft, with one launch site at least every 10 miles and one camping /overnight accommodation site every 15 miles on each shore, and by 2009, relying on voluntary

agreements, add 30 miles of riverside trails and 30 miles of countryside corridor and connector trails to the Hudson River Greenway Land Trail system.

Status: The Hudson River Greenway Water Trail is substantially complete on the Hudson River estuary, although a gap remains due to the security zone around West Point Military Academy. Since January 2005 the Greenway has added 78.53 miles of riverside trail and 11.53 miles of Countryside Corridor and Connector Trail to the Greenway Land Trail System.

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 7. Work with landowning state agencies to coordinate management objectives of all state-owned property on or in sight of the Hudson so that habitat and recreational needs are met.

Status: In 2009, landholding agencies met to address opportunities for coordinated land management. Non-profit landholding entities also participated. Recent travel restrictions make action on this goal difficult to achieve at this time.

- Done**
- Underway**
- Not started**

Target 8. Develop a plan for new shoreline access points across the railroad tracks, and implement feasible projects. Fully use the public-trust doctrine where applicable.

Status: In cooperation with NYS DOT, CSX and waterfront communities, progress is underway to create safe signalized crossings in the high speed rail corridor. At Tivoli, plans for new access across the tracks are likely to be implemented soon.

- Done**
- Underway**
- Not started**

Target 9. Establish new or upgraded recreational boating access where feasible, focusing on areas of greatest need.

Status: New boating access is under development in Troy. State grants continue to fund access for boat launching where the community seeks to develop it.

- Done**
- Underway**
- Not started**

Target 10. Establish a network of fishing access sites linked, where possible, to public transportation. Establish at least one shore fishing access per 10 miles.

Status: Transit oriented development is underway. Many river communities, are providing new fishing access opportunities as part of waterfront plans.

- Done
- Underway
- Not started

Target 11. Double the number of public swimming beaches on the Hudson, and improve facilities at the four existing beaches including bath houses.

Status: The opportunity to increase the number of swimming access sites on the Hudson has increased with the successful pilot of the River Pool at Beacon. Floating pools can be scaled up to be usable at many other locations. Facilities at Kingston Point have been improved with new beach cleaning equipment and a pavilion for shade.

- Done
- Underway
- Not started

Target 12. Create 5 new shoreline access points across the railroad tracks.

Status: See Target 8

- Done
- Underway
- Not started

Target 13. Relying on voluntary agreements, complete the Hudson River Valley Greenway Land Trail on both sides of the river from Waterford to Manhattan, and promote use of the paddle craft Greenway Water Trail, as a segment of a statewide Blueway Trail System.

Status: The Greenway has added almost 79 miles of riverside trail. The Greenway aggressively markets the Hudson River Greenway Water Trail via website, interactive Google Maps trail mapper, Facebook, outreach to media sources, and through events including the Great Hudson River Paddle and the Hudson River Valley Ramble. (See also Target 6)

- Done
- Underway
- Not started

Target 14. Develop standards for improvements at access points to insure that new facilities and /or upgrades to facilities are designed to withstand projected increases in shoreline flooding events due to climate change.

Status: Until projections for Sea Level Rise are refined, this project is on hold.

- Done
- Underway
- Not started

Accomplishments Goal 8: Education

Goal

Promote **public understanding of the Hudson River**, including the life it supports and its role in the global ecosystem, and ensure that the public understands the challenges the Hudson River faces and how they can be met.

Overview of accomplishments to date

Since its inception, the Hudson River Estuary Program has made great strides in better understanding many aspects of the estuary and its surroundings including its fish, its wetlands, the river's bottom, and the rich biodiversity of the landscape. Through our education programs, the active participation of citizens, river users, scientists and community leaders is being engaged. Information gathered by the Hudson River Estuary Program is now readily accessible to the public and local community leaders in formats that are user-friendly. Technical assistance is now available to land managers, local governments and others to develop creative solutions to complex issues at the local level.

Since 1996, the Hudson River Estuary Program has provided technical assistance and funded nearly 50 projects to develop a network of environmental education centers along the Hudson with high quality exhibits, facilities and programming. By coordinating river-wide efforts, such as the "Day in the Life of the River" and providing up-to-date scientific information about the river to valley educators, the Hudson River Estuary Program is enhancing the quality of river teaching and making it easier for our partners to share resources and learn from each other. Estuary grant support has broadened capacity for river education at more than 20 sites, and classroom programs are underway in 40 Hudson Valley schools. In addition, partnerships have been established with academic and research institutions to strengthen these efforts.

Standards-based curriculum materials are being developed by the Hudson River Estuary Program and its partners, including, among others, the "Teaching Hudson Valley" initiative of the Hudson River Valley National Heritage Area. The Hudson River National Estuarine Research Reserve is making data collected at reserve sites available to schools through innovative electronic portals and is helping them use this information in science programs. DEC's education sites at the Five Rivers and Stony Kill Education Centers are supporting Project WET/WILD, host AmeriCorps interns, and offer educational programs every year through the Student Conservation Association.

Status of specific accomplishments in meeting 2005-2009 targets

Target 1. Establish enough riverfront field education sites and facilities so that every school district in the Hudson Valley has a place to bring students for outdoor experiences.

Status: Information in the database is being transferred to GIS layers for presentation in the program’s Hudson River access map. Of school districts bordering the Hudson, 86% have a public access point within the district. Of these sites, 44% have school staff, non-for-profit educational organization staff, or government agency staff with skills and resources to conduct Hudson River educational programming.

- Done
- Underway
- Not started

Target 2. Ensure that the public recognizes the Hudson River Estuary Program and the National Estuarine Research Reserve as reliable agency sources of accurate, current information about the river’s resources and opportunities for stewardship.

Status: At the time of completion of this report, the Hudson River Estuary Program was the first hit on a Google search on “Hudson River estuary.” Hudson River E-Almanac distribution grew from 920 in October 2005 to 2,444 as of 2/5/10. Both the Hudson River Estuary Program and the Research Reserve have gained credibility as sources of information through our rigorous scientific approach. A public opinion survey proposed to measure public knowledge of the river and the Hudson River Estuary Program was not done given the fiscal situation and the high cost of a credible survey.

- Done
- Underway
- Not started

Target 3. Develop for use by interested school districts, interdisciplinary Hudson River curriculum materials tied to state learning standards for all grade levels. By 2006, develop curriculum for grades 3-5, and test these lessons in at least one school. Provide training for teachers, and develop a plan to annually increase the number of school districts using these resources. In successive years, add curriculum for middle schools, primary grades (K-2) and relevant courses offered to grades 9-12. Encourage the use of Project WET and Project Wild. The lesson plans for grades 3-5 will be in use in 75 percent of the valley’s school districts.

Status: About two dozen lessons for grades 3-6 are posted on DEC website; more are in the pipeline. A Google search for “Hudson River lesson plans” produces our lessons as its top hit. In the 08-09 school year we identified use by 26 specific elementary schools in 13 Hudson Valley districts. Web tracking data indicates broader and expanding use: after the lessons were posted, in school year 07-08 to March, the lesson plan index page received an average of 66 visits per week. For the last three months of school year 2008-2009 and the first two of school year 2009-2010, the page received an average of 98 visits per week. In spring 2008, the most popular lesson webpage, A River Runs Through It, was downloaded 94 times in March; in November 2009 it was downloaded 212 times, but was eclipsed by the Water Cycle lesson, downloaded 213 times. While Hudson River Estuary Program staff have done some work on Grade 6-8 lessons, the HRNERR have provided key curriculum for this age group. Estuary staff are working on Grade K-2 now to provide materials for all grades in elementary schools that are making the river a

central focus of study. Two estuary grants to the Cary Institute of Ecosystem Studies for their “Changing Hudson” project resulted in creation of high school curriculum. Lessons have been disseminated in training workshops. Teachers have provided detailed evaluations of lessons prior to their posting on the web. Tracking who uses lessons downloaded from the web has been problematic. A survey was posted in January 2010, but has been little used. A “carrot” is needed to encourage teachers to fill out the questionnaire; as of February 2010, a watershed poster map is being printed to serve that purpose – it will be distributed to teachers who complete the survey.

- Done**
- Underway**
- Not started**

Target 4. Through the Hudson River Estuary Grants Program, continue to support the development or improvement of facilities and programs for place-based interpretation and education that enhance public understanding of estuary management issues and opportunities to observe and directly experience fish and wildlife, the river environment and the natural landscape.

Status: From 1999 to 2007, 117 awards (average 13 per year) totaling \$3,565,300 were made for projects in the community interpretation and education category, and 82 projects were completed by the end of 2009. In 2005, \$386,183 were awarded to 14 recipients; in 2006, \$420,000 to 11 recipients; in 2007, \$434,578 for 9 projects. The fiscal situation prevented announcement of 2008 grants after the review process was completed. In response to a request for numbers served in 2005 at facilities or in programs directly supported by estuary grant funding in the education category, recipients reported 22,794 visitors or participants; for 2009, that number was 36,627.

- Done**
- Underway**
- Not started**

Target 5. Expand annual programs such as the Hudson River Almanac and the “Day in the Life of the River” sampling event to increase public understanding of and involvement in the natural environment of the Hudson River.

Status: Day in the Life participation steadily increased over the five years: in 2005 it was ~650 at 24 sites; 2006 ~1,300 at 37 sites (in a daylong drenching downpour); in 2007 ~2,500 students from 56 schools at 50 sites; in 2008 ~2700 students from 68 schools at 53 sites; and in 2009 ~3,000 students at 60 sites from Green Island in Albany County to Breezy Point in the Rockaways, New York City, aided by 42 partnering environmental education organizations. Results have been posted on the website of the Lamont Doherty Earth Observatory of Columbia University at <http://www.ldeo.columbia.edu/edu/k12/snapshotday/>. Hudson River E-Almanac distribution was 920 in October, 2005. 1,494 in October 2007, 1,690 on 3/31/08, 2,072 on 3/31/09, and 2,444 as of 3/31/09. The number of people reached through displays at public festivals and events was approximately 20,000 annually for the five years; the largest audiences were seen at the NY Boat Show and Clearwater’s Revival. HRNERR offered canoe programs annually in spring, summer,

and fall; an average of 27 trips were offered each year. The reserve also presented Tivoli Bay Talks on a monthly basis throughout the five years.

- Done**
- Underway**
- Not started**

Target 6. Identify ways that the Hudson River Estuary Program can add value to the efforts of its education partners and implement as many of them as possible. Provide technical assistance to organizations offering education programs on the Hudson.

Status: The estuary program partnered with the National Park Service, Hudson River Valley National Heritage Area, Greenway, and Marist College on the Teaching the Hudson Valley initiative. Approximately 125 people attended Teaching the Hudson Valley’s summer teacher institute in 2005, 150 in 2006, 2007, and 2008, and 140 in 2009. Staff offered 4 Day in the Life training workshops in 2005; 6 in 2006, 2007, and 2008, and 5 in 2009. In the past staff have also produced our own day-long conferences, more recently Estuary Staff co-chaired the NYS Outdoor Education Association's annual conference in 2009, focused on the Hudson. From 2005-2009, Estuary Staff provided assistance to advisory boards/task forces for NYU’s Wallerstein Collaborative for Urban Env. Ed., the K-12 Education Taskforce for the Environmental Consortium of Hudson Valley Colleges and Universities, Clearwater, the Metropolitan Waterfront Alliance, and the education subcommittee of the Hudson River Park Estuarine Sanctuary Management Taskforce. Estuary staff also provided text and images for interpretive signs installed by the NYS Office of Parks, Recreation, and Historic Preservation on the Walkway Over the Hudson, and by the City of Peekskill at Annsville. The Hudson River Estuary Program also partnered with Project WET, DEC’s Division of Public Affairs and Education, Central Hudson, New York Sea Grant, the NY/NJ Harbor Estuary Program, and the Hudson River Research Reserve to publish a colorful children’s activity book about the river.

- Done**
- Underway**
- Not started**

Target 7. In 2009, 25 river education sites will celebrate Henry Hudson’s 400th anniversary, with special exhibits and outdoor programs. Students will compare the river today with the river that Henry Hudson saw in 1609.

Status: Overall, many more than 25 sites celebrated the Quadricentennial. Of particular note among the Hudson River Estuary Program’s efforts were two estuary grants (the Mannahatta Project of the Wildlife Conservation Society and the Albany Institute) awarded in 2006, and in 2007 a second grant to the Mannahatta Project and an award to the National Museum of the American Indian. More Quad-related grants scored well in 2008, but awards were not made due to the state fiscal crisis. In our partnership with Teaching the Hudson Valley, we addressed Fulton’s achievement

with presentations at the 2006 summer teacher institute, and Hudson's in 2007. In 2008, the Institute examined cultural and environmental impacts of European settlement.

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 8. By 2010, working with its education partners, the Hudson River Estuary Program will establish the Hudson as a national and international model for interdisciplinary environmental education. Host events that promote national or international partnerships.

Status: Presentations about A Day in the Life of the Hudson, the Hudson River Almanac, and the citizen science glass eel recruitment research project were offered at statewide, New England, and national conferences. The New York State Outdoor Educators Association annual conference in 2009 was focused on Hudson Valley environmental education programs.

- Done**
- Underway**
- Not started**

Target 9. Ensure 20 new opportunities per year for the public to experience, learn about and enjoy the Hudson River Valley's abundant and diverse natural resources.

Status: This target was met through the grants program, staff initiatives, and programming by the Hudson River environmental education network. New efforts in 2009 included the Albany Institute exhibit, interpretive signs on Walkway Over the Hudson, the NYSOEA conference focused on Hudson, Project WET Discover the Hudson booklet, sturgeon exhibit at Hudson Highlands Nature Museum, opening of Scenic Hudson's Harrier Hill Park, and more. With the Quadricentennial as the driver, the number of new programs certainly exceeded 20 this year, many not facilitated by the Hudson River Estuary Program.

- Done**
- Underway**
- Not started**

Accomplishments Goal 9: Waterfront Revitalization

Goal

Revitalize all the waterfronts of the valley so that the Hudson is once again the “front door” for river communities, where scenery and natural habitats combine with economic and cultural opportunity, public access, and lively “green ports” and harbors to sustain vital human population centers.

Overview of accomplishments to date

Interagency coordination of grant programs for economic development, parks, historic preservation, waterfront revitalization, brownfields cleanup, and water quality improvement has supported the revitalization efforts of riverfront communities and can protect the estuary by guiding new development to population centers and avoid continued sprawl into pristine areas. The NYS Department of State is working with 38 river communities to prepare and implement Local Waterfront Revitalization Programs and other planning initiatives that guide the beneficial use, revitalization, and protection of their waterfront resources. As part of this effort DOS has assisted 10 river communities to advance redevelopment plans in urban areas with vacant and abandoned waterfronts.

In addition, DOS has funded 225 Hudson River projects totaling more than \$41 million since the first Estuary Action Plan was adopted in 1996. DOS also has completed three multi-media packages featuring a new web site - www.nyswaterfronts.com, guidebooks and video. One package examines "How to Make the Most of Your Waterfront;" another is a guide to restoring abandoned buildings — "Opportunities Waiting to Happen," and a guide to preparing watershed plans was completed recently. These packages feature success stories from the Hudson River Valley.

As part of the DEC Brownfields Opportunities Areas program, conducted in partnership with DOS, 10 Hudson Valley communities have received \$1.8 million to help plan for the redevelopment of former industrial and commercial waterfronts in target communities with abandoned buildings and vacant waterfront parcels. In addition, the investigation of 21 brownfield sites is under way and remediations are underway for 5 others. DEC water quality grants for Hudson River municipalities totaling \$59.3 million have assisted with the economic growth of the valley (see <http://www.dec.ny.gov/pubs/grants.html>). DEC estuary grants have provided an additional \$11.5 million for over 342 projects, providing important local stimulus and leveraging at least an additional \$3 million. (see <http://www.dec.ny.gov/lands/5091.html>)

The Hudson River Valley Greenway has adopted “Greenway Principles for Economic Development.” It has also allocated approximately \$7 million since 1996 for projects within the legislatively defined Greenway Area, which includes the riverfront from Waterford, Saratoga

County, to the southern tip of Manhattan. Currently, 87 of 94 eligible riverfront communities and 224 riverfront and countryside communities, from a total of 259 eligible, have chosen to become designated Greenway Communities.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Advance the ten local waterfront revitalization programs (LWRPs) that are currently underway in the Hudson Valley, expand the number of communities advancing local waterfront programs and continue implementation of waterfront redevelopment plans with a focus on the cities of the Hudson Valley and on mitigating the residential housing development pressures in the valley.

Status: Since 2005, the following LWRPs are now fully approved: the Villages of Dobbs Ferry and Haverstraw, the Cities of Peekskill and Watervliet, and the Town of Rhinebeck. The DOS continues to work to advance the completion of LWRPs and LWRP amendments in six other communities.

- Done**
- Underway**
- Not started**

Target 2. Continue and expand the Greenway partnership with fellow state agencies, riverfront municipalities, and non-profit organizations to foster economic revitalization of riverfront communities. Expand access to the Hudson River through the Greenway Water Trail program for canoeists and kayakers, and through the development of the Greenway Land Trail for pedestrians, as well as through the preservation and protection of historic and cultural resources along the riverfront.

Status: The Hudson River Valley Greenway has adopted “Greenway Principles for Economic Development.” It has also allocated approximately \$7 million since 1996 for projects within the legislatively defined Greenway Area, which includes the riverfront from Waterford, Saratoga County, to the southern tip of Manhattan. Currently, 87 of 94 eligible riverfront communities and 224 riverfront and countryside communities, from a total of 259 eligible, have chosen to become designated Greenway Communities.

- Done**
- Underway**
- Not started**

Target 3. Continue to promote and advance the multi-media information packages, developed by DOS, to facilitate waterfront revitalization efforts and provide communities with essential information that can help them achieve their goals.

Status: DOS also has completed three multi-media packages featuring a new web site - www.nyswaterfronts.com, guidebooks and video. One package examines "How to Make the Most of Your Waterfront;" another is a guide to restoring abandoned buildings — "Opportunities Waiting to Happen," and a guide to preparing watershed plans was completed recently.

Whenever possible, the DOS promotes these packages when meeting with communities and waterfront groups.

- Done**
- Underway**
- Not started**

Target 4. Continue a coordinated approach to the economic revitalization of waterfronts through state grant programs, and support infrastructure needs for waterfront revitalization efforts, especially in urban areas where public access is provided. Furnish technical assistance to marinas and boat clubs in managing environmental concerns.

Status: DOS has funded 225 Hudson River projects totaling more than \$41 million since the first Estuary Action Plan was adopted in 1996. DEC has funded an additional \$1.8 million in brownfield cleanups, \$30 million in estuary grants and \$30 million in Water Quality Improvement grants for infrastructure. The Hudson River Valley Greenway has invested \$7 million for projects on the Greenway boundary.

- Done**
- Underway**
- Not started**

Target 5. Promote cleanup and reuse of six or more additional contaminated, brownfield sites affecting the Hudson estuary. Continue to encourage the participation of municipalities in the voluntary cleanup and restoration of contaminated urban waterfront sites. Provide technical and financial support to preliminary investigations and cleanups.

Status: As part of the DEC Brownfields Opportunities Areas program, conducted in partnership with DOS, 10 Hudson Valley communities have received \$1.8 million to help plan for the redevelopment of former industrial and commercial waterfronts in target communities with abandoned buildings and vacant waterfront parcels. In addition, the investigation of 21 brownfield sites is underway, and remediations are underway for 5 others.

- Done**
- Underway**
- Not started**

Target 6. Adopt urban-greening and smart-growth programs that improve the environmental quality and infrastructure of river cities and improve environmental conditions for disadvantaged populations.

Status: (See also Targets 4 & 5 for smart growth projects)

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 7. By 2015 , provide economic, scenic, ecological and recreational enhancements to riverfront sites which are being developed or redeveloped as part of a brownfield cleanup, Local Waterfront Revitalization Program or a Greenway strategy.

Status: See status updates above.

- Done**
- Underway**
- Not started**

Accomplishments Goal 10: Water Quality for Swimming

Goal

Ensure that the **Hudson River will be swimmable** from its source high in the Adirondack Mountains all the way to New York City.

Overview of Accomplishments to date

To make the river suitable for swimming the Hudson River Estuary Program and DEC's Division of Water focused on four primary areas of water quality impact: 1) need for seasonal disinfection of municipal wastewater discharges, 2) reduction of Combined Sewer Overflow (CSO) impacts through appropriate control strategies, 3) implementation and compliance with Phase II Stormwater Permit Program, and 4) support for boat pump outs in No Discharge Zones, where appropriate. Although these strategies are being applied to the entire length of the river, much of the initial efforts has focused on water quality in the Capital District Area, where stormwater and combined sewer overflows from a number of municipalities along both the Troy and Albany sides of the river continue to discharge elevated levels of pollutants into the stretch of river known as the Albany Pool.

Since 1996, \$25 million from the Clean Water/Clean Air Bond Act has been invested in municipal facilities and infrastructure, which will result in measurable improvements to water quality. Much of this funding has gone to projects in the Capital District, where water quality needs improvement to be fully protective of public bathing. The state is also working with municipalities in this reach to develop a Long Term Control Plan for Combined Service Overflows (CSOs) to improve water quality in this portion of the estuary so that it is suitable for swimming. An additional \$25 million from the 1996 Bond Act has been allocated for water quality improvements in New York harbor.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. Assess the water quality of the Albany Pool to determine the actions that would be needed to achieve swimmable waters, and to measure progress toward that goal. Sampling began in 2005 and will be conducted both before and after the implementation of water quality improvement projects by DEC.

Status: Sampling conducted from 2005 thru 2008 showed substantial pathogen pollution and established a baseline for measuring improvement. Sampling will continue during and following completion of water quality improvement projects at two transects across the river (at the Corning Preserve amphitheater and at Port of Albany). Local municipalities are in the process of evaluating CSO and WWTP loading prior to implementing WWTP disinfection. No continued

sampling was conducted in 2009 due to funding constraints. Completion of capital region dry weather improvements is planned for 2014, and repeat sampling will be conducted at that time.

- Done**
- Underway**
- Not started**

Target 2. Disinfect municipal discharges where needed to achieve swimmable water quality on the Hudson estuary from the Troy dam to New York City, as well as in the Upper Hudson above Troy. Seasonal disinfection of dry weather discharges (as needed) is to be incorporated into municipal SPDES permits by the end of 2007.

Status: All wastewater treatment plant discharges to the Hudson that require seasonal disinfection of their discharges have been identified. Although revised permit limits for disinfection at these facilities were expected to be incorporated into permits by the end of 2007, 43 of 44 revised permits have been issued as of December 2009. One permit (for GE Selkirk) is undergoing technical review. To date, eleven communities have received a total of \$4.2M for disinfection at 12 sewage treatment plants. These grant-funded projects are in various stages of completion. DEC now expects to achieve disinfection for the capital region by 2014.

- Done**
- Underway**
- Not started**

Target 3. Address impacts from CSOs through implementation of best management practices by 2006 and Long-Term Control Plans for Hudson River municipalities by 2008.

Status: Four of the 15 affected municipalities (Yonkers, Poughkeepsie, Catskill, and Hudson) have adopted/approved Long Term Control Plans in place. Plans for Newburgh, Waterford and the six Albany Pool communities are now due to be submitted in September 2010. A plan for Kingston is due November 2010. CSO controls for Coxsackie and North River (NYC) are being addressed thru Consent Orders.

- Done**
- Underway**
- Not started**

Target 4. Fully implement and ensure compliance with Phase II Stormwater Permits (MS4 and construction) for Hudson River municipalities by early 2008 and facilitate the use of rain gardens and green streets for low-cost approaches to storm water source control and groundwater recharge.

Status: Estuary staff has provided support to the DEC Division of Water for development of outreach materials, coordinating training programs, and direct technical assistance to over 75 municipalities. A US Forest Service grant project team was formed to oversee implementation

of a USFS grant to design, install and develop local stewardship support for green infrastructure projects in environmental justice areas. As of December 2009, contracts were being finalized for partner organizations in the environmental justice communities to install green infrastructure projects.

- Done
- Underway
- Not started

Target 5. Continue to support No Discharge Zone in the Hudson River estuary. Promotion of additional pump-out facilities to support this designation will continue.

Status: Funding is available and applications are being continuously accepted for eligible projects. Two projects completed in 2009 include Minisceongo Yacht Club and New Rochelle pumpout boat/facility upgrades. Five projects completed in 2008 include: Hudson Powerboat Association, Coeymans Landing Marina, Viking Boat Yard, Rondout Yacht Basin and Haverstraw Marina (upgrade). Ten projects completed in 2007 include: Cossackie Yacht Club, Cornwall Yacht Club, Dykeman Marine Group (Inwood), Half Moon Bay Marina (Croton), Front Street Marina (Newburg), Stony Point Bay Marina and Yacht Club, Broadway Landing (Troy), White Hudson River Marina (New Hamburg), Ravena-Coeymans Yacht Club, Cortlandt Yacht Club.

- Done
- Underway
- Not started

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 6. By 2020, swimming all along the Hudson River will be considered a routine and popular summertime activity, with new beaches and floating swimming pools drawing more and more New Yorkers to the Hudson waterfront each year.

Status: See target 2.

- Done
- Underway
- Not started

Accomplishments Goal 11: Pollution Reduction

Goal

Remove or remediate **pollutants** and their sources so that all life stages of key species are viable, and people can safely eat Hudson River fish, and so our harbors are free of the **contaminants** that constrain their operation.

Overview of Accomplishments to date

Through funding from the Port Authority of New York & New Jersey, DEC has completed an extensive research project studying contaminant levels in water, biota, and sediment in the estuary. A contaminant reduction model has been developed to determine the sources of contaminants and evaluate which ones would respond best to remediation efforts. The model will be used to develop total maximum daily loads (TMDLs) for the lower estuary. Design of the dredging remedy in the upper Hudson River as defined in USEPA's 2002 Record of Decision is nearing completion, and implementation of the remedy by USEPA began in 2009. The Hudson River Natural Resources Trustee Council, state and federal agencies that have a role in protecting and restoring natural resources, has been investigating injuries to fish, wildlife and other natural resources caused by PCB releases in the upper Hudson. They are coordinating their efforts to restore injured resources with the PCB clean-up project.

Status of specific accomplishments in meeting 2005-2009 Targets

Target 1. By 2007, use the model to evaluate our capability of meeting targets for the reduction of contaminants in the River. Define the work necessary to attain appropriate contaminant concentrations by 2020.

Status: CARP Model Development has been completed. Funding for re-verification and other follow-up monitoring for the CARP is being pursued. This additional monitoring is likely necessary to complete at least some of the Goal 11 Targets/Goals.

- Done**
- Underway**
- Not started**

Target 2. Complete a characterization of sediment loading to the estuary and develop regional sediment management tools by 2009. Begin to investigate how sediment movement may be affected by projected increases in sea level and storm events associated with climate change.

Status: Three stations (Hudson @ Poughkeepsie, Upper Hudson @ Waterford, Mohawk @ Cohoes) are in operation and six other tributary sites have been established, but are not presently being operated. Funding for operation of these sites is being discussed among various agencies. An accurate characterization of sediment movement through the estuary system requires sediment data from the trib sites to evaluate sediment loads from watersheds of varying land use.

- Done
- Underway
- Not started

Target 3. Improve the quality of newly deposited sediments to target levels that will be established by 2007.

Status: The Regional Sediment Management Workgroup completed a draft plan that includes 40 recommendations. Some of the recommendations have been incorporated into the HEP Action Plan.

- Done
- Underway
- Not started

Target 4. Develop the programs needed to promote soil and water management practices throughout the estuary to achieve the targets to be established by 2007. Work with three or more county soil and water agencies to reduce sediment transport in the estuary and implement sediment reduction projects and programs, especially in priority areas.

Status: Sediment monitoring network is not fully established, impacting the ability to measure progress on this target. A five-year Lower Hudson Coalition of Conservation Districts contract provided stormwater training and technical assistance to promote construction site runoff control and to increase the capacity of regulated MS4 municipalities to meet the MS4 permit requirements. However this contract ended in December 2008.

- Done
- Underway
- Not started

Target 5. Dredged sediments will be beneficially reused where such use is determined to be protective of the public health and the environment.

Status: On September 1, 1997, the Mud Dump Site, which had historically been the regional disposal site for NY/NJ Harbor dredged materials, was officially closed. Concurrent with that closure, EPA designated the former Mud Dump Site and a surrounding buffer area as the Historic Area Remediation Site (HARS) under the Marine Protection, Research, and Sanctuaries Act. The HARS site is to be capped with Harbor dredged materials that are of sufficient quality to reduce impacts at the site to acceptable levels in accordance with the governing regulations.

Presently, all dredge material generated by projects in the NY/NJ Harbor are being beneficially used at the Historical Area Remediation Site (HARS) in the NY Bight or as fill at upstream brownfields sites. Dredge material generated above the Harbor area is not currently being beneficially used.

- Done**
- Underway**
- Not started**

Target 6. Continue to systematically track down sources of contaminants in the Hudson River Estuary and monitor the response to pollution reduction activities. In particular, identify, quantify and remediate sources of contaminants of concern such as dioxin, PCBs, PAHs, metals, and pesticides. Review other chemicals that may become targets for future resolution. Work with USEPA as it guides implementation of the dredging remedy for PCB hot spots in the upper Hudson. Begin to investigate how contaminant movement may be affected by projected increases in sea level and storm events associated with climate change.

Status: DDT trackdown was conducted in the Wallkill River watershed. Results show widely diffuse sources that may be difficult to address. Dioxin trackdown was conducted in the Catskill Creek watershed. However dioxin trackdown efforts have more recently been directed to reducing emissions from burn barrels and resulting impacts. No additional trackdown efforts are currently underway.

- Done**
- Underway**
- Not started**

Target 7. Evaluate opportunities and develop a plan to reduce contamination at the source which will facilitate future navigational dredging of New York Harbor and other ports on the estuary and minimize the uptake of these chemicals into the food chain.

Status: The New York Academy of Sciences has identified five (5) chemicals (mercury, cadmium, PCBs, dioxins, and PAHs) of greatest concern. One result of this effort has been some contribution to achieving recent regulations requiring dentists to install mercury traps. The NYAS project is now complete and the results are being incorporated into the Harbor TMDL development process. TMDLs for appropriate contaminants in New York Harbor waters (extending into the Hudson estuary) are being considered by USEPA, New York and New Jersey.

- Done**
- Underway**
- Not started**

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 8. By 2020, sediment hot spots, and point and non-point sources of contaminants entering the estuary will be reduced, such that levels of toxics in newly-deposited sediments do not inhibit a healthy thriving ecosystem and can be dredged and beneficially reused with little or no treatment required.

Status: The results of the CARP model (see Target 1) indicate that dredging and removal of upper Hudson PCBs is the most significant action needed. A pilot project has been completed by GE and next steps are being evaluated.

- Done
- Underway
- Not started

Target 9. By 2020, the quantity of sediments entering the estuary system will support the ecological health of the estuary, including protection of shallow water habitats, such as oyster reefs, without impairing navigational activities.

Status: (See targets 2 & 3)

- Done
- Underway
- Not started

Accomplishments Goal 12: Celebrate Progress and Partnerships

Goal

Track our progress and **celebrate** our successes!

The Hudson River ecosystem is going through a period of profound change. Today, we are in a better position to track these changes than ever before. In partnership with regional academic and research institutions, DEC is poised to strengthen the scientific foundation of the Hudson River Estuary Program, to make the Hudson a model for scientific management through productive partnerships.

The “*Hudson River Estuary Action Agenda 2005-2009*” offers a combination of ways that the program’s successful achievements can be viewed and celebrated. The first step will be to work with our partners to develop a set of monitoring stations along the river to track critical components of the Hudson River ecosystem such as dissolved oxygen and water temperature. Scientific information gathered by the program’s many studies will be presented in an understandable format, allowing the public to monitor progress, evaluate effectiveness of the program, and participate in future decision-making exercises to help guide the program. Celebrations such as National Estuaries Day will continue to bring heightened attention to the Hudson River and its many values. The 2009 Hudson Fulton Champlain Quadricentennial, offered a unique opportunity to celebrate our accomplishments and pass on legacy projects, securing the future of the Hudson River for generations to come.

Overview of Accomplishments to date

To date, the Hudson River Estuary Program has dedicated nearly 20 years to intensive research, adaptive approaches to management, public outreach and the development of partnerships with both state and federal agencies, local governments, and other involved groups and organizations, all for the betterment of the Hudson River estuary and its surrounding watershed lands. Indeed, we have much to celebrate, as we have described in the preceding pages.

Status of accomplishments in meeting 2005-2009 Targets

Target 1. Partner with the Hudson-Fulton-Champlain Celebration Commission to identify opportunities to celebrate conservation accomplishments for the Hudson in 2009.

Status: The Quadricentennial provided dozens of events, exhibits and programs to celebrate our accomplishments.

- Done**
- Underway**
- Not started**

Target 2. By 2006, complete the planning for a long-term program to track progress on the goals set for the river and to allow the public to follow our efforts.

Status: Performance measures were adopted and tracked.

- Done**
- Underway**
- Not started**

Target 3. By 2008, work with our partners to gather appropriate real-time, internet accessible monitoring data from the Hudson River. Support the efforts and report the findings of multiple partner organizations that conduct river monitoring activities, and link Hudson Valley monitoring to emerging national monitoring systems.

Status: The Hudson River Environmental Conditions Observing System (HRECOS) is now up and running supported by the DEC, the Hudson River Estuary Program, National Estuarine Research Reserve System, Lamont Doherty Earth Observatory, Hudson River Foundation, USGS, and The Cary Institute of Ecosystem Studies. The system can be visited at www.HRECOS.org.

- Done**
- Underway**
- Not started**

Target 4. By 2009, gather and analyze available information on indicators of change over time in the Hudson River watershed, as was done for the NY-NJ Harbor Estuary. Make a summary report on the “State of the Hudson” available on our website.

Status: The 2009 “State of the Hudson Report” was released in June 2009 at the River Summit at West Point.

- Done**
- Underway**
- Not started**

Target 5. By 2008, develop an information and data management system to ensure that the databases and reports generated by Hudson River Estuary Program projects are readily available to our partners and the public. Develop strategies to foster greater integration between program projects.

Status: A simplified data collection system to gather and archive information about completed projects funded by the Hudson River Estuary Program has been established.

- Done
- Underway
- Not started

Target 6. By 2006, report on 10 years of progress since the first Hudson River Estuary Action Plan was adopted in 1996.

Status: The “Ten Year Report” was released in 2006.

- Done
- Underway
- Not started

Target 7. Annually celebrate National Estuaries Day (the 4th Saturday in September) with Hudson River activities.

Status: National Estuaries Day is celebrated every year as part of the Hudson River Valley Ramble with special estuary themed events.

- Done
- Underway
- Not started

Status of Accomplishments in meeting long range 5-15 Year Targets

Target 8. By 2010, develop funding mechanisms to establish long term collection of scientific information that is needed to support management decisions and to develop public understanding of the need for management action.

Status: We continue to work with our partners to establish long term funding mechanisms, however, the state fiscal crisis has prevented significant progress in this area.

- Done
- Underway
- Not started

Target 9. By 2010, enlist 1,000 partners (municipalities, businesses, non-profits, and individuals) in implementing this *Action Agenda*. Ensure that our partners represent the diversity of the Hudson Valley.

Status: The Hudson River Estuary Program has over 500 partners to date and the list keeps growing.

- Done
- Underway
- Not started

Appendix A – Summary Table Status of Targets 2005-2009

	Done	Underway	Not Started
GOAL 1			
Target 1		√	
Target 2	√		
Target 3	√		
Target 4	√		
Target 5	√		
Target 6	√		
Target 7		√	
Target 8	√		
Target 9			√
GOAL 2			
Target 1		√	
Target 2	√		
Target 3	√		
Target 4		√	
Target 5	√		
Target 6	√		
Target 7	√		
GOAL 3			
Target 1	√		
Target 2	√		
Target 3		√	
Target 4	√		
Target 5	√		
Target 6	√		
Target 7	√		
Target 8	√		
Target 9		√	

	Done	Underway	Not Started
GOAL 4			
Target 1	√		
Target 2		√	
Target 3	√		
Target 4	√		
Target 5	√		
Target 6	√		
Target 7	√		
Target 8	√		
Target 9	√		
GOAL 5			
Target 1		√	
Target 2		√	
Target 3		√	
Target 4	√		
Target 5		√	
Target 6		√	
Target 7		√	
Target 8		√	
GOAL 6			
Target 1	√		
Target 2	√		
Target 3		√	
Target 4			√
Target 5		√	
Target 6	√		
Target 7	√		

	Done	Underway	Not Started
GOAL 7			
Target 1		√	
Target 2	√		
Target 3	√		
Target 4	√		
Target 5	√		
Target 6	√		
GOAL 8			
Target 1		√	
Target 2	√		
Target 4	√		
Target 5	√		
Target 6	√		
Target 7	√		
GOAL 9			
Target 1	√		
Target 2	√		
Target 3	√		
Target 4	√		
Target 5	√		
Target 6	√		
GOAL 10			
Target 1	√		
Target 2		√	
Target 3		√	
Target 4		√	
Target 5	√		

	Done	Underway	Not Started
GOAL 11			
Target 1		√	
Target 2		√	
Target 3		√	
Target 4		√	
Target 5	√		
Target 6		√	
Target 7		√	
GOAL 12			
Target 1	√		
Target 3	√		
Target 4	√		
Target 5		√	
Target 6	√		
Target 7	√		
	Done	Underway	Not started
Total	57	29	2

