

**Exhibit B (Part 2) to
New York Attorney General's
Comments dated March 30, 2018**

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

-----X
STATE OF NEW YORK,

Plaintiff,

**DECLARATION
OF WILLIAM
RUDGE**

v.

UNITED STATES ARMY CORPS OF ENGINEERS; et al.,

CV-11-2599
(Garaufis, J.)
(Pollak, M.J.)

Defendants,
-----X

WILLIAM RUDGE states as follows:

1. I am the Natural Resource Supervisor for Region 3 of the New York State Department of Environmental Conservation (“New York DEC” or the “Department”), and submit this declaration in opposition to defendants’ motions for dismissal and/or summary judgment and in support of plaintiff State of New York’s cross-motion for summary judgment.

2. This declaration is based on my personal knowledge concerning the Upper Delaware River acquired in my position with the New York DEC and as the New York State representative to the Upper Delaware Council, a partnership of local, state, and federal governments and agencies which help manage and protect that waterbody.

3. The purpose of this declaration is to explain New York’s concrete interests in the environment and natural resources of the Upper Delaware River within the Basin which are at risk of injury because of the federal agencies’ failure to perform environmental review pursuant to the National Environmental Policy Act of 1969, 42 U.S.C. § 4321 et seq. (“NEPA”).

A. Background and Qualifications

4. I have been employed by New York DEC since 1985 in positions of increasing responsibility within the field of natural resource management, after receiving a Bachelor of Science Degree in Natural Resources Management from Colorado State University. Since 2001, I have served as Natural Resources Supervisor for the Department's Region 3, a seven-county area that includes the Upper Delaware River and other portions of the Delaware River Basin in New York. In this position, I supervise eight program managers and a staff of fifty employees in programs designed to protect New York's wildlife, forests, fisheries, and habitat within Region 3. As part of my job, I act as New York's representative on the Upper Delaware Council.

B. The Upper Delaware River

5. The 78-mile Upper Delaware runs from Hancock to Port Jervis along the border between New York and Pennsylvania, with the portions of the River lying north and east of its midpoint lying within New York. The River is renowned for its scenic beauty, wildlife, and unique recreational opportunities. In 1978, a 73.4 mile portion of the River was designated by Congress as the "Upper Delaware Scenic and Recreational River" under the Wild and Scenic Rivers Act of 1968, 16 U.S.C. § 1271 et seq. ("the Act").

6. The exceptional nature of the River is underscored by the fact that of the 3.5 million miles of rivers within the Nation, only about 12,600 miles of rivers (or one-quarter of one percent) have been designated for protection under the Act. (See DRBC, "The Delaware River Basin," <http://www.nj.gov/drbc/thedrb.htm>, attached as Exhibit A.) The Superintendent of Defendant National Park Service ("NPS"), who administers the "Upper Delaware River Scenic and Recreational River" under the Act, described it as "one of the most beautiful places in the

world.” (See Upper Delaware Council and NPS, “Partnering to Protect the River,” October 2008, p.2., attached as Exhibit B)

7. The River is noted for its tranquil scenic beauty, with forested hills rising along its banks, along with hillside fields and pastures, and villages on the valley floors. The Delaware River Gorge, through which the River flows, has been identified as an outstanding scenic geologic feature by the Pennsylvania Geological Survey, and the New York Legislature has designated the highway which runs along the River within the State as a “New York Scenic Byway” because of the spectacular vistas it affords travelers.

8. The River is also unique for the habitat it provides for fish and other wildlife. The River’s basin serves as home to diverse populations of reptiles, amphibians, mammals and birds, including the bald eagle and over 200 species of migratory birds.

9. Pursuant to the Act, during 1986 and 1987 NPS developed a River Management Plan for the Upper Delaware River and performed environmental review of that plan pursuant to NEPA. The River Management Plan noted that “the Upper Delaware’s consistently high water quality provides habitat to diverse and well-balanced biological communities,” including a cold water trout fishery in the 27-mile stretch of water from Hancock to Callicoon, and a warmwater fishery running south from Callicoon to Port Jervis that provides habitat for sunfish, eel, bass, and walleye, among other fish. (See “Final River Management Plan: Upper Delaware Scenic and Recreational River, New York and Pennsylvania” (November 1986), p.3, relevant portions attached as Exhibit C.)

10. The final environmental impact statement for the Management Plan concluded that:

The Upper Delaware provides some of the most important fish habitat in the Northeast, because of its free-flowing nature, high water quality, and cold water releases (from

reservoirs on tributaries). The northern segment of the river, between Hancock and Callicoon, is unique due to its cold water temperatures, and offers some of the finest trout fishing in the Northeast. The Upper Delaware is currently one of only two natural shad rivers (the Hudson River is the other) from Maine to West Virginia that is sufficiently free of man-made barriers and industrial pollution to allow passage of shad to their upper reach spawning habitats.

(See NPS, “Final Environmental Impact Statement, Upper Delaware Scenic and Recreational River, New York and Pennsylvania” (March 26, 1987), relevant portions attached as Exhibit D.) Those fish remain abundant in the Upper Delaware today, and in addition other fish are found there as well, including rainbow trout, brown trout, smallmouth bass, largemouth bass, rock bass, walleye, American eel, gizzard shad, brown bullhead, fallfish, shiners and minnow.

11. The River is also home to endangered or threatened species, including the dwarf wedge mussel and the bald eagle, our national bird. The dwarf wedge mussel is a freshwater mussel listed as endangered under federal, New York, and Pennsylvania laws. (See DEC, “Dwarf Wedge Mussel Fact Sheet” at <http://www.dec.ny.gov/animals/42253.html>, attached as Exhibit E; see Exh. B., p.9.) As noted by NPS, freshwater mussels, including the dwarf wedge mussel, make up the greatest animal biomass in the Delaware River and play an important role in maintaining water quality and water clarity because they can filter up to five gallons of water each day, thereby removing contamination from the River. (Id.)

12. While the dwarf wedge mussel was once found in numerous locations in 15 major Atlantic Coast drainages, its numbers have declined drastically, and most remaining populations number in the 100s. (See Exh. E.) In 2000, the United States Geological Survey (in work funded by NPS) documented the presence of the dwarf wedge mussel in three populations spread out over a 22-mile section of the Upper Delaware River. (Id.) New York DEC also collects data concerning the populations of aquatic species along the River through a variety of sources which include macro invertebrate surveys performed by the Department’s Division of Water staff,

submissions from other agencies including NPS and the United States Geological Survey, as well as through the Department's regulatory process. Whenever there is a proposal to undertake a regulated activity in areas known to provide habitat for threatened or endangered species we require the applicant to undertake surveys and other studies to determine presence, abundance and potential impacts the project may have on that species. New York DEC's data confirms the presence of the dwarf wedge mussel at ten locations within the Upper Delaware between Cochecton and Frisbie Island, just upstream of Lordville.

13. Water pollution has been implicated as a major cause of the decline of the dwarf wedge mussel nationally and continues to present a threat to the endangered population of this mussel in the Upper Delaware. (See Exh. B; see "New York Natural Heritage Program: Dwarf Wedgemussel" at <http://acris.nynhp.org/guide.php?id=8375>), attached as Exhibit F.)

14. Bald eagles have established themselves on the Upper Delaware River because of the habitat provided by the River's clean water, food supply consisting largely of fish from the River, and the presence of protected stands of large deciduous and coniferous trees along its shores on which the eagles perch and nest. (See NPS, "Upper Delaware Scenic and Recreational River: Nature and Science" at www.nps.gov/upde/naturescience/index.htm, attached as Exhibit G.). Bald eagles rely on clean uncontaminated water and fish. Over 100 bald eagles winter along the River each year, and as observed by NPS, this is "the largest population of wintering bald eagles in the northeast, and a growing year-round population of eagles has made the area an ideal location for eagle watching." (See *id.*; NPS, "Upper Delaware Scenic and Recreational River: Bald Eagles," at www.nps.gov/upde/photosmultimedia/Bald-Eagles.htm, attached as Exhibit G, and Map and Pamphlet, attached as Exhibit H.) Recent monitoring has disclosed at least 18 active bald eagle nests along the Upper Delaware River that produced 30 fledglings in

2010. (See NPS, “Upper Delaware Scenic and Recreational River: 2010 State of the Park Report,” p. 8, attached as Exhibit I.) Nevertheless, the bald eagle remains classified as a threatened species under both New York and Pennsylvania law.

C. New York’s Concrete Interests in the Upper Delaware River

15. The State has a strong interest in the surface waters located within its borders (including the portions of the Upper Delaware River in New York), and generally owns the fish and other wildlife found in water or on land in New York.

16. The River and its nearby areas provide important recreational opportunities for sightseeing, fishing, boating, bird watching, hiking, and camping because of the River’s extraordinary scenic beauty, clean water, excellent fishery, bald eagles and other wildlife, and its proximity to large population centers in New York and elsewhere. According to NPS, the Upper Delaware River had over 300,000 recreational visitors in 2010 taking part in these activities, many of whom reside in New York. (See “National Park Service Statistics” at www.nature.nps.gov/stats/viewReport.cfm, attached as Exhibit J.) A recent study estimated that the economic output of recreational activities on the Upper Delaware River in 2010 exceeded \$27 million. (See Gerald J. Kauffman, “Socioeconomic Value of the Delaware River Basin in Delaware, New Jersey, New York, and Pennsylvania” (October 11, 2011), p. 30, at www.state.nj.us/drbc/thedrb.htm, relevant portions attached as Exhibit K.)

17. The State owns lands and other facilities along the River for the purpose of facilitating the public’s recreational use of the River and to protect the State’s forests, fish and wildlife. These facilities include New York DEC access sites for boating and fishing at the following locations: Hancock and Lordville Bridge (Town of Hancock), Kellams Bridge (Town of Fremont), Callicoon (Town of Delaware), Cochection and Skinners Falls (Town of

Cochecton), Narrowsburg (Town of Tusten), Town of Highland, Mongaup (Town of Lumberland), and Sparrowbush (Town of Deerpark). These sites are the primary means for anglers, boaters, and hikers to obtain access to the Upper Delaware in New York.

18. In addition, DEC has constructed and maintains Eagle Observation Areas on State land along the River and within the adjacent Mongaup Valley Wildlife Management Area to enable the public to observe bald eagles without disrupting or harming them and to learn more about that species. (Attached as Exhibit L is a photograph of one of the observation facilities, located in Minisink Ford, and photographs of educational exhibits displayed in these facilities.)

19. The Mongaup Valley Wildlife Management Area consists of 11,855 acres of land adjacent to the Upper Delaware that are owned in fee or are subject to a conservation easement in favor of the State, and managed by the New York DEC. The Mongaup River, a major tributary of the Upper Delaware, runs through the Area, before emptying into the River. The Area provides recreational opportunities for hunting, trapping, fishing, boating, wildlife observation and wildlife photography. The Mongaup Valley Bird Conservation Area includes all of the Mongaup Valley Wildlife Management Area, and is managed by New York DEC to conserve the diversity of bird and wildlife species using the area, particularly bald eagles. As noted above, the State owns these wild animals. In addition to Mongaup, the State owns State Forest Preserve lands in the Town of Hancock, including Bouchoux Trail, along the River.

20. The State also owns Route 97, designated in 1992 by the State Legislature as the Upper Delaware Scenic Byway pursuant to New York Highway Law § 349-dd. This 70-mile stretch of road was built into steep hillside hugging the River for most of its length, offering to motorists spectacular views both of the River below and of lands in Pennsylvania to the south and west. Because of its breathtaking setting, leading car manufacturers (such as BMW, Honda,

Mercedes-Benz, Saab and Cadillac) have used the road for television commercials. In addition to providing such views, the road offers picnic areas on its River side for motorists to enjoy.

D. Environmental Review of Potential Impacts of Natural Gas Development on the River

21. The New York DEC has been engaged in a two-year environmental review process of evaluating horizontal drilling and high volume hydraulic fracturing (“HVHF”) under the State Environmental Quality Review Act (New York Environmental Conservation Law, Article 8) involving the drafting of successive environmental impact statements based on review of thousands of public comments by the Department, the input from its staff, and consultation with outside experts. As part of that review, New York DEC is presently evaluating a suite of potential mitigation measures to address any adverse environmental impacts of HVHF in New York.

22. Portions of Pennsylvania within the Delaware River Basin drain to the Upper Delaware River. If the Upper Delaware River were polluted by natural gas development activity from Pennsylvania there is a potential for harm to the State’s portion of that River and its fish and other wildlife; impairment of State lands along the River, and reduced public participation in recreational and educational activities on those lands. If there were adverse visual impacts associated with natural gas development in Pennsylvania they have the potential to adversely impact the State’s scenic byway along the River.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on January 30, 2012.



William Rudge

EXHIBIT A



The Delaware River Basin

Download "Socioeconomic Value of the Delaware River Basin in Delaware, New Jersey, New York, and Pennsylvania" Final Report (2.695 MB) and Executive Summary prepared by Gerald Kauffman, Director, Water Resources Agency, Institute for Public Administration, University of Delaware (October 2011). (*Free Adobe reader required to view both documents*)

The Delaware is the longest un-dammed river in the United States east of the Mississippi, extending 330 miles from the confluence of its East and West branches at Hancock, N.Y. to the mouth of the Delaware Bay where it meets the Atlantic Ocean. The river is fed by 216 tributaries, the largest being the Schuylkill and Lehigh Rivers in Pennsylvania. In all, the basin contains 13,539 square miles, draining parts of Pennsylvania (6,422 square miles or 50.3 percent of the basin's total land area); New Jersey (2,969 square miles, or 23.3%); New York (2,362 square miles, 18.5%); and Delaware (1,004 square miles, 7.9%). Included in the total area number is the 782 square-mile Delaware Bay, which lies roughly half in New Jersey and half in Delaware.

Over 15 million people (approximately five percent of the nation's population) rely on the waters of the Delaware River Basin for drinking, agricultural, and industrial use, but the watershed drains only four-tenths of one percent of the total continental U.S. land area. The 15 million figure includes about seven million people in New York City and northern New Jersey who live outside the basin. New York City gets roughly half its water from three large reservoirs located on tributaries to the Delaware. The Delaware Bay is only a gas tank away for about 23 percent of the people living in the U.S.

Three reaches of the Delaware have been included in the National Wild and Scenic Rivers System. One section extends 73 miles from the confluence of the river's East and West branches at Hancock, N.Y. downstream to Milrift, Pa.; the second is a 40-mile stretch from just south of Port Jervis, N.Y. downstream to the Delaware Water Gap near Stroudsburg, Pa. Combined, these two

river corridors take in 124,929 acres. The Lower Delaware Wild and Scenic Rivers Act, signed into law on November 1, 2000, added a 38.9-mile section of the main stem Delaware (and about 28 miles of selected tributaries) to the national system, linking the Delaware Water Gap and Washington Crossing, Pa., just upstream of Trenton, N.J. *Three-quarters of the non-tidal Delaware River is now included in the National Wild and Scenic Rivers System.* Sections of the Maurice River in New Jersey (a Delaware Bay tributary) and the Musconetcong River in New Jersey (a Delaware River tributary), as well as the White Clay Creek in Pennsylvania and Delaware (which flows into the Christina River, a tributary to the Delaware) also have been included in the national system. According to the National Park Service's web site, the U.S. has 3.5 million miles of rivers, but only about 12,600 river miles (just over one-quarter of one percent) are included in the National Wild and Scenic Rivers System.

As a result of clean-up efforts in the Delaware River, shad and other fish species, as well as bald eagles, are increasing in number.

The Delaware Estuary -- the Delaware Bay and tidal reach of the Delaware River -- has been included in the National Estuary Program, a project set up to protect estuarine systems of national significance.

There are numerous economic benefits from the river. The Delaware River Port Complex (including docking facilities in Pennsylvania, New Jersey, and Delaware) is the largest freshwater port in the world. According to testimony submitted to a U.S. House of Representatives subcommittee in 2005, the port complex generates \$19 billion in annual economic activity. It is one of only 14 strategic ports in the nation transporting military supplies and equipment by vessel to support our troops overseas. The Delaware River and Bay is home to the third largest petrochemical port as well as five of the largest east coast refineries. Nearly 42 million gallons of crude oil are moved on the Delaware River on a daily basis. There are approximately 3,000 deep draft vessel arrivals each year and it is the largest receiving port in the United States for Very Large Crude Carriers (tank ships greater than 125,000 deadweight tons). It is the largest North American port for steel, paper, and meat imports as well as the largest importer of cocoa beans and fruit on the east coast. Over 65% of Chilean and other South American fruits imported into the United States arrive at terminal facilities in the tri-state port complex. Wilmington, Delaware is home to the largest U.S. banana importing port, handling over one million tons of this cargo annually from Central America. According to Rear Admiral Sally Brice-O'Hara, District Commander of the Fifth Coast Guard District, "The port is critical not only to the region, but also to the nation."

The Delaware: A National Treasure
(free Adobe reader required to view)

Map Gallery

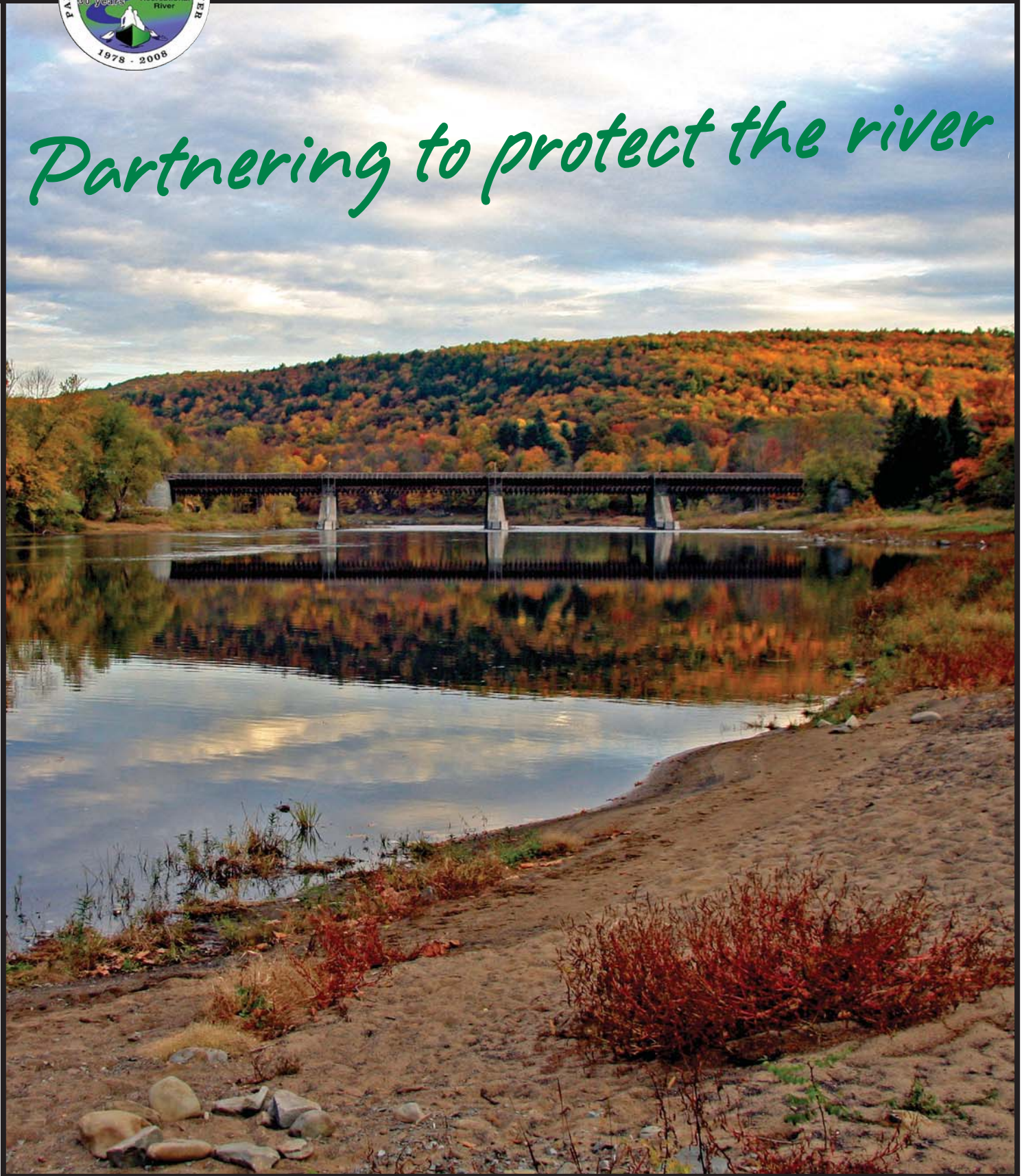
Municipalities in the Basin

EXHIBIT B



Celebrating the 30th Anniversary of the
Upper Delaware Scenic and Recreational River

Partnering to protect the river



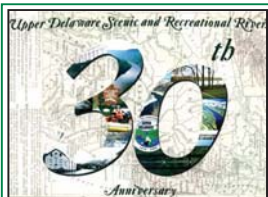


Celebrating the 30th Anniversary of the Upper Delaware Scenic and Recreational River



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Over 50 area high school students submitted original artwork depicting the rich natural resources and cultural history of the Upper Delaware River Valley in the 30th anniversary poster contest. A Delaware Valley Arts Alliance jury selected the winners.



United States Department of the Interior

NATIONAL PARK SERVICE
Upper Delaware
Scenic and Recreational River
274 River Road, Beach Lake PA 18405



In Reply Refer to:

October 23, 2008

Dear Friends of the River,

I recently had the pleasure of driving up the Upper Delaware Scenic Byway, and as I broke over a hilltop, the valley opened before me in full autumn regalia. The setting sun bounced off of the bright yellows, oranges and reds before it landed as diamonds on the water's surface. It was breathtaking. It is my first autumn on the Upper Delaware, and that memory will never be forgotten. The Upper Delaware Scenic and Recreational River is one of the most beautiful places in the world.

It gives me pause, as we are inclined to do at this time of year, to be thankful for what we have at the Upper Delaware. The law that established the Upper Delaware Scenic and Recreational River as a unit of the Wild and Scenic Rivers System is 30 years old, and as we mature together, we consider our nearly 400 partner agencies and organizations who work tirelessly together to keep this one of the most beautiful places in the world. Who are our partners? The list begins with the Upper Delaware Council, and it extends through the 15 towns and townships, five counties and two states with their agencies who play a role. It includes the Delaware River Basin Commission and federal agencies such as the U.S. Geological Survey and U.S. Fish and Wildlife Service. It includes Scouts and 4-H Clubs, historical groups and community organizers. There are scores of volunteer organizations who pitch in wherever they are needed...and when a new need arises, a new organization forms to help.

But it is obvious that unsung heroes contribute also. Last year at the National Park Service alone, we logged over 10,000 hours of volunteer service, a new record. Residents volunteer for community cleanups, spruce ups and fundraisers. Ambulance Corps and Fire Departments volunteer to help in emergencies. Families volunteer to "adopt a highway."

Thank you. All of you. Each of you. Each hour contributes to the overwhelming beauty of the Upper Delaware. I am humbled to be in your service.

Sincerely,

Vidal Martinez
Superintendent

How to Contact Us

National Park Service
Upper Delaware Scenic and
Recreational River
274 River Road
Beach Lake, PA 18405
www.nps.gov/upde

Office of the Superintendent
570/729-8251

Natural Resources Management
570/729-7842

Cultural Resources Management
570/685-4871

Interpretation
570/685-4871

Protection
Call 911 in emergencies
Chief of Protection
570/729-7134
Milanville Ranger Office
570/729-7862
**Barryville Ranger Office
& Dispatch**
845/557-0222

Maintenance
570/729-7137

Administration
570/729-7136

The Upper Delaware Council
845/252-3022
PO Box 192
211 Bridge Street
Narrowsburg, NY 12724
www.upperdelawarecouncil.org



Islands punctuate the Upper Delaware North of the Callicoon Bridge.

Photo by David B. Soete[©]

River of Compromise

With eight New York towns, four Pennsylvania townships, and numerous agencies of the two states, as well as the National Park Service (NPS), the Upper Delaware Council (UDC) and the Delaware River Basin Commission (DRBC) involved in its management, the Upper Delaware National Scenic and Recreational River is truly a unique creation.

The current NPS Superintendent of the river corridor, Vidal Martinez, who has 32 years of federal government service, discovered the difference from other NPS areas as soon as he arrived on the job in February of 2008.

He said, “The difference is significant in that the whole concept of this style of management has to do with working with the townships in helping to conserve and protect the scenic and recreational values of the river corridor and the Upper Delaware River.”

When a situation arises that might threaten the river, the UDC and NPS voice their concerns to the appropriate officials.

One recent example of working together to try to prevent a direct threat to the river valley is the

effort mounted against the New York Regional Interconnect (NYRI). This project originally proposed to run a High-Voltage, Direct-Current electrical transmission line on a 190-mile path that would parallel the Upper Delaware River corridor on the railroad right-of-way.

Strong objections raised by the NPS and UDC, among other organizations and individuals, resulted in the private investment company moving its nominated route slightly east of the corridor boundaries in its application before the New York State Public Service Commission.

“This fight isn’t over yet but we remain committed to urging compliance with the River Management Plan, which characterizes a project of this scope as an incompatible use,” said William Douglass, Executive Director of the UDC.

With the changing demographics of the river valley, the role of the NPS and the UDC has shifted slightly. Sandy Schultz, the NPS Assistant Superintendent, said the emergence of more environmental organizations in the area has allowed the NPS to remain more in the center of

the dialogue among various groups in the river valley with different points of view. She said that with the advent of active citizen groups such as the Upper Delaware Preservation Coalition and Catskill Mountainkeeper, the NPS is no longer viewed by many as being extreme in its role of protecting the river. Now that the UDC has been in business for 20 years, and the NPS has been in the valley for 30 years, much of the initial suspicion about the federal effort has been abated.

Douglass said, “The skepticism is not completely gone, but over the years there have been fewer and fewer problems. There are still issues out there, but in general, things have calmed down. The River Management Plan is working; nobody’s property has been taken. Those who were really afraid of it, I think, have realized that the Park Service is not here to take their land—that’s just not going to happen, and that’s the real success story here.”



Photo by David B. Soete[©]

The river at Narrowsburg: Serene and welcoming at the deepest point.

The River Runs Through It

In the post-World War II era, the economy was booming and new construction was underway across the nation. It was national policy to promote construction of dams on some rivers. But by the 1960s, many felt that some rivers in the country should be protected from development to ensure that they remain “free-flowing.” In 1968, Congress passed the Wild and Scenic Rivers Act, to protect selected rivers from dams and other construction projects. The act noted that the selected rivers “possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values,” and these rivers and their immediate environs “shall be protected for the benefit and enjoyment of future generations.” The Upper Delaware River was one of the initial Study Rivers for the National Wild and Scenic Rivers System.

This led to a lengthy period of study that involved input from governments and organizations and residents because the river means many things to many people, and there were many stakeholders to be consulted and considered during the study...

- the towns and local residents have interests related to the river in terms of earning a living, pursuing recreation, or enjoying its scenic beauty.

- the Upper Delaware receives releases from two reservoirs that serve New York City.
- the Delaware River Basin Commission (DRBC), representing the four states through which the Delaware flows, has jurisdiction over certain aspects of the river.

Some property owners were suspicious of the federal government because in the '60s, the U.S. Army Corps of Engineers began acquiring land, some by eminent domain, for the Tocks Island Dam, to be built upstream from Delaware Water Gap. Many former residents complained bitterly that the government had taken their land without adequate compensation. Some of those people who were moved off their land settled upstream in the Upper Delaware River valley (Ultimately, the proposed dam was never built, and the project was abandoned. The land is now the Delaware Water Gap National Recreation Area, managed by the National Park Service (NPS). Fearing a repeat of that kind of land acquisition, residents organized and petitioned their representatives in Washington to become heavily involved in shaping the future of the Upper Delaware River valley. They also urged very limited government land acquisition.

In July 1976, the Bureau of Outdoor Recreation,

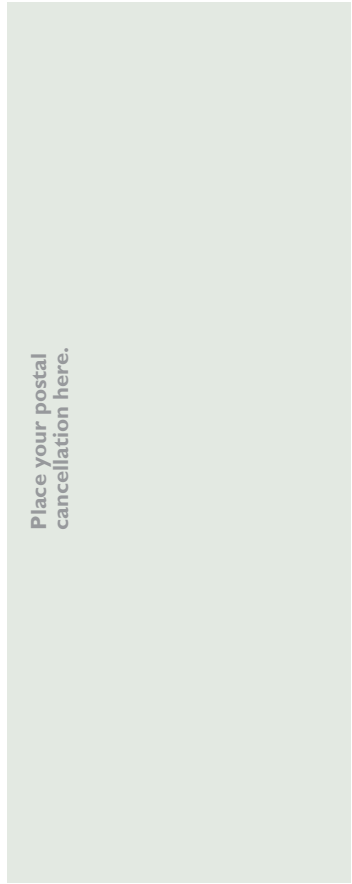
an agency of the U.S. Department of the Interior, released an exhaustive study identifying the resources of the Upper Delaware. The report documented the “outstandingly remarkable scenic, recreational and cultural values” of the Upper Delaware:

- **Scenic Values:** Rich variety of riparian vegetative screening of development, fields and pastures add variety to an already interesting landscape, and overall tranquil scenic beauty.
- **Recreational Values:** Developed recreation resources; camps and campgrounds; hunting and fishing preserves; public recreation—state parks, forests and game lands; opportunities for canoeing, fishing, swimming and sightseeing; and related river activities.
- **Fish and Wildlife:** Outstanding habitat for both a cold and warm water fishery; anadromous species such as shad and the American eel; large and small wildlife species; waterfowl and upland game populations; reptiles and amphibians.
- **Cultural Values:** Including archeological sites of the early Native Americans, and historic sites depicting the timber industry with rafting of logs, farming of cleared land, and the Delaware and Hudson Canal.



Photo by David B. Soete®

The Upper Delaware begins at regal Point Mountain, where the East and West Branches meet.



Clearly, there were many natural and cultural resources worthy of protection in the river valley.

In 1978, Congress designated "The Upper Delaware Scenic and Recreational River." The legislation assigned administration to the U.S. Secretary of the Interior through the National Park Service and directed that the NPS should work with representatives of both states, local governments in both states, the DRBC and the Upper Delaware Citizens Advisory Council—which was comprised of concerned citizens—to create a river management plan. Land the federal government could acquire was limited to a total of 450 acres of "land and interests in land for access, development sites, the preservation of scenic qualities or for any other purpose..." with the exception that the federal government could acquire an additional 1,000 acres if it were so designated in the river management plan. That language guaranteed that the river area would not be owned by the federal government as is the usual case for national parks, but instead would be a groundbreaking partnership with NPS and many other interested stakeholders.



Photo by David B. Soete®

The Upper Delaware River valley is home to a great variety of aquatic birds, including this great blue heron.



Photo by David B. Soete®

The Upper Delaware Scenic Byway follows the river along New York State Route 97.

When John Hutzky was appointed as the first National Park Service (NPS) Superintendent of the Upper Delaware Scenic and Recreational River in November 1979, he was tasked with overseeing the formation of the Upper Delaware River Management Plan (RPM). He was entering uncharted territory.

The process for creating this plan was far different. Normally, the NPS would buy the land required for a natural park. In this case NPS was ordered by Congress to work with state and local governments, other agencies and community groups to develop a plan in which federal jurisdiction would be limited to the river surface and a small amount of property, while the vast majority of land remained privately owned.

Many residents along the river were extremely skeptical about the intentions of government officials regarding the acquisition of land. In the '60s, thousands of acres of land had been acquired, some of it by eminent domain from unwilling sellers, for a planned "Tocks Island Dam" in the Middle Delaware River. In earlier decades New York City condemned thousands of acres of land to create the Neversink, Cannonsville and Pepacton Reservoirs, which ended with many homesteads forever covered by water.

With that historical backdrop, the challenge for the NPS was to convince residents of the Upper Delaware Valley that their primary mission was to protect the natural resources of the area, and not take land by condemnation. This was especially difficult because a 1970s Bureau of Outdoor Recreation report recommended federal acquisition of land for a quarter mile on either side of the river (This recommendation, however, was not included in the enabling legislation for the Upper Delaware). On the other hand, not all residents and local officials were opposed to the NPS. Some were pleased that the NPS brought policing services to the river to help enforce local laws. At the time, many people from outside the area would travel to the river for recreation, and behave badly.

Visitors would litter and relieve themselves on private property, and there is a story repeated by residents that one woman came home to find a naked man using her phone.

The NPS helped to quell that sort of activity and some residents were grateful that the NPS had "cleaned up the mess in the river." Additionally, the NPS was responsible for cutting the number of drownings on the river. The year before the National Park Service arrived, there were ten drownings on the Upper Delaware.

In 1980, the creation of the RMP began. NPS personnel from the NPS Denver office, working with local officials from the five counties, the Citizens Advisory Council (CAC), and with input from a group of local county planning professionals called the Upper Delaware Clearinghouse, drafted two river management plans, both of which were soundly rejected by local residents. The general consensus was that the Denver planners did not understand the importance of the concept of home rule. Major concerns of the residents included over-regulation, the use of eminent domain, loss of local control, and issues such as the right to fish, hunt and use the river corridor as families had for generations.

With the third attempt at drafting the plan, the Denver planning people withdrew from the process. Many local residents and politicians were brought into the process more deeply, and the group of seven Pennsylvania townships and eight New York towns along the river formed the Conference of Upper Delaware Townships (COUP) in 1981, which became involved to a very important degree.

Several community groups were pushing various agendas for the plan at the time. At least two influential groups were pushing for "de-authorization" of the Upper Delaware, a scenario under which the NPS would simply leave the valley.

A California land rights activist, Charles Cushman, had come to the area, and promoted showings of

the film "For the Good of All." The film told the story of the actions of the Army Corps of Engineers and the NPS regarding the Cuyahoga Valley National Recreation Area in Ohio in the late '70s and early '80s. According to testimony Cushman later gave to Congress, the number of homes purchased by the federal government to create the area was well over 300. He said, "The small community was destroyed, schools closed, their tax base eroded by unnecessary land acquisition." The film gave support to those calling for "de-authorization."

There were also other concerns. The owners of the various canoe livery services along the river were resistant to the NPS requiring the liveries to operate under licenses. Smaller liveries feared they would be squeezed out.

And there was vandalism aimed at the NPS. In February 1984, five vehicles in the NPS motor pool were painted with black swastikas.

By July of 1984, five towns and townships had endorsed de-authorization, while other towns came out in support of the Upper Delaware legislation. COUP hired a consulting firm at NPS expense to assist them in re-writing the plan.

Foresight Consulting Group conducted a survey and found that "of those who responded, large majorities state preferences for 'zero' or 'slower than current rates of growth' rates of development along the river, and management of land by town governments."

Rewriting the plan was contentious, dealing with such complex and thorny issues as the rights of towns or townships choosing not to participate in the plan. On August 9, 1985, the new draft plan was submitted to the towns and townships for review. Several towns voted to withdraw from COUP and thus future participation in the plan.

The first public hearing on the plan was scheduled for June 4, 1986, at the Damascus School. More than 300 people attended, with a large majority of them opposed to the plan. As the meeting was called to



Contributed photo

The National Park Service was met with skepticism and outright opposition by some in the Upper Delaware River Valley.

The Final River Management Plan for the Upper Delaware Scenic and Recreational River, adopted in 1986, includes the following Goals and Objectives which are still adhered to today:

1. Protect and maintain the unique scenic, cultural, and natural qualities of the Upper Delaware River corridor, including its rare and endangered plant and animal species and rare natural habitats.
2. Maintain and enhance the corridor's social and economic vitality and its diversity, consistent with efforts to protect the recognized values of the river corridor.
3. Conserve the resources of the Upper Delaware primarily through the use of existing local and state land use controls and voluntary private landowner actions consistent with local land use ordinances.
4. Protect private property rights, and allow for the use and enjoyment of the river corridor by both year-round and seasonal residents.
5. Provide for planned growth, consistent with local ordinances, to ensure optimum use of existing public services, while maintaining and conserving the essential character of the river valley.
6. Maintain and improve fisheries and wildlife habitat to ensure the continued public enjoyment of hunting, fishing and trapping, consistent with state laws.
7. Foster a public recognition of the Upper Delaware River Valley as a place with its own identity, continuing history, and a destiny to be shaped by its residents.
8. Provide for the continued public use and enjoyment of a full range of recreational activities, as is compatible with the other goals.
9. Encourage maximum local government official, private landowner, private group, and citizen involvement

in the management of the Upper Delaware.

10. Develop and implement an interim plan for the protection of public health and safety due to the presence of a toxic landfill located adjacent to the river in the Town of Tusten, and advocate the prompt cleanup and removal of its contents.

(In the Upper Delaware Council's second Five-Year Operating Program Cooperative Agreement with the National Park Service covering 2002-2007, four new goals were added to this list):

11. Ensure that no new landfills are located within the Upper Delaware corridor, and that existing landfills either within or beyond the corridor boundaries do not threaten the corridor's ecological health and integrity.

12. Carefully manage the transport of hazardous materials and toxic substances through the river corridor to minimize the risks to human health and the river corridor's ecology. Emergency services and communication, especially for hazard warnings to recreational users, should be elevated to the highest level of preparedness.

13. Protect and enhance the Upper Delaware River's outstanding values: its free-flowing nature, excellent water quality, and aquatic ecosystem.

14. Provide for the effective and continued operation of the Upper Delaware Council as a community-based, non-profit organization working in close contact with its members and the property owners of and visitors to the river valley.

order, an organized disruption began and cowbells and other noisemakers were sounded, and chants of "No park, no plan, no way," broke out. The noise continued for 90 minutes, preventing anyone from speaking. Eventually representatives of CAC, COUP and NPS left the podium.

A second meeting ended the same way.

Meetings on June 6 and 7, however, were brought to order, and testimony from 74 individuals was taken, with 256 written comments received. Later that month, COUP sent a letter inviting the 15 eligible towns to participate in a new Plan Revision Committee. Nine of the fifteen towns and townships chose to participate, and the committee held several hearings through October 23.

Some of the early meetings were disrupted by anti-plan activists, but the NPS requested assistance from the Tusten Town Police, and the disruptions ceased.

It was during this period that tensions ran highest in the community. The River Reporter newspaper had been supporting the NPS and the adoption of a River Management Plan, drawing the ire of groups and individuals who favored de-authorization. In August of 1986, the home of the publisher and editor of the paper was burned to the ground. While no one was ever charged with setting the fire, many residents remain convinced to this day that the fire was connected to the paper's support of the NPS.

An anti-plan resident also lost a building to fire at about the same time, but there is some ambiguity about whether that fire was connected to the NPS controversy.

The Plan Revision C committee made some 400 changes to the plan over the next year to try to strike a balance among all of the entities involved.

Among the most important clauses in the revised plan were:

- An imperative to local government to retain control through the establishment of the

Upper Delaware Council, which would have primary responsibility for coordinating and overseeing the plan.

- Protection against over regulation by using only existing local, state and federal laws to protect the river.
- Providing landowners with protections against the use of eminent domain by implementing a multi-step process that would be followed before eminent domain could be used.
- Emphasizing the need to maintain the local economy through the use of alternatives to fee title land acquisition.
- Limiting the total amount of NPS land acquisition for management purposes to not more than 124 acres on a willing-seller, willing-buyer basis only.
- Revision of the plan and guidelines to ensure continuation of such traditional activities as recreation, hunting, fishing, trapping, timbering and agriculture.
- Providing towns with alternatives and flexibility that allowed them to meet the plan guidelines in their own way.

The River Management Plan also includes a Land and Water Use Guidelines supplemental section based on management principles and objectives set forth in the 1968 U.S. Wild and Scenic Rivers Act.

The Guidelines provide direction for all cooperating governments—local, state and federal—to determine those land and water uses which: are clearly appropriate in the Upper Delaware River Valley; those uses which might, with conditions, be deemed appropriate; and those which might pose a threat to its resources and therefore are considered incompatible.

Local governments that adopt land use regulations based on these Guidelines are deemed to be in "substantial conformance" with them. Implementation of these Guidelines is accomplished through the use of existing legal authorities, with

maximum flexibility allowed.

The overarching purpose of the Land and Water Use Guidelines is to assure that actions on all levels of government contribute to a true, partnership-based management of the Upper Delaware by protecting the health, safety and welfare of river corridor residents, while also protecting and enhancing the unique characteristics of the Upper Delaware River Valley.

The plan was adopted in November 1986, and the UDC was officially incorporated on February 18, 1988. Eligible for membership were the eight New York towns and seven Pennsylvania townships bordering the river, the State of New York, the Commonwealth of Pennsylvania, the Delaware River Basin Commission and the Upper Delaware Citizens Advisory Council.

The voting membership includes representatives of eight New York towns: Hancock, Fremont, Delaware, Cocheton, Tusten, Highland, Lumberland and Deerpark; four Pennsylvania townships: Damascus, Lackawaxen, Shohola and Westfall; and the two states. The Delaware River Basin Commission and the National Park Service are non-voting members.

As of this writing, three townships in Wayne County, PA—Berlin, Buckingham and Manchester—remain eligible for membership in the UDC but have not yet chosen to join.

The CAC, which was established in 1978 to advise the U.S. Secretary of the Interior and NPS about issues pertaining to the management of the Upper Delaware Scenic and Recreational River, expired on February 6, 1999.

For more information on the River Management Plan and its Land and Water Use Guidelines, contact the Upper Delaware Council at P.O. Box 192, 211 Bridge St., Narrowsburg, NY 12764; phone (845) 252-3022; or on-line at www.upperdelawarecouncil.org.

The Upper Delaware River region is rich with varied flora and fauna that exist in a delicate balance affected by many factors. While some species are able to thrive and out-compete native species, others struggle to meet precarious habitat needs. Learn more about several of the endangered and invasive species of the region here.



Japanese knotweed

Contributed photo

Invasive Species

The U.S. Fish and Wildlife Service (FWS) defines invasive species as organisms introduced into a non-native ecosystem and which are likely to cause harm to the economy, environment or human health. Invasive plants and animals have many impacts and can degrade, change or displace native habitats in their competition for various resources.

According to the FWS, when non-native species are introduced into an ecosystem in which they did not evolve, their populations sometimes explode. Normally, species evolve together into an ecosystem with checks and balances—such as predators, herbivores, diseases, parasites, other competing organisms and environmental factors—that limit the population growth of any one species.

However, when an organism is introduced into an ecosystem in which it did not evolve naturally, it no longer has those limits. The resulting unnaturally large population can then have severe impacts because it disrupts natural communities and ecological processes. Suddenly, native species must compete for favorable habitat and resources like food, water and shelter. The invasive species can decrease the diversity of the ecosystem, making it more susceptible to diseases and natural disasters and can even cause extinction of other species. Following are several examples of invasive species affecting the Upper Delaware River region.

Japanese knotweed (*Polygonum cuspidatum*)

This herbaceous perennial plant can be seen throughout the region. It begins to emerge each growing season as “asparagus-like” stalks in late April or early May. The hollow, bamboo-like, reddish-brown stalks typically reach their full height of 10 feet by the end of July. The whitish and fragrant flowers are often in full bloom by late August. The leaves of the plant are broadly egg-shaped with pointed tips and square bases. This plant is typically found in degraded habitats such as roadsides and riverbanks. Japanese

knotweed produces roots called rhizomes, which allow a single plant to colonize a large area in little time. It spreads very easily to new locations when tiny pieces of stem fragment or rhizomes get washed downstream after being cut or uprooted by flooding. As a result of knotweed’s ability to regenerate from stem and root fragments and its astounding growth rate (young shoots can grow as much as three to four inches a day), it quickly colonizes scoured shores and river islands after flooding, and forms extremely persistent and dense thickets, known as monocultures, which exclude almost all other types of native vegetation from growing.

Native to eastern Asia, Japanese knotweed was introduced to England in 1825 for use as an ornamental plant. Today it can be found in 38 states across the U.S. Historical records show Japanese knotweed arriving in the Upper Delaware River Region sometime around 1979.

Asian longhorn beetle (*Anoplophora glabripennis*)

This beetle, which made its way to the United States as larvae inside wood packing material from China, attacks many different species of hardwood trees in the United States, including maples, horse chestnut, poplar, willow, elm, mulberry and black locust. It kills the trees by boring into the trunks and branches. Trees damaged by this pest have round entry and exit holes about half an inch in diameter and may have sawdust piled up at the base. Sap may flow out of these holes.

The adult beetle can be up to one inch long with a glossy black body with white spots. The very long antennae are black with distinctive white bands. Adults can be seen from May through November. Adults should not be confused with the Whitespotted sawyer, which is native to North America.

The Asian longhorn beetle was confirmed in New York State in 1996 and has been found at several locations in New York City and Long Island, though it is not currently found in the Upper Delaware River region. To prevent its transmission to other areas, the New York Department of Environmental Conservation (DEC) imposed an emergency regulation in September 2008 against importing firewood into New York unless it has been treated (kiln-dried) to eliminate pests. The ban also prohibits the movement of untreated firewood within New York more than 50 miles from its source. To protect the trees of the Upper Delaware, leave firewood at home. Do not transport it to campgrounds or parks. Only buy firewood that has been harvested locally or treated for pests. Burn all firewood brought to the campsite.

Northern snakehead (*Channa argus*)

This aggressive fish is native to China, Russia and Korea, and one we hope never to see get established in the Upper Delaware River watershed. They are voracious predators, feeding on a variety of other fish, frogs, crayfish and aquatic insects and can grow to over 30 inches in length.

Snakeheads have the potential to greatly harm native fish populations. They are highly invasive, and could inhabit any of our streams and lakes. They can tolerate water with lower levels of dissolved oxygen than our native fish species, can breathe air, and may survive for days out of water in damp conditions.

Northern snakeheads were found this past summer as close as Orange County, NY. In its early stages, it was eradicated this past August in a concerted effort by DEC biologists, who isolated and poisoned sections of the treatment area. These fish likely appeared as the result of illegal introductions. Importation and interstate transport of snakeheads is prohibited under the federal Lacey Act, and New York and Pennsylvania also prohibit the possession, sale and live transport of snakehead fish (genus *Channa* and *Parachanna*) and their viable eggs.

If you see or catch a snakehead, report it to DEC’s Region 3 fisheries office at 845/256-3161 or the Pennsylvania Fish and Boat Commission at 570/588-6388 or the National Park Service at 570/729-7842. If caught, do not release the fish. Kill, freeze and report your catch. Take a digital photo if possible.

Didymo algae (*Didymosphenia geminata*)

Didymo is a freshwater microscopic diatom found in streams and rivers in much of North



Transmitter fitting on bald eagle

Contributed photo

America. Commonly called “rock snot,” this aquatic nuisance algae increasingly poses a threat to aquatic ecosystems because it forms extensive mats on streambeds. Didymo attaches to the streambed by stalks which have a rough texture similar to wet wool and mimic strands of toilet paper, as opposed to other algal species which feel “slimy.”

In August 2007, Didymo was confirmed to be present in the East Branch of the Delaware River. There are no feasible methods of eradication known, but efforts have been made to educate the public about practices such as cleaning waders and equipment between outings in hopes of minimizing chances of its spread.

Hemlock woolly adelgid (*Adelges tsuga*)

A small aphid-like non-native invasive insect, the Hemlock woolly adelgid (HWA) was introduced in the United States in 1951 and appeared regionally after destroying hemlock forests from Virginia to New Jersey. Adelgids feed at the bases of hemlock needles causing the needles to die. Defoliation and mortality of hemlocks can follow, sometimes in as little as four years, with a heavy infestation. Believed to be native to Japan and China, experts think that hemlock woolly adelgid (HWA) probably came to the United States on imported ornamental hemlocks. The adelgid was not a serious problem in its native lands because of an abundance of predatory beetles that kept it in check.

Hemlocks dominate most ravines of tributaries that flow into the Upper Delaware River, providing shade and cooler water inputs, and stabilizing these streams' hydrologic regimes while making them less likely to dry up during the summer months. Research and monitoring conducted at Delaware Water Gap National Recreation Area since 1993 has indicated that hemlock-shaded streams are three times more likely to have native brook trout than drainages with deciduous tree canopies. Along with this species are entire natural communities of birds, mammals, amphibians and invertebrates linked to these environments for thousands of years with evolved interdependencies.

The potential for controlling HWA is thought to lie in the introduction of predatory beetles, which have been released at Delaware Water Gap National Recreation Area and other places in the Eastern United States. Besides biological controls, spraying individual trees with insecticidal soaps and oils, or injecting them with a systemic insecticide that kills the adelgid, may be feasible options. Aerial applications of pesticides to kill HWA are not appropriate, because hemlocks often grow near sensitive stream areas.

Endangered Species

In 1973, the United States Congress created the Endangered Species Act, one of the world's strongest and most effective wildlife conservation laws, in order to reverse the trend of human-caused extinctions threatening shared ecosystems. The Act has continued to evolve, and today protects many species of fish, wildlife and plants. It declares that these species possess aesthetic, ecological, educational, historical, recreational and scientific value and pledges to conserve them.

Individual states also protect such species. Their classifications as endangered or threatened help to prevent further population declines.

Listed below are a few species whose populations are at risk in the Upper Delaware River region.

Miner's lettuce (*Montia chamissoi*)

This very small and rare herbaceous perennial plant is classified as an endangered species in Pennsylvania. It sends out long slender runners and produces two- to five-centimeter pink petals on two to seven flowers in May through August each year. Miner's lettuce can be found on moist,

rocky ledges, riverbanks and streambanks from low to high elevations of coastal valleys and mountains.

Dwarf sand cherry (*Prunus pumila*)

Considered a threatened species in New York, dwarf sand cherry is a colonial shrub that produces creeping stems radiating outward from the original plant. The stems may be three-to-five meters long, and they root prolifically where they contact the ground. The simple leaves are four to 10 centimeter long and narrow, finely toothed and whitish on the undersides. This plant may be identified in any season, though it might easily be overlooked in winter when the leaves are gone.

In New York, dwarf sand cherry is most often found on the islands and banks of large rivers, where scouring ice prevents trees and large shrubs from persisting. The prostrate, ground-hugging stems of this subspecies appear well adapted to these unique habitats.

Quillwort (*Isoetes riparia*)

This grass-like, emergent aquatic plant with dark green stiff leaves can be found in lakes, ponds, streams and river shores. Quillwort is classified as an endangered species in New York and is infrequently found in shallow water and shores of slow-moving rivers and streams, and intertidal mud flats. This plant ranges from southern Quebec and Ontario, south through Eastern New York and Western New England, down to the coastal plain of North Carolina. The best time to find quillwort is in late June through early October when the vegetative stems are present. Certain populations of this plant have been negatively impacted by pollutants, run-off, boat traffic and other changes to their associated waterways.

Dwarf wedge mussel (*Alasmidonta heterodon*)

The dwarf wedge mussel is a small freshwater mussel that rarely exceeds one and a half inches (38 mm) in length. Once found at 70 locations in 15 major Atlantic Coast drainages, its numbers have declined drastically, and it is now found at only about 20 sites in seven Atlantic Coast drainages. Its Federal status, as well as its status in Pennsylvania and New York, is endangered.

In 2000, a United States Geological Survey team, funded by the NPS, documented their presence here in three populations spread out over



Contributed photo

This thriving eaglet is part of an Upper Delaware River valley success story.

a 22-mile section of the Upper Delaware River. The Delaware River has nine species of freshwater mussels, or 64 percent of the 14 species known to the Atlantic slope. Historically, North America was home to 297 species of freshwater mussels, by far the highest diversity in the world. Today, they are the most rapidly declining animal group in the United States, with 70 percent of their species either extinct, endangered, threatened or potentially justifying federal protection.

While not very charismatic animals, freshwater mussels are not insignificant. They make up the greatest animal biomass in the Delaware River, and play an important, integral role in its ecosystem. A freshwater mussel can filter up to five gallons of water a day, and collectively they act as a filtration system for the river, contributing to water quality and clarity. Estimates are that the mussels found in the Delaware River filter its water volume several times over before it reaches Delaware Bay.

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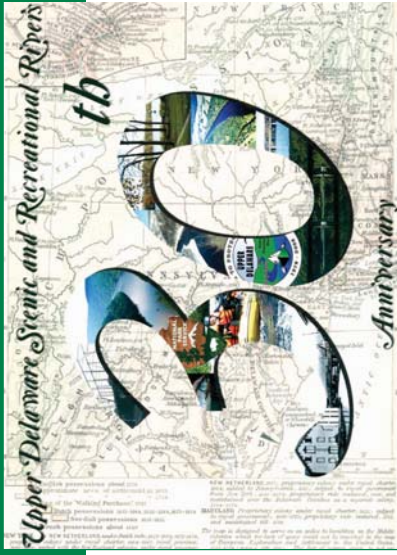
Photo by David B. Soete

The deceptively beautiful purple loosestrife and a common egret make for a striking riparian scene.

Did You Know?

Known as "The Gateway to the Delaware River," Hancock, New York, is famous for its bluestone and timber industries. Louisville Slugger baseball bats were made from Hancock timber for over 85 years and its bluestone was used in building the Empire State Building and the Statue of Liberty.

Spawned in the Sargasso Sea in the Atlantic Ocean, the American eel migrates as a juvenile to fresh water where they grow into adults. As a traditional food source for Native Americans, smoked eels are still a local delicacy.



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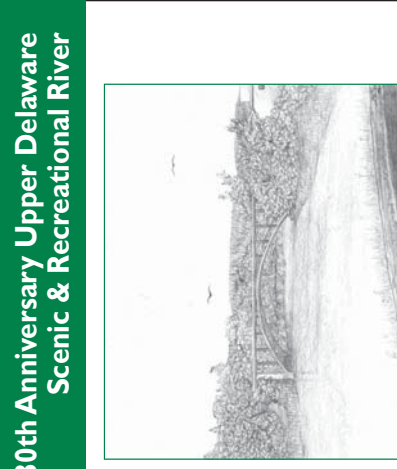
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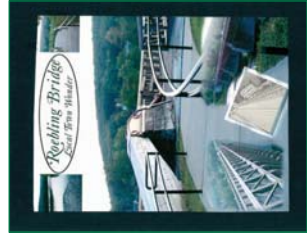
Ariana Wagner, Delaware Valley HS, Grade 11



Jamie Rivera, Port Jervis HS, Grade 11



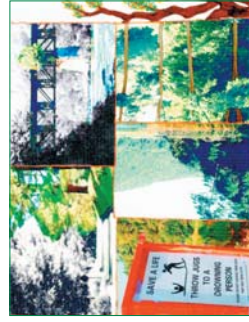
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Photo by David B. Soete©

The magnificent bald eagle has made a comeback in the valley, with 16 breeding pairs in 2008.

American Bald Eagles: A Success Story

After nearly disappearing from the United States, the bald eagle is now considered to be flourishing and was removed from the federal threatened and endangered species list, though it continues to be protected under both New York and Pennsylvania law. The bald eagle, native only to North America, was one of the original species protected since 1973 by the Endangered Species Act after widespread use of the pesticide DDT nearly caused the majestic bird's extinction.

The legal protections given the species, along with a decision by the Environmental Protection Agency to ban the general use of DDT in 1972, accelerated eagle recovery through captive breeding programs, reintroductions, law enforcement efforts, protection of habitat around nest sites and land purchase and preservation activities.

The U.S. Department of the Interior's decision to delist the bald eagle was based on the bird's dramatic recovery. In 1963, the lower 48 states were home to barely 400 nesting pairs of bald eagles. After decades of conservation effort, they are home to some 10,000 nesting pairs, a 25-fold increase in the last 40 years.

Bald eagles will continue to be protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Both federal laws prohibit "taking"—killing, selling or otherwise harming eagles, their nests or eggs.

Eagle populations will be monitored for at least five years, as required by the Endangered Species Act. If at any time it appears that the bald eagle again needs the Act's protection, the U.S. Fish and Wildlife Service can propose to relist the species.

Did You Know?

In addition to "Partnering to Protect the River", the National Park Service offers many programs and services, including

- Providing information and education to the public about the Upper Delaware River, including programs about river safety, boating, fishing, Zane Grey, Roebling Bridge, the Delaware and Hudson Canal, Upper Delaware Native Americans, plants, animals and birds, among many others
- Assisting visitors in emergencies and providing law enforcement on the Upper Delaware Scenic and Recreational River, at 16 accesses along the river, and at NPS-owned sites throughout the corridor

As part of the National Wild and Scenic Rivers System, Upper Delaware Scenic and Recreational River stretches 73.4 miles along the New York – Pennsylvania border. The Upper Delaware is the longest free flowing (undammed) river in the Northeast, and one of the longest and cleanest free flowing rivers in the Eastern United States.

The American Shad are a saltwater fish that migrate from the Atlantic Ocean up the Delaware River to spawn in the spring. Fish reach the upper portions of the river by early to mid May. After spawning many of the weakened adult Shad die, usually in late June and into July.

Volunteer Programs at National Park Service

Over the years, the National Park Service has been assisted by volunteers made up of groups and individuals. These people have assisted the Service to do things that its limited budget could not cover.

There are two main volunteer programs:

- The Park Ranger Internship Program enlists college students during the summer to the NPS Division of Interpretation. Duties include staffing river access sites, presenting river safety talks, providing area information to river users, performing river patrols and presenting educational programs to park visitors.
- The second volunteer program occurs at the Zane Grey Museum where volunteers present tours and talks, answer questions and operate the sales outlet, work with the museum collection, historic properties, archival collections and various other efforts.



National canoe safety patrol volunteers.

For information about the NPS Volunteer Program, contact Ingrid Peterec at 570/685-4871.



Q & A

Canoeing on the West Branch of the Delaware River.

Photo by David B. Soete®

A Conversation with the Superintendent

Vidal Martinez stepped into the role of the National Park Service (NPS) Superintendent of the Upper Delaware Scenic and Recreational River in February 2008.

Question: What challenges did you face when you arrived?

Answer: When I arrived at the beginning of February, I was immediately faced with weather and closure issues. I quickly realized that the honeymoon period was over, as I was rudely awakened by the sheer number of complex issues facing the Upper Delaware.

I knew about the non-federal lands concept of the Upper Delaware, and the extensive work with partners. I also knew about power lines, and how that project could affect the river, and that one of the challenges that faced the NPS was the need to communicate the importance of wearing life jackets while on the river.

However, when I walked in that door, it seemed that the floodgates opened with development issues that could have a profound impact on the river itself, as well as the overall complexity of protecting the river through the use of local land use controls. So these are the kinds of issues that I was immediately confronted with.

Question: How is the NPS dealing with the possibility of natural gas drilling in the region?

Answer: Gas drilling has emerged as an activity that could greatly change the character of the river valley and the surrounding region. We're still uncertain as to what the long-term impacts will be on the river corridor. We know that it is spreading into the region, and there are several areas outside the river corridor that are starting to concern us.

We need to find out the impacts, and that's where we need to work with the Delaware River Basin Commission (DRBC) to ensure that the regulatory requirements, through their permit process, will protect the river. The DRBC will address issues of water extraction on surface water, groundwater and tributaries that will affect the river corridor.

So, we are relying on the DRBC. That's totally different from a traditional or typical park setting where a NPS manager would have more control because of park-owned land.

Question: Working with so many partners: the UDC, DRBC, seven townships in Pennsylvania and the state government, eight towns in New York and that state government, the DEP in Pennsylvania and the DEC in New York, is it frustrating because it can take a rather long time to get things accomplished?

Answer: It can be challenging. The fact remains that we have home-rule governments here. That's what we signed up for, and that's what the idea was with the River Management Plan: that the towns and other partners would collectively support the goal of protecting and preserving the scenic and recreational values of the river corridor. And so those were the key points, that there are appropriate practices and compatible land uses that won't compromise the river corridor. Many partners now feel that it's a plus that the Park Service is here. In the past, that wasn't so. But as time goes on, it appears that there has been a change in perspective to believing that the NPS and the Upper Delaware Council are meaningful organizations trying to do the right thing.

Question: This past spring, you got your first chance to go out and paddle on the river. How did you like it?

Answer: The experience is breathtaking. It presents a different perspective, and shows the reason why we're doing what we're doing. It really becomes pretty apparent as you're seeing the beautiful scenery, the untouched areas, the bald eagles soaring through the air and the different types of landscapes. And the experience of being on the river—it's not a beach, or a lake—it's a moving body of water and each different part of the river that you go through is a new experience.

It's not like seeing it from the road. When you're on the river, you're getting worthwhile experience, and I think the young people today need to divorce themselves from the TV and the electronic games for a while and step out with their moms and dads and get outdoors. And the Upper Delaware Scenic and Recreational River is a great place to do that.

Did You Know?

The Delaware River's deepest point is in Narrowsburg, New York, at an astounding 113 feet deep. It was once thought to be a long - drowned "plunge pool" from a glacial waterfall or possibly even a pothole scoured out by erosion with the smooth rocks at the bottom being the tools that did the job.



Photo by David B. Soete[©]

Ten Mile River Access along the Upper Delaware.

Partnerships – The Secret of the Upper Delaware Scenic and Recreational River’s Success

Forming productive partnerships among the many groups that cherish the river has been the secret to the success of the Upper Delaware Scenic and Recreational River, according to Sandy Schultz, Assistant Superintendent of the National Park Service (NPS).

“These organizations and individuals have built trusting relationships because they have a common purpose—protecting and improving the Delaware River,” Schultz said.

The NPS and the Upper Delaware Council (UDC) comprise the epicenter of these partnerships, encouraging and enlisting the services of various groups in fulfilling the mandates of the River Management Plan, a document whose purpose is to conserve, protect, maintain and enhance the river corridor’s resource values and social and economic vitality.

“When we asked our staff to name the organizations and groups that are our partners, they came up with 400 names,” said Carla Hauser Hahn, NPS Program Specialist. Though it would be impossible to name all these in this article, we can highlight a few groups that contribute to these unique relationships.

Besides the obvious partners, NPS, the UDC, the New York State Department of Environmental Conservation (DEC), the Pennsylvania Department of Environmental Protection (DEP), Delaware River Basin Commission (DRBC), the Pennsylvania Department of Conservation and Natural Resources (DCNR), and the local municipalities along both

sides of the river, others are briefly highlighted here.

The National Canoe Safety Patrol (NCSP)

This group pre-dates even the federal designation of the river in 1978. “Back before we had learned about the designation, a group of canoe clubs in Pennsylvania, New York and New Jersey, saw the need to lessen the deaths that had been occurring along the river,” said Richard Rhodes of the NCSP. “So we began to organize and train rescue teams and have continued to do so in cooperation with the NPS. Since our beginnings, we have lessened the deaths of those using canoes to zero or near zero.”

The volunteer group will focus next year on educating swimmers about river safety.

The Delaware Highlands Conservancy (DHC)

DHC is a land trust whose purpose is to conserve the forests, farms and waters of the Upper Delaware River region by acquiring conservation easements, or land, from willing landowners. Founded in 1994, DHC met its goal of protecting 10,000 acres in 2007, and has set a new goal to protect an additional 10,000 acres across the region by 2012.

The Kittatinny Canoes River Cleanup

An annual volunteer effort organized by Kittatinny Canoe Livery owner Ruth Jones, this

cleanup enlists volunteers who search the river and remove trash and debris that mars the beauty of the river.

The Delaware and Hudson Transportation Heritage Council (DHTHC)

This partnership includes public, private and non-profit organizations committed to promoting the appreciation, preservation and restoration of the historic resources of the Delaware and Hudson Canal and Gravity Railroad. Many sections of the D&H Canal towpath, once used by mules for pulling canal boats, have been transformed into unique recreational trails.

The partnership includes Wayne County Historical Society and Museum, the Neversink Valley Area Museum, the Waymart Area Historical Society, the Ellenville Public Library and Museum, the Sullivan County Historical Society, the Century House Historical Society and the Hudson River Maritime Museum, the D&H Canal and Gravity Railroad Conservancy, the Upper Delaware Council, and the National Park Service.

The Eagle Institute

One of the cherished resources of the Upper Delaware River are the bald eagles, who draw large crowds of viewers. The Eagle Institute is a volunteer, non-profit organization dedicated to protecting the eagle and its habitat. The Institute is uniquely located near the largest wintering eagle habitat in the northeast, encompassing the Upper Delaware



Photo by David B. Soete©

Hancock, NY fishing access.



Photo by Sandra Schultz©

Erica Benoit zipping her life jacket before entering the river at Narrowsburg.

River watershed in New York and Pennsylvania and the lower Hudson Valley of New York. The group fulfills its purpose through education, research and public awareness.

The Upper Delaware Scenic Byway

The Byway was established in 2002 to enhance the economic vitality and preserve the scenic values of the communities along New York State Route 97. The designation involved three counties and 8 municipalities. Signs identify the route that traverses the valley from Port Jervis in Orange County, NY, through six towns of Sullivan County to Hancock, NY, in Delaware County. Research and data collection along Route 97 indicates that significant historic, cultural, natural, recreational, scenic and archeological qualities exist within the byway corridor.

The Delaware River Sojourn

"This event, like no other, symbolizes the true life and charm of the river," says NPS Assistant Superintendent Sandra Schultz. Since 1995, the annual Sojourn takes people—from children to seniors—on an organized, seven-day canoe journey with camping in established campgrounds on the banks of the river.

"Being on the river changes your view of its importance," she said. "You fall in love with the river the more time you spend on it, in a boat and sleeping on its banks. It's so important that we bring decision-makers on the river to experience it, not intellectually, but emotionally and spiritually."

Zane Grey's West Society

Fulfilling their mission to "promote interest in

and knowledge of the eminent American author, Zane Grey and his works..." the Zane Grey's West Society collaborates with the National Park Service at the Zane Grey Museum in Lackawaxen, PA. Contributions to the museum have, among other things, helped restore the "summer kitchen." Members volunteer during "Zane Grey Days" where visitors—children in particular—are introduced to the stories of the Old West through programs and hands-on projects. Other members contribute their extensive knowledge about the author and his life and prepare for new exhibits at the museum.

The Cochetcon Preservation Society

The 1850s-era train station, originally located at the site of Cochetcon Mills, is being restored by the Cochetcon Preservation Society and will serve as a companion to the proposed Upper Delaware Scenic Byway Visitor Center on New York State Route 97. The visitor center will be owned and operated by Sullivan County in a similar fashion as they operate the Fort Delaware Museum of Colonial History in Narrowsburg. In addition to rest rooms and tourist literature, the visitor center will contain office space for the Byway organization and the Preservation Society.

The Upper Delaware River Roundtable

The Roundtable is a network initiative to foster communication and collaboration between regional partners and stakeholders in the Upper Delaware River Valley and provide tools and

educational activities for governmental entities. An early accomplishment of this initiative, which began September 2007, was the creation and continual updating of a regional map of the river valley which shows existing development, proposed subdivisions over 20 units and preserved lands from the Delaware Water Gap, PA to the headwaters of the Upper Delaware in Delaware County, NY

Catskill Regional Invasive Species Partnership (CRISP)

A volunteer partnership of diverse stakeholders with an interest in invasive species management in the Catskill and Delaware region, CRISP promotes prevention, early detection and rapid response, and limited broader control of invasive species to protect natural resources. In addition to conducting public outreach and management activities, CRISP supports research about ecological impact and effective controls of invasive species.

These groups and many others will be celebrating the river's anniversaries at the Upper Delaware EXPO to be held on Saturday, October 25, 2008 at the Damascus School on Route 371 in Damascus, PA. Admission is free.

Providing Public Access

"Please Respect Private Property Rights." This message appears at every opportunity, both in publications and signage throughout the valley. National Park Service (NPS) staff must explain that the Upper Delaware Scenic and Recreational River is different from many other NPS sites. Of the 56,000 acres comprising the "cooperative" management area, NPS is limited by the River Management Plan to acquiring no more than 124 acres. After 30 years, NPS owns 30.6.

Yet, nearly 250,000 visitors come to National Park Service-managed facilities at the Upper Delaware Scenic and Recreational River each year, and river users at 16 public accesses are introduced to the experience of fishing or boating via agreements. It is impossible to enjoy the Upper Delaware River without experiencing Upper Delaware partnership success first-hand.

The New York State Department of Environmental Conservation or the Pennsylvania Fish and Boat Commission, both agencies with complimentary missions to the National Park Service, provide 14 accesses that allow visitors to use the river. The Town of Hancock, NY and the Boy Scouts of America at Ten Mile River, NY, provide the other critical two.

The National Park Service stepped in to fill the need for adequate amenities, law enforcement, education and information. Three-panel bulletin boards inform and educate, while National Park Service Interpretive rangers talk to visitors at accesses with higher visitation. Law Enforcement Rangers educate visitors about safe and appropriate river use. And in the background, our maintenance and administrative staff sees to our visitors' comfort and the river's cleanliness by providing trash pickup and toilet facilities, either directly or through separate agreements with the local municipalities.

Providing a seamless experience to our guests, together we are "Partnering to Protect the River," orchestrating the best the incomparable Upper Delaware has to offer.

For more, please see <http://www.nps.gov/upde/planyourvisit/>



John Hart interpreting traditional woodworking used on the Roebling Bridge.



Canal remnants can be observed along NYS Route 97 south of Minisink Ford.

Contributed photos

The Upper Delaware River – Rich in History

The history of the Upper Delaware River is a saga of singular ventures, new inventions, disappointments and positive regeneration.

The singular events and new inventions were the building of the Delaware and Hudson Canal and Gravity Railroad, and the construction of the nation's first railroads, initiating a daring precedent for entrepreneurs across this nation to follow, building a nation that would become the economic and ideological model for the rest of the world. It all started here.

The disappointments came as the nation developed in new directions, away from dependence on rivers for transportation, on wood and forests, on tanneries, acid factories and blue stone, leaving the communities along the Delaware River to wither until the construction of the Greater New York and Erie Railway, transforming the area in later years into a tourist area, attracting people because of its unspoiled beauty.

The regeneration has come in recent years with the designation of the Upper Delaware Scenic and Recreational River, the arrival of the National Park Service, and the establishment of the Upper Delaware Council with a management plan for the future.

It is this history and regeneration that we are commemorating during this year when we celebrate not one, but three significant anniversaries: 40 years of the Wild and Scenic Rivers Act, 30 years of the Upper Delaware Scenic and Recreational River, and 20 years of incorporation of the Upper Delaware Council.

"It wasn't always beautiful in the area," said Mary Curtis, Town of Delaware historian and former NPS Historian. "If you could have seen the denuding of the wonderful pine forests that happened during the rafting period, the bodies of the hemlocks stripped of their bark and strewn all around, and the smell of the tanneries and the acid factories, you wouldn't want to live here."

Despite all this, the history of the Upper Delaware is rich.

The Lenape Tribes

The Native American Lenape, also known as "the Delaware," who inhabited the Delaware and Hudson River valleys in the 17th century when the European settlers arrived, were a loosely organized band of indigenous people sharing the same culture and language. They were hunters, fishers and farmers who stayed close to their lands. Their homes were sturdy structures of saplings and bark, and dugout canoes were their principle means of travel. They were largely a peaceful people.

At the time of the European settlement, their numbers are estimated to have been about 15,000. By the mid-1700s diseases such as measles and smallpox, for which the Lenape had no immunity, dwindled their numbers, and pressure by the Iroquois Confederacy and the more educated and venturesome colonists forced the tribe to move away.

The early white settlers

"The roads in those early days were mud ways," Curtis said. "When the railroad came in, it created the towns along the river that we have now."

The first settlers came from Connecticut. "One of the British kings gave the Yankees claim to the land going west—overstepping New York and beginning again in Pennsylvania," Curtis said. "The main families had names like Skinner, Tyler, Calkins and Thomas. They set up a settlement they called Cushetunk, meaning place of the red rocks. The place was present day Cochection."

Another group of settlers came from the south and settled in Tusten. "They were massacred by a group of marauding braves from the Susquehanna Valley and their settlement didn't last," she said.

The German immigrants of the 19th century brought much of the architecture of the valley; they expanded farming and the boarding house industry, the tourism of the 1800s.

Zane Grey

Born in Zanesville, Ohio, Zane Grey (1872-1939) came East to attend the Dental School at the University of Pennsylvania on a baseball scholarship. Following graduation, he played semi-pro baseball while he practiced dentistry.

Zane Grey began his writing career relating stories of his experiences fishing along the Upper Delaware River. On one of these outings in 1900 he met his future wife, Lina Elise "Dolly" Roth, who persuaded him to leave both baseball and dentistry to write full-time, which he did by fall of 1904, when he purchased property on the confluence of the Delaware and Lackawaxen Rivers where he lived and wrote until 1918. Zane and Dolly's three children were born during the Lackawaxen era.

Early in his marriage, Grey traveled to the American West. The harsh landscapes and determined people Grey encountered on these expeditions and in the many that followed would color his descriptions of people and landscapes for the rest of his life.

Grey's first successful novel, *The Heritage of the Desert*, was followed by his most noted work, *Riders of the Purple Sage*, which launched his stellar career writing the classical novel of the "Old West." Ultimately the prolific author's books would become the inspiration for over 100 classic black-and-white films of the "Old West."

Though he moved his family to California in 1918, the family retained the house in Lackawaxen, visiting when they were on the East Coast. The ashes of both Zane and Dolly Grey were interred in the cemetery near their home in Lackawaxen, fulfilling their wishes to rest together along the Delaware River where it all had begun for them.

The Delaware and Hudson Canal

This canal was the first in this nation built as a private venture. Constructed from 1825 to 1829 by immigrant Irish and German laborers, it gave the area a unique mix of ethnicities. The canal was used to transport anthracite coal from the mines of northeast Pennsylvania to Kingston, New



Contributed photo

Zane Grey

York, where it was then transported along the Hudson River to New York City, depending first on the Gravity Railroad that carried the coal from Carbondale over the Moosic Mountains to Honesdale where the railroad ended and the canal began. As part of the effort, what is considered the first steam locomotive engine, the Stourbridge Lion, began operating.

The Roebling Bridge – Delaware Aqueduct

As the canal wended its way toward the Hudson River, its operators realized the necessity of carrying the coal barges over the rapidly flowing Rivers, so they commissioned a German immigrant engineer, John Roebling, to construct four suspension aqueducts in 1845 (the other three aqueducts were abandoned and succumbed to the elements over the years). The aqueduct operated for

50 years until the canal was closed in 1898 and it was converted to a roadway bridge.

Although not the first suspension bridge built in America, the Roebling Bridge is now the oldest surviving suspension bridge in the country. It was purchased by the National Park Service in 1978 and restored over succeeding years.

The Railroad

The fast-paced Industrial Era brought with it the Steam Locomotive, an equally fast-moving transportation system. Supplies and materials of ever increasing quantities were needed throughout the world, and people were again broadening their horizons. The Upper Delaware valley was a crossroads for that new system. Many railroads crisscrossed the Catskills and Poconos. Each of the quaint hamlets along the river once hosted a railroad station. Among the

cargo carried were travelers, most of whom escaped the cities to spend their summers on family farms here during the heyday of the railroad and the budding tourism industry. Only the Norfolk Southern and Central New York railroads still traverse the Upper Delaware today.

Tourism

Since the advent of the railroad, tourism has been a major industry in the Upper Delaware region. More recently, however, nearly 250,000 visitors come to experience the natural beauty of the Upper Delaware Scenic and Recreational River in particular, while thousands more tour the Upper Delaware Scenic Byway and the shops, trails and cultural stops throughout the valley. Ecotourism is a burgeoning industry. "Everything old is new again."

Places to go



Photo contributed by National Park Service

Zane Grey Museum



Photo contributed by National Park Service

D&H Canal



Photo by David B. Soete®

Tusten Mountain Trail

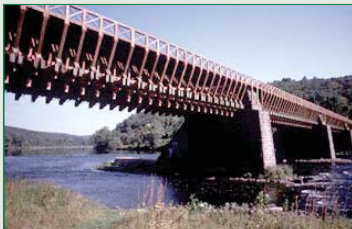


Photo contributed by National Park Service

Roebling Bridge



Photo by David B. Soete®

Upper Delaware Scenic Byway



Photo by David B. Soete®

Recreation on Upper Delaware



For additional information, please contact:
UDC: Laurie Ramie, (845) 252-3022 or laurie@upperdelawarecouncil.org
NPS: Sandra Schultz, (570) 729-8251 or sandra_schultz@nps.gov

Please Join Us

Upper Delaware Scenic and Recreational River Thirty-Year Retrospective

Saturday, November 8, 2008, 8 a.m. to 5 p.m.
Central House Family Resort, Beach Lake, PA

Please join the National Park Service and Upper Delaware Council, Inc., as we examine the thirty years since the 1978 designation of the Upper Delaware Scenic and Recreational River and look at the road ahead as the Upper Delaware Region faces unprecedented challenges.

The \$25 registration fee includes a continental breakfast, buffet luncheon, and two snack breaks. A social hour will follow.

The registration deadline is Friday, October 31.

Make checks payable to "UDC" and note "Retrospective" in the subject line.
Mail to Upper Delaware Council, Inc., P.O. Box 192, Narrowsburg, NY 12764-0192.



Contributed photo

National Park Service personnel demonstrate water safety for young boaters.

Enjoying the Delaware River

A river trip should be exciting, but it can also be a dangerous experience. To avoid problems or injuries, it is important to prepare carefully for a safe trip.

The Delaware River does not have particularly hazardous rapids. At average water levels, the Upper Delaware has only a few Class II or II+ rapids. However, moving water can be deceptive and potentially treacherous, even for non-paddlers. More drownings on the Delaware River have been swimming-related than boating-related. In almost all cases, the victims were not wearing a properly fitted life jacket.

Follow the steps and information listed here to learn how to safely and comfortably enjoy the river.

Be Prepared

- Wear a life jacket and river shoes.
- Bring a spare paddle, a throw line and a first aid kit.
- Bring adequate drinking water.
- Protect yourself from heat-related illnesses.
- Heat cramps are the warning sign that the body is having trouble with the heat.
- Resting and drinking water will help prevent more serious illnesses like heat exhaustion or heat stroke. Do not drink river or stream water.

Be Aware of River Conditions

Call the Upper Delaware River Hotline at 845/252-7100. This recorded message is available 24 hours a day and is updated daily during the boating season. It provides the river height, air and water temperatures, boating conditions and general river safety information. Be aware of upstream releases and sudden changes in water depth and speed. River information is also available at www.nps.gov/udpe.

Be Ready for Changing Weather and Cold Water

Bring raingear. To protect against hypothermia, have clothing made of wool,

polypropylene, high-performance fleece or a wet suit. Immersion hypothermia is the numbing effect that cold water has on the body. Hypothermia is possible whenever the water temperature falls below 70° F. Loss of body heat is 25 times greater in cold water than in air of the same temperature.

Always Tell Someone Where You Are Going And When You Expect to Return

Arrange drop-off and pick-up points before you leave. Leave emergency phone numbers and vehicle description and tag numbers with someone who can report that you are overdue.

Avoid Mind-Altering Substances

Avoid alcohol and other drugs while on the river. Alcohol makes you more susceptible to heat-related illness. In an emergency, it slows your response. Never impair your judgment while on the river.

Laws on underage drinking, possession of illegal drugs, disorderly conduct and littering are strictly enforced.

Guard against sunburn

It's easy to get burned before you realize it on a cool, refreshing river. Knees, backs of hands, neck and tops of feet are most susceptible to burns. Be sure to apply waterproof sunscreen or keep your skin covered. Wear UV-protecting eye wear. Eyes can be sunburned too!

YOUR SAFETY IS YOUR RESPONSIBILITY

Always Wear Your Life Jacket

It's smart to wear a life jacket—while boating, tubing, fishing, wading or swimming on the river. By law, all children 12 and under must wear a life jacket while on the river in any vessel, including inner tubes. Every person in a boat or using an inner tube must have a life jacket within reach.

Use Proper Boating Techniques

- Kneel when canoeing in rapids to keep your weight low. This helps avoid capsizing. In rapids, aim for the downstream "V."
- When boating with a partner, paddle on opposite sides of the canoe. Hold on to your paddle, not the boat.
- Paddle around eel weirs. Avoid these large, V-shaped wooden and rock traps, usually constructed by late summer.
- Always be courteous on the river. You may encounter a variety of river users on your trip. Please respect their rights and act responsibly and ethically.

If You Capsize...

Don't panic. Stay upstream of the boat so it does not pin you against a rock.

Don't attempt to stand in rapids. Get on your back and keep your feet up and pointed downstream to push off obstacles.

Never swim against the current. Backstroke and let the current assist you to shore.

Don't Become a Statistic

Since 1980, when the National Park Service



Proper use of life jackets saves lives on the Delaware.

Photo by David B. Soete®



Photo by David B. Soete®

This mature buck is one of the magnificent animals sharing space in the forests and fields of the Upper Delaware River valley.

began river operations here, 56 drownings have been recorded on the Upper Delaware Scenic and Recreational River. Fifty-three were male. The average age is just 28. At least 20 percent of the deaths were drug- or alcohol-related fatalities.

- Over 65 percent of the drownings occurred while victims were swimming or wading. The number wearing a life jacket? Zero!
- The Upper Delaware includes swift currents, rapids, eddies, sudden dropoffs, slippery rocks and floating or submerged debris.
- There are no designated or life-guarded swimming areas on the Upper Delaware River.
- Wear a life jacket and appropriate footwear while swimming, wading or floating.
- Never try to stand in rapids. Your foot could get trapped between submerged rocks. The current could push you over and hold you under even if you are wearing a life jacket.
- Do not jump or dive from cliffs, rocks or bridges into the river; the water may be shallow and objects may be submerged.
- Never attempt to swim across the river.

Protect the River and Others around You

- Obey all regulations and respect all resources.
- Observe fishing limits and seasons.
- Display your fishing license properly; fishing regulations are enforced.
- Do not fish from any bridge.
- Respect private property. More than 85 percent of the land along the river is privately owned.
- Do not remove or deface cultural artifacts or natural features.
- Don't litter. Be sure to tie all gear—except life jackets—to your boat. Carry in, carry out. No glass containers on or near the river.
- If you have questions or need assistance look for National Park Service rangers or volunteers, who are there to help.

Angling Etiquette

- Keep only the fish you plan to use.
- Handle fish carefully to avoid injury.
- Follow fishing regulations.
- Observe safe angling and safe boating.
- Never stock fish or plants in public waters.
- Do not disturb nesting birds.
- Remove all mud and drain all water from boats before departing access site.
- Do not release live bait into the water.
- Dispose of water from bait bucket on land.
- Do not transport fish or aquatic plants from one body of water to another.
- Do not dispose of fish carcasses or by-products in the water.
- Properly dispose of used fishing line.
- Leave the area as clean as (or cleaner!) as you found it.

Eagle Etiquette

American bald eagles are not very tolerant of human activity and may be easily disturbed. Human presence can stress the birds and affect their overall health, feeding, roosting and nesting. Eagle watchers are asked to cooperate by not attempting to approach any eagle and by following the preferred eagle etiquette:

- Use binoculars instead of trying to get a little closer."
- Don't try to make a bird fly, as it will waste precious energy it needs to survive.
- Persons on foot are the most disturbing to bald eagles.
- It is illegal under federal and state laws to kill, trap, injure, take, annoy, harass, worry, or pursue (approach) a bald eagle.

For the least intrusive and most successful eagle viewing, please:

- Remain in your vehicle.
- Remain quiet. No loud music, yelling, door slamming, etc.

- Respect private property and restricted areas.
- Get out early in the day, between sun-up and 11:00 a.m., when eagles are most active.

Outdoor Etiquette

Practice the following Leave No Trace principles:

- Be prepared. Select gear and make plans by thinking about how it will impact the environment.
- Keep to existing roads, trails and footpaths.
- Carry in and carry out all your belongings, including trash.
- Leave what you find. Don't disturb natural features such as rocks and plants, nor alter campsites by digging, chopping or hammering.
- Minimize use of fire with lightweight camp stoves.
- Practice "Negative Trace." Clean up trash left behind by others.

Wildlife Viewing Etiquette

Opportunity abounds for observing wildlife throughout the region. Outdoor enthusiasts may encounter black bears, white-tailed deer, eagles, wild turkeys, porcupines, coyotes and much more. Care should be taken to avoid disturbing any wild creature. The following measures should be practiced:

- Approach wildlife slowly and maintain an appropriate distance.
- Use binoculars and telephoto lenses to get a closer view.
- Turn off headlights, car engines and alarms and cell phones.
- Don't chase wildlife whether on foot or in a motorized vehicle.
- Don't touch, swim with or feed wild animals.
- Talk quietly; don't make loud noises or imitate animal sounds.
- Sit still and move slowly. Sudden moves can alarm wildlife.
- Do not move or remove any creature from its habitat.
- One of the best ways you can assist wildlife is by protecting its habitat.

Emergency Contact Numbers for the Upper Delaware:

911

National Park Service: 845/557-0222

New York State Police:

Delaware County: 607/467-3215

Sullivan County: 845/292-6600

Orange County: 845/856-6500

Pennsylvania State Police

Honesdale: 570/253-7126

Blooming Grove: 570/226-5718

Cell phones may not work along the river.

Upper Delaware EXPO

Celebrate the 30th Anniversary
of the Upper Delaware Scenic
and Recreational River



**Join the National Park Service and
Our Partners in Celebrating 30 Years
of “Partnering To Protect The River”**

Upper Delaware EXPO

Damascus Elementary School, Route 371 & High School Road, Damascus, PA

Saturday, October 25, 2008

10 am to 4 pm

Opening Ceremony at 10:30 am

Winners of the 9th-12th Grade Art Contest will be Announced

Educational Programs Include:

Birds of Prey by the Delaware Valley
Raptor Center at 11 am & 1 pm

Resource Management through
the Years at 12:30 pm

Reptiles and Amphibians by the Pennsylvania
Fish & Boat Commission at 2 pm

K-9 Search and Rescue Unit by New York
State Environmental Conservation will have a
demonstration at 3 pm

Outside, throughout the day, river safety and
rescue demonstrations will take place

A photographic and art exhibition by
well-known photographer Dave Soete &
award-winning students will be on display

Exhibits by Upper Delaware partners will highlight
their collaborative contributions to the “partnering
to protect the river” philosophy

Boy Scout Troop #122 will have food
available for sale throughout the day

PROUD MEDIA SPONSORS PARTNERING TO PROTECT THE RIVER

THE RIVER REPORTER



Stuart Communications
Creative Services
FULL-SERVICE MARKETING SOLUTIONS

PIKE COUNTY
DISPATCH

To learn more about the Upper Delaware EXPO, visit the park's web page at
www.nps.gov/upde or call Education Specialist Ingrid Peterec at 570/685-4871

EXHIBIT C

Final River Management Plan

**UPPER DELAWARE
SCENIC AND RECREATIONAL RIVER**

New York and Pennsylvania



**Prepare by the Conference of Upper Delaware Townships
in cooperation with the National Park Service**

November 1986

Final River Management Plan

**UPPER DELAWARE
SCENIC AND RECREATIONAL RIVER**

New York and Pennsylvania

**Prepared by the
Conference of Upper Delaware Townships**

In Cooperation with the

**Commonwealth of Pennsylvania;
State of New York;
Delaware River Basin Commission;
National Park Service;
and the
Upper Delaware Citizens Advisory Council**

November, 1986

Water Quality

High water quality, the presence of cold water releases and its free-flowing character all give the Upper Delaware some of the most important fisheries habitat in the Northeast. The Upper Delaware's consistently high water quality provides habitat to diverse and well-balanced biological communities. The upper segment of the river is also unique among large rivers in the East due to its relatively cold temperatures. Since 1967, when large volumes of cold water were first released from the Cannonsville Reservoir, the New York State Department of Environmental Conservation reclassified approximately 27 miles of river between Hancock and Callicoon as a coldwater fishery. This stretch supports an abundant population of rainbow trout and brown trout, offering some of the finest trout fishing in the Northeast. The 50 miles of warmwater fishery between Callicoon and Port Jervis offers habitat to many species including sunfish, eel, bass, and walleye.

Certain tributaries to the river are vitally important fishery areas. These tributaries, although not specifically recognized in the Upper Delaware legislation or included within the proposed river boundary area, are biologically important to the fishery values of the main stream of the river. Specifically, many of these streams, which have been legislatively or administratively recognized by the State of New York or the Commonwealth of Pennsylvania, provide spawning habitat for trout and other species.

New York Tributaries

A number of tributary streams of the Upper Delaware River have been determined by New York's Department of Environmental Conservation to be fishery areas which have a direct relationship to the values of the designated river area. All New York tributaries that are currently classified C(t) or higher, or are so reclassified in the future, are recognized as having this direct relationship. The major tributaries now in this category are:

1. Basket Creek - upstream to the confluence of the East and North Branches
2. Hankins Creek - upstream to the impassable barrier at Mileses
3. Callicoon Creek - upstream to the confluence of the East and North Branches
4. Mongaup River - upstream to the impassable barrier at the Rio Dam

Pennsylvania Tributaries

All tributaries on the Pennsylvania side of the river have been designated as "exceptional value," "high quality," or "coldwater fishery" by the Commonwealth of Pennsylvania under the state Clean Streams Law. This designation, designed to improve water quality and habitat, permits no degradation of exceptional value streams. It also permits no degradation of high quality, coldwater fishery streams, unless overriding social and economic justification/benefits exist.

Wildlife

The Upper Delaware River corridor contains diverse habitats that support abundant wildlife populations. In addition to the dense forest cover (from 50% to 75% of the corridor), farming practices have introduced new pioneer plant species and have provided pasture grasses and crops that enhance the wildlife food supply. Of the fifty species of mammals observed in the corridor, the white-tailed deer is a principal wildlife resource. The valley provides habitat for the river otter, once abundant throughout Pennsylvania. About 70% of the state's remaining otter population is now thought to reside in the basin. Wildlife biologists believe that Pike County, Pennsylvania, has one of the highest Eastern Black Bear populations in the state. Other animals of note in the corridor include bobcats, coyotes, and wild turkey.

As part of the Atlantic Flyway, the corridor hosts large numbers of waterfowl and waterbirds in the wooded riverside habitats. Approximately 200 species of birds have been identified within the corridor, including the federally endangered bald eagle, which winters in the Delaware watershed. According to wildlife biologists, the highest concentration of eagle wintering areas in New York is found in this watershed.

Threatened and Endangered Species

The Upper Delaware River corridor is habitat to several threatened and endangered species, including the bald eagle which winters in the area. The Pennsylvania office of The Nature Conservancy has identified several rare plant species along the Pennsylvania side of the river. These species are considered potential candidates for state designation, a register that will be officially released in 1986. The plants proposed for designation as rare are the sand cherry (*Prunus pumila*), the thread rush (*Juncus filiformis*), and the roseroot stonecrop (*Seedum rosea*). The roseroot stonecrop has only been observed on one additional site in the state. The plant proposed for designation as an endangered species is the miner's lettuce (*Montia chamisso*). The river corridor is the only location in the state of Pennsylvania where this plant has been observed.

The New York Natural Heritage Program is conducting a two year study of rare plants and exemplary natural communities within the proposed river corridor boundaries on the New York side of the Upper Delaware River. The final report for this study will be available in February 1987. Preliminary findings indicate the presence of four species considered rare in New York: Great Saint John's wort (*Hypericum pyramidatum*), prostrate sand cherry (*Prunus pumila* var. *depressa*), river birch (*Betula nigra*), and sand plain gerardia (*Agalinis setacea*). The study will identify human use impacts within the proposed river corridor boundaries.

Recreational Resources

Hunting and Trapping

The Upper Delaware Valley offers some of the best hunting and trapping opportunities in Pennsylvania and New York. Wildlife biologists recognize the river valley as an excellent hunting area because its combination of diverse habitats produces abundant wildlife populations. Large tracts owned by hunting clubs contribute to this healthy population. New York's Delaware County had the second highest deer harvest in the state in 1983, and the highest turkey harvest in the spring of 1984. Hunting and trapping also substantially contribute to the economy of the area.

Fishing

The Upper Delaware is recognized by sportsmen and fisheries biologists as one of the finest fishing rivers in the northeastern United States. The Upper Delaware offers opportunities for both cold and warmwater fishing and provides a high quality fishing experience in close proximity to major metropolitan areas. According to the 1976 New York Angler Survey, the Upper Delaware is one of the five most heavily fished river areas in the state. In 1982, it was estimated that there were nearly 60,000 angler days for the river area between Hancock and Port Jervis. (Sheppard, 1983) Since 1978, the estimated fishing days in the 27 mile reach between Hancock and Calicoon have increased by ninety percent, while the 36 mile reach between Narrowsburg and Port Jervis has experienced an increase of 205 percent. The annual economic value of recreational fishing to the Upper Delaware area has been estimated at nearly 5,000,000. (Sheppard, 1983).

Fisheries biologists from Pennsylvania and New York recognize the upper segment of the river as one of the foremost trophy trout streams in the Northeast. Depending on the time of year and volume of cold water releases from tributary reservoirs, this significant trout fishery ranges between the hamlets of Hancock and Calicoon. Trout and other fish have been subjected periodically to extreme changes in flows and water temperature due to sudden changes in the release schedules of the upstream reservoirs. American eels are found throughout the corridor, sustaining one of the finest commercial eel fisheries in the world during the fall, when mature eels return to the sea to spawn.

The Upper Delaware also provides key spawning and nursery habitat for the American shad along its entire length. The Delaware is the only natural shad river in the Northeast (from Maine to West Virginia) that is sufficiently free of man-made barriers and industrial pollution to allow passage of these migratory fish to their upper reach spawning habitats. Up to 500,000 shad migrate to the upper reaches annually. This number is expected to increase substantially upon completion of several new sewage treatment plants in the Philadelphia area. The most important spawning occurs above the Delaware Water Gap, with nursery areas at or downstream of spawning grounds due to the downstream dispersal of young shad. The most important nursery areas are located from Belvedere to Hancock and up into the East Branch, and centered near Tusten and Lordville. The shad spawning period runs from mid-April through June. From Port Jervis up into the East Branch the peak of the spawning period usually occurs in June due to the slower warming waters.

Canoeing and Rafting

The Upper Delaware is one of the most outstanding canoeing rivers in the Northeast. The designated river section is canoeable throughout its entire length and boasts a total elevation differential of 460 feet, better than six feet per mile, although it is much steeper in some reaches. Boating experts have stated that the combination of proximity to major metropolitan areas, high visual quality, and consistent flows due to upstream dam releases make the Upper Delaware one of the finest recreational canoeing rivers in the Northeast. The number of rafting trips on the river has been increasing in recent years.

Data on river use throughout the United States is incomplete, but many boating experts agree that the Upper Delaware receives more recreational canoeing use than any other river in the Northeast, and that it is certainly one of the most popular canoeing rivers in the country. The New York State Department of Environmental Conservation estimated that for the period from 1978 to 1982, the annual number of boating trips on the Upper Delaware ranged between a low of 20,500 trips in 1979, and a high of over 59,000 trips in 1980. In 1982, the economic value of recreational boating activities on the river was estimated to be \$12.7 million.

Cultural, Historical and Archeological Resources

The Upper Delaware Valley is rich in structures and sites that reflect its history and cultural development, although the full potential of many of these structures has yet to be explored. Prehistoric archeological sites, historic architecture, and historic engineering and industrial sites are all abundant in the valley.

The Roebling Bridge, formerly an aqueduct that was part of the Delaware and Hudson Canal, was designated a component of the Delaware and Hudson Canal National Historic Landmark in 1968, the highest designation of national significance that a structure can receive. Designed by John Roebling, creator of the Brooklyn Bridge, the aqueduct is his earliest surviving suspension bridge and may be the oldest cable suspension bridge in the world that survives intact. The aqueduct was also designated by the American Society of Civil Engineers as a national historic civil engineering landmark in 1973.

Much of the Delaware and Hudson Canal corridor is lined with the remains of structures related to canal operations--bridges, locks, aqueducts, dams and related buildings, which provide a record of the complex infrastructure of nineteenth century canal transport. Several canal segments outside the river corridor have been listed on the National Register of Historic Places, and two segments within the corridor, between Sparrow Bush and Mongaup and between Pond Eddy and Barryville, are also considered eligible for nomination.

Three historic buildings in the river corridor, the Arlington Hotel and the Kirk House in Narrowsburg, and the Zane Grey House in Lackawaxen, were recently listed on the National Register of Historic Places. The Zane Grey House is a large "eclectic style" home occupied by the popular author of Western novels between 1905 and 1918. It now contains a private museum and is leased in part for office space by the National Park Service. The Arlington Hotel, built in 1894, is the focal point of Narrowsburg's commercial district and is considered significant for its association with the early economic and social history of the river valley. It is currently being restored by its present owners, the Delaware Valley Arts Alliance.

The Kirk House is a small "high style" Greek Revival house originally built around 1840, and "modernized" with a stucco exterior around 1920. This exterior is considered an exceptional example of vernacular architectural design in stucco.

EXHIBIT D

Final Environmental Impact Statement
UPPER DELAWARE
SCENIC AND RECREATIONAL RIVER
New York and Pennsylvania

FES 87-13
RELEASED
March 26, 1987

Prepared by National Park Service, Mid-Atlantic Regional Office, Division of Park and Resource Planning; in consultation with the State of New York, Commonwealth of Pennsylvania, Conference of Upper Delaware Townships, Delaware River Basin Commission, Citizens Advisory Council, and other public and private interests.

CHAPTER I - PURPOSE AND NEED

A. Purpose

The Upper Delaware legislation (P.L. 95-625) Section 704 requires that the Secretary of the Interior in cooperation with the Delaware River Basin Commission, the Citizen's Advisory Council, the Commonwealth of Pennsylvania, the State of New York and their concerned political subdivisions develop and approve a river management plan. The purpose of the proposed Upper Delaware River Management Plan is to set forth how the resources of the Upper Delaware River corridor will be managed, through cooperative federal, state, local and private efforts, and to provide as broad a range of land and water uses as is compatible with conserving outstanding resource values. If approved, this plan will guide the future actions of the National Park Service (NPS) and other agencies and units of government in the management of the river and adjacent land resources for the next 20 years.

B. Need

The Upper Delaware River is one of only four river segments in the Northeastern U.S. to have been designated as a component of the National Wild and Scenic Rivers System. To receive such recognition, a river and its surrounding environment must be free-flowing and relatively undeveloped, and must possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic and cultural resources, or other similar values. Designated rivers, by law, are to be preserved in free-flowing condition and protected for the benefit and enjoyment of present and future generations. The Delaware River is the only major river in the Northeastern United States that remains undammed along its main stem, although its flow is controlled, in part, by several tributary dams.

The high water quality of the Upper Delaware, in part attributable to the rural, sparsely settled nature of the region, is also an important

resource, which has prompted the Pennsylvania Department of Environmental Resources to designate the watershed as a special protection area.

The landscape of the Upper Delaware area is a visually diverse one, characterized by the contrast of farmland and villages on the valley floors with the forested hills that surround the valley. The Delaware River Gorge, which extends north from Matamoras, Pennsylvania, for much of the corridor's length, has been identified by the Pennsylvania Geological Survey as an outstanding scenic geologic feature.

The Upper Delaware provides some of the most important fish habitat in the Northeast, because of its free-flowing nature, high water quality, and cold water releases (from reservoirs on tributaries). The northern segment of the river, between Hancock and Callicoon, is unique due to its cold water temperatures, and offers some of the finest trout fishing in the Northeast. The Upper Delaware is currently one of only two natural shad rivers (the Hudson River is the other) from Maine to West Virginia that is sufficiently free of man-made barriers and industrial pollution to allow passage of shad to their upper reach spawning habitats.

Recreational opportunities are abundant in the Upper Delaware area. The river is one of the most outstanding canoeing rivers in the Northeast, combining consistent water flows, high scenic quality, and proximity to metropolitan areas. Because of its combination of diverse habitats, the area also offers excellent recreational fishing and hunting opportunities. Many also visit the area for sightseeing, swimming, and other activities.

This rural area is readily accessible to approximately 31,750,000 people who live within a 150-mile radius of the river. These outstanding resource values, and the steadily increasing recreational use of the river, are among the reasons the U.S. Congress designated 73.4 miles of the Upper Delaware River as part of the National Wild and Scenic Rivers System

through the National Parks and Recreation Act of 1978 (P.L. 95-625). The Upper Delaware legislation requires that the river management plan shall set forth:

- (A) a map showing detailed final landward boundaries, the upper and lower termini of the corridor, and the specific segments of the river classified as scenic and recreational, to be administered in accordance with such classifications;
- (B) a program for the management of existing and future land and water use, including the application of available management techniques;
- (C) an analysis of the economic and environmental costs and benefits of implementing the management plan, including any impact of the plan upon the revenues and costs of local government;
- (D) a program providing for coordinated implementation and administration of the plan with proposed assignment of responsibilities to the appropriate governmental unit at the Federal, regional, State and local levels; and
- (E) such other recommendations or provisions as shall be deemed appropriate to carry out the purposes of Section 704(c)(2) of the Act.

C. Legislative and Planning History

The Upper Delaware River was one of the original twenty-seven rivers designated for study upon passage of the Wild and Scenic Rivers Act by Congress in 1968 (P.L. 90-542, 16 U.S.C. 1271). A federal study team led by the Bureau of Outdoor Recreation (BOR) began its evaluations in 1969, and a draft river qualification study and draft environmental impact statement was released in February 1974. Concern over the level of federal land acquisition arose during this time, which resulted in a substantial redefinition of the study's recommendations concerning the boundary, land acquisition, and local involvement in the river's management. Further drafts were produced in October 1974, before a river study and a final environmental impact statement were released in July 1976. The final study and statement attempted to resolve these concerns by recommending a wider

EXHIBIT E



NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

Dwarf Wedge Mussel Fact Sheet

Dwarf Wedge Mussel

Alasmidonta heterodon

New York Status: **Endangered**

Federal Status: **Endangered**

Description

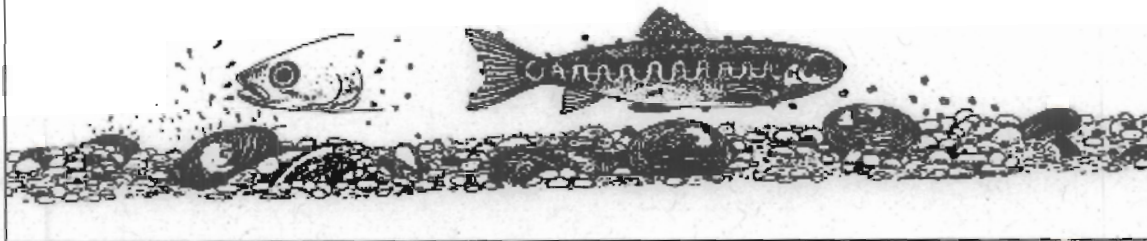
The dwarf wedge mussel is a small freshwater mussel that rarely exceeds 1.5 inches (38 mm) in length. It is brown or yellowish-brown in color. Adult mussels are filter-feeders, feeding on algae and other small suspended particles. They spend most of their time buried almost completely in the bottom of streams and rivers.



Life History

The dwarf wedge mussel is sexually dimorphic, with separate sexes, unlike some mussels which are hermaphroditic, with individuals having both male and female reproductive organs. Even so, the dimorphism is very subtle; routine determination of sex in dwarf wedge mussels is at best difficult. Male dwarf wedge mussels release sperm into the water column during the mid-summer or fall. Females collect the sperm while siphoning water for food; the eggs are then fertilized and kept within the female until they are released the following spring. By then, each egg has developed into a parasitic larvae called a glochidium. After release from the female, the glochidium attaches itself to a fish with the aid of a small hook-like appendage. Mussel glochidia are generally species-specific and will only live if they find the correct host. With dwarf wedge mussels, the right hosts are small bottom-dwelling fish, the tessellated darter (*Etheostoma olmstedii*) and the mottled sculpin (*Cottus bairdi*). It appears that the glochidium receives little nutrition from the fish, but uses it only as a means of dispersal. After several weeks, the glochidium detaches itself from the unharmed fish and drops to the river bottom. It is then a juvenile mussel.

1. Eggs, carried in the female's gills, are fertilized as sperm-laden water passes through.
2. The "glochidia" attach to a host fish where they develop for a time.
3. Juvenile mussels detach and sink to the bottom where they continue to develop.



Dwarf Wedge Mussel Life Cycle

Many mussels have lifespans that range upwards of 20, 30 or even 100 years. The dwarf wedge mussel is considerably different in this regard, though, as it appears to only live about 10 years. Adults must therefore be constantly replaced to maintain a viable population.

Distribution and Habitat



The dwarf wedge mussel is found at 17 sites in seven Atlantic Coast drainages. These are located in New Hampshire, Vermont, Connecticut, New York, Maryland, Virginia and North Carolina.

Typical habitat for this mussel includes running waters of all sizes, from small brooks to large rivers. Bottom substrates include silt, sand and gravel, which may be distributed in relatively small patches behind larger cobbles and boulders. The river velocity is usually slow to moderate. Dwarf wedge mussels appear to select or are at least tolerant of relatively low levels of calcium in the water.

Status

This mussel was once found at 70 locations in 15 major Atlantic Coast drainages. Its numbers have declined drastically; most populations that remain number in the 100's. The two exceptions are the lower Neversink River in Orange County, where there appears to be at least ten thousand if not tens of thousands of dwarf wedge mussels, and the Tar River in North Carolina.

Water pollution, including sediments and chemicals from agriculture and other development projects such as golf courses, have been implicated in the mussel's decline. Also, impoundments and channelization may have eliminated the mussel from former habitat.

Management and Research Needs

Studies by the Institute of Ecosystem Studies at Millbrook, New York and the Nature Conservancy are presently underway to better understand the habitat requirements of the dwarf wedge mussel. It is still largely unknown what determines the location of mussel beds on the river bottom. More detailed population surveys in the Neversink River will be done to determine the age structure, distribution and size of the New York population. Research will focus on potential threats to the mussels such as the

effects of dams and agricultural practices.

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EXHIBIT F

Dwarf Wedgemussel



Alasmidonta heterodon



Photo credits: Kathryn J. Schneider

Scientific Name *Alasmidonta heterodon*
(I. Lea, 1830)

Family Name Unionidae
Unionid Mussels

Did you know?

The Neversink River population, estimated at 20,000 individuals is one of the largest known populations in the U.S. (Strayer and Jirka, 1997).

Summary

Protection Endangered Species in New York State, listed as Endangered federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species in imminent danger of extirpation or extinction in New York. 2) Any species listed as endangered by the United States Department of the Interior.

This level of federal protection means: this species is formally listed as endangered.

Rarity G1G2, S1

A global rarity rank of G1G2 means: Critically Imperiled or Imperiled globally - At very high or high risk of extinction due to rarity or other factors; typically 20 or fewer populations or locations in the world, very few individuals, very restricted range, few remaining acres (or miles of stream), and/or steep declines. More information is needed to assign a single conservation status.

A state rarity rank of S1 means: Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology makes it especially vulnerable in New York State.

Conservation Status in New York

The extent of this species in New York is limited to a small area within the Delaware River watershed. The Neversink River population, a tributary of the Delaware, dropped by an estimated 60,000 individuals between 1990 to 1994 and continues to be vulnerable to a myriad of stressors that affect aquatic systems, including non-point pollution and existing impoundments (Strayer et al. 1996).

Short-term Trends

The Neversink River population has apparently declined by 75% since it was first located in 1990 when it dropped from an estimated 80,000 individuals to 50,000 in 1991, then to 20,000 in 1994 (Strayer et al., 1996). It is not known if the population still numbers in the tens of thousands since the last survey over a decade ago. Since these population estimates are based on the direct capture of only a small number of individuals and standardized monitoring methods have only recently been adopted for Unionids (Strayer and Smith 2003) the estimates may not be accurate, nor directly comparable. The short-term trend for the Delaware River (meta)population is not known at this time because the sites have not been monitored since they were first located by U.S. Geological Survey researchers in 2000 (Lellis, 2001).

Long-term Trends

All 13 major populations studied rangewide, including the Neversink River in New York, had low densities, similar to earlier 20th century observations. About 100 years ago the species was known from about 70 Atlantic seaboard river systems, but now from only 25-30 (USFWS, 1993). Similar declines in the distribution of dwarf wedgemussels have undoubtedly occurred in New York. However, since the Recovery Plan was published in 1993, increased survey effort has led to the discovery of 40 new locations where the species had been presumed extirpated, or in rivers where it had never been found (Nedeau 2005). Of the 70- 80 known locales in 2004 only 16 were believed to support reproducing populations, while 31 were based on observations of five or fewer individuals, or solely on spent shells.

Conservation and Management

Threats

Water pollution and impoundments are the primary threats. This species requires a low silt environment with a slow to moderate current, a situation that dams alter both upstream and downstream of the impoundment. A wide array of industrial, agricultural and domestic pollutants have been responsible for the dwarf wedgemussel's disappearance from much of its historical range and continues to be a problem in most aquatic systems (USFWS 1993). The darter and sculpin glaucidial host fish species are generally pollutant sensitive taxa and a healthy fish assemblage is critical to viable mussel populations (Pinkney et al. 1997). The low densities (< 0.5 per square meter) in which this species occurs is problematical since successful reproduction is density dependent. Females need to be in close proximity to a sperm-releasing male to be successfully fertilized (Strayer et al. 1996). Competition with exotic bivalves, both the Asian clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*) could pose a threat because they are expected to eventually invade all of New York's watersheds, although neither has yet invaded the upper Delaware system (Strayer and Ralley 1991). The majority of 45 individuals collected from the Neversink population were 4 and 5 year old specimens, and none were older than 8 years (Michaelson and Neves 1995). This indicates recent successful reproduction. However, since this species can live at least 20 years, and perhaps much longer, the lack of older individuals in the population could indicate high rates of mortality of older animals, possibly from pollution. Ageing Unionids by counting growth rings has recently been shown to vastly underestimate the true age of individuals, so the ages cited above may be too low by up to an order of magnitude (Strayer 2004).

Conservation Strategies and Management Practices

When feasible, the removal of impoundments in order to restore rivers to their natural flow would be beneficial. The Nature Conservancy negotiated with the Army Corps of Engineers for the removal of the Cuddebackville Dam in the summer of 2003 in order to restore natural flow patterns to the lower Neversink and is working to reduce alterations to the natural flow caused by the upstream Neversink Reservoir Dam. The outcome of this management strategy on the mussel populations has not been evaluated. The U.S. Fish and Wildlife Service has suggested that reintroductions may need to be undertaken to bring low- density populations back up to viable levels and re-establish populations extirpated from certain rivers (USFWS 1993).

Research Needs

There is still much to learn about this species, including confirmation of host fish(es) in the Delaware and the Neversink rivers, diet, age and growth, and mortality factors. Details about habitat requirements (current speed, water depth, substrate grain size, substrate stability, water temperature, and water quality factors) also need work. However, Strayer and Ralley (1993) found that the distribution of this species was not related to these typical physical habitat qualities, but instead to long term stability of the substrate (i.e., flow refuges). Both large and smaller scale forces promoting the patchy occurrence of Unionid mussel beds is an active area of research (Strayer 2004).

Habitat

In New York, dwarf wedgemussels live embedded in the fine sediment that has accumulated between cobbles in slow to moderate current and relatively shallow water (40 cm) in small cool water rivers and similar habitat in larger rivers (Strayer and Jirka 1997).

Associated Ecological Communities

Confined River

The aquatic community of relatively large, fast flowing sections of streams with a moderate to gentle gradient.

Associated Species

Triangle Floater (*Alasmidonta undulata*)

Brook Floater (*Alasmidonta varicosa*)

Alewife Floater (*Anodonta implicata*)

Eastern Elliptio (*Elliptio complanata*)

Identification Comments

Alasmidonta heterodon is a small freshwater mussel, usually less than 55 mm long. Its shell is subrhomboidal to suntriangular, with a prominent posterior ridge. The beak sculpture consists of two concentric ridges surrounded by two to three trapezoidal ridges along the posterior slope. The periostracum is greenish to brownish, usually with many fine green color rays. Pseudocardinal and lateral teeth are both present and the nacre is white (Strayer and Jirka 1997).

Identifying Characteristics

The small size, roundly pointed postero-basal margin, and reversed lateral hinge teeth readily distinguish this species (Strayer and Jirka 1997).

Best Life Stage for Identifying This Species

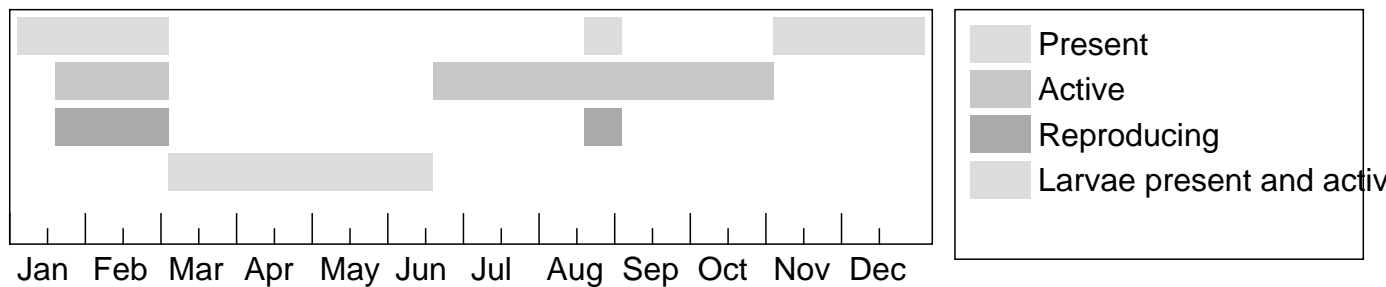
Adults

Behavior

Adults of this species are sessile with only limited movement in the substrate. Passive downstream movement may occur when they are displaced from the substrate during floods. More major dispersal occurs while glochidia are encysted on their darter and sculpin hosts, although McLain and Ross (2005) showed that tessellated darters move very little which promotes a patchy distribution of mussel beds. Being ectothermic, activity levels are reduced greatly during colder months of the year. This is a long-term brooder that spawns in late summer, becomes gravid in the fall and the larvae become active the following spring (Michaelson and Neves, 1995).

The Best Time to See

Little is known about the activity periods of Unionid mussels but they are presumed to be greatly reduced during cold times of the year. Freshwater mussels are most often easiest to locate during late summer when water levels are lowest. This species is a long-term breeder (winter- early spring) (Clarke 1981) and larvae (glochidia) are released into the water from early March to June (Wicklow 2004).



The time of year you would expect to find Dwarf Wedgemussel in New York.

Similar Species

Brook Floater (*Alasmidonta varicosa*): *Alasmidonta heterodon* can be distinguished from *A. varicosa* by its reversed lateral teeth. Two occur in the right valve and one in the left, opposite of what is normally found in other unionoids.

Taxonomy

Kingdom Animalia

└─ Phylum Mollusks (Mollusca)

└─

Class Bivalves (Bivalvia)
└─ **Order** Freshwater Mussels (Unionoidea)
└─ **Family** Unionidae (Unionid Mussels)

Additional Resources

Links

Unio Gallery

<http://unionid.missouristate.edu/>

The Ohio State Division of Molluscs

<http://www.biosci.ohio-state.edu/~molluscs/OSUM2/>

NatureServe Explorer

<http://natureserve.org/explorer/servlet/NatureServe?searchName=ALASMIDONTA+HETERODON>

Google Images

<http://images.google.com/images?q=ALASMIDONTA+HETERODON>

New York State Department of Environmental Conservation

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This project is made possible with funding from:

- New York State Department of Environmental Conservation Hudson River Estuary Program
- Division of Lands & Forests, Department of Environmental Conservation
- New York State Office of Parks, Recreation and Historic Preservation

Information for this guide was last updated on Oct 04, 2011

This guide was authored by

EXHIBIT G

National Park Service
U.S. Department of the Interior



Upper Delaware Scenic and Recreational River **Nature & Science**

The Upper Delaware River Valley and its watershed provides an ideal habitat for the bald eagle. This includes clean water, ample food, and undisturbed stands of large deciduous and coniferous trees for perching and nesting. But until recently, your chances of actually seeing an eagle along the Upper Delaware were slim. That is changing, thanks to recent cooperative efforts to improve environmental conditions and to re-establish the bald eagle in the eastern United States. During the winter, when lakes and rivers freeze, bald eagles from the northern portions of the United States and Canada leave their nests and move southward to areas, like the Upper Delaware, with open water and reliable food supplies. Well over 100 bald eagles visit this area each winter.



Did You Know?

Upper Delaware is the home of the oldest existing wire cable suspension bridge in the nation - the Delaware Aqueduct. Built in 1847 for the Delaware and Hudson Canal, it was designed by and constructed under the supervision of John A. Roebling, future engineer of the Brooklyn Bridge.

Last Updated: August 01, 2006 at 13:02 MST

National Park Service
U.S. Department of the Interior



Upper Delaware Scenic and Recreational River Bald Eagles

Bald Eagles

Gallery Description: A selection of photographs of Upper Delaware's bald eagles, including chicks, hunting and feeding eagles, and birds at rest.

Immature eagle



Photo by Jason Farmer

Eagle Eye



Photo by Scott Rando

Female and young



Photo by Scott Rando

Eaglets



Photo by Peter Nye

Adult eagle approaching immature eagle



Photo by Scott Rando

Immature Eagle



Photo by Scott Rando

[\[Download 87 kb\]](#)

Immature Eagles



Photo by Scott Rando

Adult and young



Photo by Scott Rando

Immature doing a half roll



Photo by Scott Rando

Eaglet



Photo by Scott VanArsdale

Juvenile with a headache



Photo by Scott Rando

Eagles in nest



Photo by PA Fish & Boat Commission

Eaglets stretching their wings

Mature eagle in flight

Male eagle with a squirrel

Mature eagle fishing



Photo by Scott Rando



Photo by Scott Rando



Photo by Scott Rando



Photo by Scott Rando

Female with prey

Female eagle on nest



Photo by Scott Rando



Photo by Scot: Rando

Female and young

Female



Photo by Scott Rando



Photo by Scott Rando

Feeding an eaglet

Mature and immature eating an eel



Photo by Scott Rando



Photo by Scott Rando

Mature and immature eating an eel

Eaglet



Photo by Scott Rando



Photo by Peter Nye



Did You Know?

The Upper Delaware watershed hosts the largest inhabitants of wintering bald eagles in the northeast, and a growing year round population of eagles has made the area an ideal location for eagle watching.

Last Updated: July 16, 2010 at 00:13 MST

EXHIBIT H

Recreation

The Upper Delaware offers some of the finest recreational opportunities in the northeastern United States. In particular, sightseeing, boating, camping, hunting, fishing, hiking, birdwatching, and cycling along state-established bike routes are popular activities in the river area.

The river corridor's 55,375 acres of mostly private property traverse five counties, eight New York towns, and seven Pennsylvania townships.

Many historic sites are easily visited from Rt. 97. Of note are the Zame Grey Museum in Lackawanna, PA, former home of the famous western novelist; Minisink Battleground, the site of a bloody 1779 Indian and Tory victory over Colonialists; Roebbing's 1848 Delaware Aqueduct, the nation's oldest existing wire suspension bridge built by Brooklyn Bridge designer John A. Roebling to accommodate the Delaware & Hudson Canal, remnants of which can still be seen; and Fort Delaware in Narrowsburg, a living re-enactment of regional frontier life.

Upper Delaware communities offer year-round sporting activities, fairs, festivals, parades, ethnic celebrations, and arts programs to appeal to people of all ages. Browse museums, go antiquing, observe the Upper Delaware's historic walking tours.

The valley boasts many fine restaurants, specialty shops, and choices of lodging. A listing of visitor-oriented businesses located within the river corridor is provided on the reverse side.

Boating and Camping



The Upper Delaware is navigable by a wide variety of watercraft throughout its entire length and boasts a total elevation differential of 460 feet, better than six feet per mile, although it is much steeper in some reaches. Boating experts have said that the combination of proximity to major metropolitan areas, high visual quality, and consistent flows due to upstream reservoir releases, makes the Upper Delaware one of the finest recreational canoeing rivers in the Northeast.

Those using their own boats should locate the public access points that are indicated on the inside map. Of course, every boater should bring along a bag for trash and pack out what he or she carries in.

Camping is available only at private or commercial campsites. Keep in mind that most land in the river valley is privately owned and should not be used without permission. Primitive camping is available on Pennsylvania State Forest land with a permit, which may be obtained free of charge by stopping by the National Park Service's Baryville Office located on NY Route 97 or calling (845) 557-0222.

Hunting and Eagle Watching



Hunting and trapping within the river valley are managed by the states in accordance with state and federal laws. In Pennsylvania, state game lands and state forest lands in Pike County are provided for public hunting. In New York, state forest preserve lands are available. The map on the reverse side of this guide shows the locations of these and other public lands. All other land in the river valley is privately owned. Always ask permission before crossing private land. Please don't trespass.

A state license is required for hunting and trapping. Licenses may be obtained from local municipal offices, authorized commercial agents, or online via the Internet. The license year in New York State is October 1 to September 30. The hunting license year in Pennsylvania is July 1 to June 30.

The Mongaup Valley Wildlife Management Area, with property in the Towns of Lumberland, Decatur, Highland, and Forestburgh, offers opportunities for eagle watching, fishing, hunting, hiking, nature study, and photography. Restricted to all use from December 1 to March 31 to protect the wintering bald eagle population, after April 1 most of the lands are open to the public.

Bald eagles are easily disturbed by human activity that alters their use of feeding and roosting areas. Please follow proper viewing etiquette and all posted regulations.

The Eagle Institute, which maintains a winter field office at the Roebbing Bridge Information Center in Lackawanna, Pa., offers year-round information on these majestic birds, as well as wintertime updates on area viewing locations, eagle sightings, ice cover, road conditions, and visitation numbers, through its web site at www.eagleinstitute.org or call (570) 685-5960 in PA and (845) 557-6162 in NY.

Before Getting on the River

Like any large river, the Upper Delaware is potentially dangerous and must be treated with respect. Tragic drownings teach a lesson of supreme importance: while boating, swimming, or tubing on the river, it is mandatory for each person to have a life vest, also known as a personal flotation device (PFD), and you are strongly advised to wear it. Children 12 years of age and under are required to wear a PFD at all times in any vessel. Because of reservoir releases or heavy rains, the Upper Delaware can run cold enough to stun even during the summer months. A person may also be incapacitated by striking the rocky river bottom. In such situations a PFD is often the only chance for survival. Before getting in a boat, make certain that everyone has a PFD and is wearing it properly. Almost all Upper Delaware drowning victims did not wear their PFDs.

If Boating or Tubing ...

- **Wear a securely-fastened, USCG-approved Personal Flotation Device!**
- **Don't drink alcohol.** Alcohol impairs your judgment and increases the effect of cold. Many boating accidents and drownings are alcohol-related.
- **Know how to swim.** If you are in a boat, assume that sooner or later you will be in the water.
- **Scout the rapids.** There are seven relatively difficult Class II rapids on the river (see map). It is wise to scout the rapids from shore before attempting to run them.

- **Carry out** what you carry in. No glass containers, please.



Visitor Information Map and Guide For Touring The Upper Delaware Scenic and Recreational River New York & Pennsylvania



A map and guide with information on recreation, safety, restaurants, accommodations and more!

Prepared and Published by the
UPPER DELAWARE COUNCIL

Fishing

The Upper Delaware is recognized by anglers and fishery biologists as one of the finest fishing rivers in the northeastern United States.

Smallmouth bass, walleye, and a growing number of striped bass are present in the warmer section below Callicoon. Coldwater releases from upstream reservoirs provide conditions suitable for trout at least to Hankins, Pennsylvania, state game lands and state forest lands in Pike County are provided for public hunting. In New York, a valid New York or Pennsylvania fishing license is required for all anglers, age 16 and older, when fishing from a boat or purchased from local sporting goods stores or other state license issuing agents. A list of bait and tackle shops located in the river corridor is available on the reverse side.

Variable flows can affect the angling experience on the Upper Delaware Scenic and Recreational River. The United States Geological Survey has established a number of gaging stations along the Delaware River to measure the quantity and temperature of its surface water. Real-time data on river flows can be obtained prior to setting out for a fishing trip by consulting the gage station links provided on the Delaware River Basin Commission's web site at www.fish.state.pa.us

Approximately 40 commercial fishing guides are licensed by the National Park Service to operate on the Upper Delaware Scenic and Recreational River. To obtain a complete list of these fishing guides, access the National Park Service unit's web site at www.nps.gov/updelp/planyourvisit/fishingguides.htm or request a copy from the Upper Delaware Council office by calling (845) 252-3022.

Keep in mind that private property dominates both sides of the Upper Delaware River and its islands. Please respect the rights of local landowners when accessing the river to fish. The New York State Department of Environmental Conservation and Pennsylvania Fish and Boat Commission offer several public fishing accesses along the river.

For Further Information

Upper Delaware Council, Inc.
P.O. Box 192, 211 Bridge St.
Narrowsburg, NY 12764-0192
(845) 252-3022
www.upperdelawarecouncil.org

National Park Service
Upper Delaware Scenic and Recreational River
274 River Rd.
Beach Lake, PA 18405-4046
(570) 685-4871
River Conditions Hotline: (845) 252-7100
www.nps.gov/updelp

NYS Department of Environmental Conservation
Region 3: for Sullivan and Orange Counties
21 South Pitt Corners Rd., New Paltz, NY 12561
(845) 256-3000
Region 4: for Delaware County
1130 North Westcott Rd., Schenectady, NY 12306
(518) 357-2068
www.dec.ny.gov

PA Fish and Boat Commission, Northeast Region
P.O. Box 88, Sweet Valley, PA 18656-0088
(570) 477-2206 (Educ.) or (570) 477-5717 (Law Enf.)
www.fish.state.pa.us

PA Game Commission, Northeast Region
P.O. Box 220, Dallas, PA 18612-0220
(570) 675-1143 or 1144
www.pgc.state.pa.us

PA Bureau of Forestry, #19 Delaware District
HC 1 Box 95A, Switwater, PA 18370-9723
(570) 895-4000 or 4001
www.dep.state.pa.us

Delaware River Basin Commission
P.O. Box 7360, West Trenton, NJ 08628-0360
(609) 883-9500
www.state.nj.us/drbc

How to Get Here

The Upper Delaware valley is located between the Catskill and Pocono regions, where the river forms the border between Pennsylvania and New York, and is easily reached by major highways.

The southern terminus of the river above Fort Jervis, NY may be reached by I-84 and U.S. Routes 6 & 209 to NY Route 97. The northern terminus of the river below Hancock, NY is accessed via NY Route 17 (future I-86) to NY Route 97 and PA Route 191. Middle sections of the river may be reached by a variety of state, county, and local roads. Please refer to the map on the reverse side.

Delaware County, NY: www.delawaracounty.org
Sullivan County, NY: www.scva.net
Orange County, NY: www.orangecountynysm.org
Wayne County, PA: www.waynecountygc.com
Pike County, PA: www.pikepa.com
PA Regional: www.pococons.org
NY Regional: www.upperdelawarascenicbyway.org

Emergency Contacts
River Emergency in NY or PA **Dial 911**
National Park Service Dispatch (845) 557-0222
New York State Police
Delaware County (Deposit) (607) 467-3215
Sullivan County (Narrowsburg) (845) 252-3212
Orange County (Middletown) (845) 344-5300
Pennsylvania State Police
Delaware County (Honesdale) (570) 253-7126
Pike County (Blooming Grove) (570) 226-5718
American Red Cross
Emergency Preparedness and Assistance
Orange/Sullivan Chapter: (845) 294-9785
Wayne/Pike Chapter: (570) 253-2310 or 296-5229
www.nyredcross.org
www.redcrossonline.org

Welcome to the River

Welcome to the Upper Delaware Scenic and Recreational River, a component of the National Wild and Scenic Rivers System. This designated, 73.4-mile section of the Delaware River flows freely from Hancock, NY to Mill Rift, PA. The Upper Delaware Council is proud of our river valley's unique management structure, natural beauty, rich history, and recreational opportunities.

Why This Guide?

The purpose of this guide is to provide information that will help to make your visit enjoyable and safe. Please keep in mind that, unlike most units within the National Park System, the majority of land in the Upper Delaware Scenic and Recreational River is privately owned.

A list of public access areas, river rest stops, and state-owned lands appears on the reverse side of this brochure. To avoid trespassing on private land, plan ahead to use available public and commercial recreational facilities.

The Upper Delaware River forms the boundary of two states. As you travel downstream, New York is on your left and Pennsylvania is on your right.

Conserve the Resource

The Upper Delaware Scenic and Recreational River is a working partnership of local, state, and federal governments, as well as individuals, organizations, and businesses, dedicated to conserving this precious resource while providing for the public's enjoyment and preserving private property rights.

While visiting, please leave habitat intact, properly dispose of litter, and respect the wishes of private property owners. Be a part of this cooperative stewardship for current and future generations.

Upper Delaware Council

The Upper Delaware Council (UDC) was incorporated in 1988 as the oversight body responsible for the coordinated implementation of the River Management Plan for the Upper Delaware Scenic and Recreational River.

As the driving force behind the River Management Plan, the UDC provides a mechanism to address actions by local, state, and federal agencies which affect the river valley. Services to members include reviews of development projects, ordinances, and governmental initiatives. The Council also administers a Technical Assistance Grants program, publishes *The Upper Delaware* quarterly newsletter, sponsors educational programs, and holds an annual awards ceremony to honor river valley contributors.

The Council's voting members are the two states and presently 11 of the 15 local governments which border on the Upper Delaware River. The Delaware River Basin Commission is a non-voting member. The UDC, a registered 501(c)(3) non-for-profit organization, operates under a Cooperative Agreement with the National Park Service.

The UDC's business office is in Narrowsburg, NY. The full Council meets on the first Thursday of every month. Three standing committees - Water Use/Resource Management, Project Review, and Operations - also convene monthly. All meetings of the Council are open to the public.

For further information, contact:

Upper Delaware Council, Inc.
211 Bridge Street
P.O. Box 192
Narrowsburg, NY 12764-0192
Tel.: (845) 252-3022 Fax: (845) 252-3359
E-mail: udcramie@hvc.rr.com
www.upperdelawarecouncil.org

Cover Photo Courtesy of David B. Soete
Visitor Information Map and Guide, © 2008, UDC

UPPER DELAWARE

SCENIC & RECREATIONAL RIVER



Public Lands and Accesses (north to south)

PA Fish and Boat Commission Fishing Access Sites	New York Dept. of Environmental Conservation Sites	Other Public Access Sites and Public Lands Near the River
Balls Eddy Buckingham Township	Hancock and Lordville Bridge Town of Hancock	River Road Access Buckingham Township, PA French Woods State Forest Preserve Town of Hancock, NY Bouchoux Trail State Forest Preserve Town of Hancock, NY Long Eddy Access Town of Fremont, NY PA Game Lands No. 316 Lackawaxen Township, PA Ten Mile River Access Town of Tusten, NY PA State Game Lands No. 116 Lackawaxen & Shohola Twp., PA Hickok Brook Multiple Use Area Town of Highland, NY PA Game Lands No. 209 Shohola & Westfall Twp., PA PA State Forest Lands Shohola & Westfall Twp., PA Mongaup Valley Wildlife Management Area Towns of Lumberland, Deerpark, Highland and Forestburgh, NY
Shehawken Buckingham Township	Kellams Bridge Town of Fremont	
Buckingham Buckingham Township	Callicoon Town of Delaware	
Equinunk (primitive) Buckingham Township	Cochecton and Skinners Falls Town of Cochecton	
Callicoon Damascus Township	Narrowsburg Town of Tusten	
Damascus Damascus Township	Highland Town of Highland	
Narrowsburg Damascus Township	Mongaup Town of Lumberland	
Zane Grey Lackawaxen Township	Sparrowbush Town of Deerpark	
Matamoras Westfall Township		

Accommodations

The Carriage House 3351 NYS Route 97 Barryville, NY 12719 (845) 557-0400 www.TheCarriageHouseNY.com	Nolan's River Inn Motel Route 97 Pond Eddy, NY 12770 (845) 858-8921	Smith's Colonial Motel * 23085 NYS Route 97 Hancock, NY 13783 (607) 637-2989 www.smithscolonial.com
ECCE Bed & Breakfast * 19 Silverfish Rd. Barryville, NY 12719 (845) 557-8562 www.eccebedandbreakfast.com	Roebling Inn on the Delaware * 155 Scenic Drive Lackawaxen, PA 18435 (570) 685-7900 www.roeblinginn.com	The Spring House Commons Bed & Breakfast 3461 NYS Route 97 Barryville, NY 12719 (888) 558-8189 or (845) 557-8189 www.thespringhouse.com
HickoryHaven Lodge 25 Route 55 Barryville, NY 12719 (888) or (845) 557-8077	Rolling Marble Guest House P.O. Box 33 Long Eddy, NY 12760 (845) 887-6016 www.swiftfolders.com/doorway	Sylvania Tree Farm * 112 Mast Hope Ave. Lackawaxen, PA 18435 (570) 685-7001 www.sylvaniatreefarm.com
The Inn at Lackawaxen * 188 Scenic Drive Lackawaxen, PA 18435 (570) 685-7061 www.theinnatlackawaxen.com	Sandercock House B&B * 8 Sandercock Rd. on Grocery Hill Equinunk, PA 18417 (570) 224-8302 www.sandercockhouse.com	Twin Spruce Lodge 4136 River Rd. Equinunk, PA 18417 (570) 224-4191 www.twinsprucelodge.com
Long Eddy Hotel & Saloon 7 Depot St. Long Eddy, NY 12760 (845) 887-4554	Shohola Glen Hotel & Rohman's Inn 103 Rohman Rd. Shohola, PA 18458 (570) 559-7479	Western Hotel 22 Upper Main St. Callicoon, NY 12723 (845) 887-9871
Narrowsburg Inn * 182 Bridge St. Narrowsburg, NY 12764 (845) 252-3998 www.narrowsburginn.com		

Bait and Tackle

Angler's Roost and Hunter's Rest Two River Junction 106 Scenic Drive Lackawaxen, PA 18435 (570) 685-2010 www.2riverjunction.com	Catskill Delaware Outdoor * 34 A. Dorner Drive Callicoon, NY 12723 (845) 887-4800
The Barryville Sportsman at The Spring House Commons 3461 NYS Route 97 Barryville, NY 12719 (845) 557-9907 www.BarryvilleSportsman.com	Hagemann's Tackle & Variety Store * 116 Richardson Ave. Shohola, PA 18458 (570) 559-7589
	Tom's Bait and Tackle 118 Kirk Road Narrowsburg, NY 12764 (845) 252-7445

Fishing Guides

Approximately 40 commercial fishing guides are licensed by the National Park Service to operate on the Upper Delaware Scenic and Recreational River. To obtain the complete list of these fishing guides, visit the National Park Service unit's web site at www.nps.gov/upde/playourvisit/fishing-guides.htm or request a complimentary copy from the Upper Delaware Council office by calling (845) 252-3022.

Map Orientation



Map Legend

	Designated River Corridor
	Public Land
	Access Sites
	National Park Service Offices
	Point of Interest
	River Mile Number
	Rapids
	Railroad Bridge
	Hamlet Area
	Larger Hamlet or City

This directory includes businesses which are located within the boundaries of the Upper Delaware Scenic and Recreational River Corridor only. They are presented here for informational purposes, and do not reflect any endorsements or recommendations by the Upper Delaware Council. Businesses marked with an asterisk (*) contributed voluntary donations toward the printing costs of this brochure, with our appreciation.



Note: Most land within the river corridor is privately owned and should be treated with due respect. Please don't trespass or litter.

Restaurants / Food

Barryville Coffee Shop 3358 NYS Route 97 Barryville, NY 12719 (845) 557-8123	The Inn at Lackawaxen * 188 Scenic Drive Lackawaxen, PA 18435 (570) 685-7061 www.theinnatlackawaxen.com	Peck's Market * 120 Kirk Rd. Narrowsburg, NY 12764 (845) 252-3016 www.pecksmarket.com
Callicoon Creamery * 4623 Route 17B Callicoon, NY 12723 (845) 887-4480	Lander's River Cafe * 23 A. Dorner Drive Callicoon, NY 12723 (845) 887-6800	Peppino's Family Pizzeria and Restaurant 27 Main St. Callicoon, NY 12723 (845) 887-6767
Carini Pizzeria & Restaurant Peck's Plaza, 112 Kirk Rd. Narrowsburg, NY 12764 (845) 252-3338	Long Eddy Hotel & Saloon 7 Depot St. Long Eddy, NY 12760 (845) 887-4554	Restaurant 15 Main 251 Bridge St. Narrowsburg, NY 12764 (845) 252-6562 www.restaurant15main.com
The Carriage House 3351 NYS Route 97 Barryville, NY 12719 (845) 557-0400 www.TheCarriageHouseNY.com	Main Street Cafe 40 Main St. Narrowsburg, NY 12764 (845) 252-7222	River Market * 3385 NYS Route 97 Barryville, NY 12719 (845) 557-FOOD
Cedar Rapids Inn NYS Route 97 Barryville, NY 12719 (845) 557-8711 www.cedarrapidsrafting.com	Martin's Village Barn Restaurant Route 191 Equinunk, PA 18417 (570) 224-2772	Rohman's Inn 103 Rohman Rd. Shohola, PA 18458 (570) 559-7479
China King 225 Bridge St. Narrowsburg, NY 12764 (845) 252-3988 or 3989	Matthew's on Main * 19 Lower Main St. Callicoon, NY 12723 (845) 887-5636	Town Diner * 13 Barryville-Yulan Rd. Barryville, NY 12719 (845) 557-9929
The Chocolate Mousse Cafe, Bakery & Confectionary at The Spring House Commons 3461 NYS Route 97 Barryville, NY 12719 (845) 557-3622 www.thespringhouse.com	Millbrook Inn 1174 NYS Route 97 Pond Eddy, NY 12770 (845) 856-7778	Tre Alberi Ristorante 3402 NYS Route 97 Barryville, NY 12719 (845) 557-6104
Circle Cafe 31 Main St. Callicoon, NY 12723 (845) 887-5126	Narrowsburg Inn * 182 Bridge St. Narrowsburg, NY 12764 (845) 252-3998 www.narrowsburginn.com	Two River Junction Deli, Grocery & Restaurant 106 Scenic Drive Lackawaxen, PA 18435 (570) 685-2010
Club 97 8294 NYS Route 97 Callicoon, NY 12723 (845) 887-5941	Narrowsburg Roasters 25 Main St. Narrowsburg, NY 12764 (845) 252-6688 www.narrowsburgroasters.com	Western Hotel 22 Upper Main St. Callicoon, NY 12723 (845) 887-9871
Delaware Dips 'n Dogs * 2384 NYS Route 97 Pond Eddy, NY 12770 (845) 557-0002	The 1906 Restaurant * 41 Lower Main St. Callicoon, NY 12723 (845) 887-1906 www.1906restaurant.com	Whistle Stop Cafe 119 Kirk Rd. Narrowsburg, NY 12764 (845) 252-3355 www.whistlestopcafe.net
Il Castello Pizzeria & Ristorante 3438 NYS Route 97 Barryville, NY 12719 (845) 557-6300 or 6400	Peck's Market * 9 Lower Main St. Callicoon, NY 12723 (845) 887-5090 www.pecksmarket.com	

Liveries and Campgrounds

Ascalona Campground at Minisink Ford 4499 Route 97, P.O. Box 42 Barryville, NY 12719 (845) 557-6554	Lou's Tubes at Skinners Falls * Skinners Falls Rd., Cochecton, NY P.O. Box 11, Milanville, PA 18843 (845) 252-3593
Cedar Rapids Outfitters NYS Route 97, Barryville, NY 12719 (877) or (845) 557-6158 www.cedarrapidsrafting.com	Silver Canoe and Raft Rentals * 37 So. Maple Ave., Port Jervis, NY 12771 (800) 724-8342, (845) 856-7055 or (800) 233-RAFT www.silvercanoe.com
Deer Run Rustic Campground NYS Route 97, Narrowsburg, NY 12764 (845) 252-7419	Soaring Eagle Campground at Kellams Bridge, Stalker, PA 4092 River Rd., Equinunk, PA 18417 (877) 278-8383 or (570) 224-4666 www.soaringeaglecampground.com
Indian Head Canoes, Rafts and Campground * NYS Route 97, Barryville, NY 12719 (800) 874-2628 www.indianheadcanoes.com	Sylvania Tree Farm Camping * 112 Mast Hope Ave. Lackawaxen, PA 18435 (570) 685-7001 www.sylvaniatreefarm.com
Jerry's Three River Campground 2333 Route 97, Pond Eddy, NY 12770 (845) 557-6078 www.jerrys3rivercampground.com	Two River Junction Canoe & Raft Float Trips 106 Scenic Drive Lackawaxen, PA 18435 (570) 685-2010 www.2riverjunction.com
Kittatinny Canoes & Campgrounds * 3854 Route 97, Barryville, NY 12719 (800) FLOAT-KC or (845) 557-8611 www.kittatinny.com (multiple bases)	Lander's River Trips & Campgrounds * 5666 Route 97, Narrowsburg, NY 12764 (800) 252-3925 www.landersrivertrips.com (multiple bases)
	Wild & Scenic River's Edge Campground Lander's River Trips NYS Route 97, Barryville, NY 12719 (800) 836-0366 or (845) 557-8783 www.landersrivertrips.com

EXHIBIT I

Upper Delaware Scenic and Recreational River

2010 State of the Park Report



Photo by David B. Soete

“It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values shall be preserved in a free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.” (Public Law 90-542)

Congress forged an uncharacteristic “new” mission for the National Park Service (NPS) when designating the upper 73.4-mile section of the main-stem Delaware River as a unit of the Wild and Scenic Rivers System. We are charged with protecting our “Outstandingly Remarkable” values-- overall tranquil scenic beauty of the valley; camping, hunting, fishing, swimming, sightseeing and river related recreational opportunities; outstanding habitat for both a cold and warm water fishery; large and small wildlife species; history and archeological sites. The twist is that we must do so with and through many partners, on land that we do not own.

For over 30 years, compliance with the *Secretary of the Interior’s Guidelines for Land and Water Use Management* through the *Upper Delaware River Management Plan* which guides municipalities was sufficient to protect the significant resources that comprise our “outstandingly remarkable” values through local planning and land use regulation. Since 2003, however, the pressure of energy resource development at an industrial magnitude never anticipated challenges our staff, governmental management partners, and the community: How it will be possible to preserve and protect our outstanding resource values in view of our metropolitan New York City and Philadelphia neighbors’ increasing need for both high quality water and energy consumption.

Natural Gas Drilling

Recognizing the pressure placed on the resources of the Delaware River basin by placement of an estimated 10,000 natural gas wells (currently five test wells have been drilled near the Upper Delaware Scenic and Recreational River [UPDE] boundary) and well infrastructure in the Delaware River basin, an interdisciplinary team convened for monthly teleconferences to address the impacts anticipated within NPS areas. The team includes NPS staff from UPDE and other parks, NPS Geologic Resources Division, NPS Water Resources Division, Northeast Regional Office, the DOI Northeast Region Solicitor's Office, and Upper Delaware Council. A more geographically-broad federal interagency team includes NPS representation to concentrate on overall resource management issues.

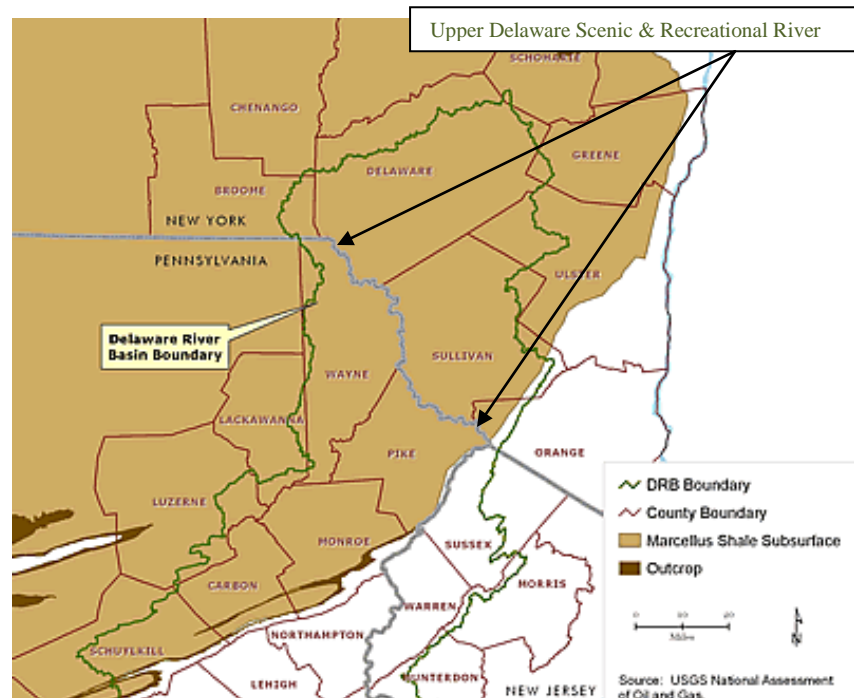
A key management partner, the Delaware River Basin Commission (DRBC) is a federal-interstate compact government agency formed by 1961 concurrent legislation enacted by the United States, Pennsylvania, New York, New Jersey, and Delaware (which includes the Middle and Lower Delaware units of the Wild and Scenic Rivers System). DRBC has legal authority over both water quality and water quantity-related issues throughout the basin, including water quality protection, water supply allocation, regulatory review (permitting), water conservation initiatives, watershed planning, drought management, flood loss reduction, and recreation.

DRBC regulates Special Protection Waters (SPW) for point source (or "end-of-pipe") discharges and for non-point source pollutant loadings carried by runoff to protect existing high water quality in areas of the Delaware River Basin deemed "to have exceptionally high scenic, recreational, ecological and/or water supply values."

In connection with natural gas drilling, the Commission has identified three major areas of concern:

1. Gas drilling projects in the Marcellus Shale or other formations may have a substantial effect on the water resources of the basin by reducing the flow in streams and/or aquifers used to supply the significant amounts of fresh water needed in the natural gas mining process.
2. On-site drilling operations may potentially add, discharge or cause the release of pollutants into the ground water or surface water.
3. The recovered "frac water" must be treated and disposed of properly.¹

With NPS support, DRBC's Executive Director expanded on a 2009 determination, concluding that "all natural gas well sponsors, including the sponsors of natural



Extent of Marcellus Shale Formation in the Delaware River Basin

¹ From Delaware River Basin Commission website www.drbc.net, used with permission

gas well projects intended solely for exploratory purposes, must first apply for and obtain commission approval before commencing any natural gas well project for the production from or exploration of shale formations within the drainage area of [Special Protection Waters](#) in the Delaware River Basin."

DRBC is developing natural gas regulations to ensure protection of basin waters while minimizing regulatory duplication. The draft regulations will likely be published in December 2010, and will be accompanied by a public rulemaking process. This process will entail two public hearings and a written comment period.²

See *Natural Resources Section* for more information on this issue.

Changing of the Guard

"There is nothing permanent except change".³ During Fiscal Year 2010, Superintendent Vidal Martinez accepted a Superintendent position at Prince William Forest Park after nearly 2 years at UPDE; Assistant Superintendent Sandra Schultz retired after 36 years with the NPS (Sandy worked on the Legislative Support Data Package for UPDE, as a Regional Planner assigned to UPDE, as UPDE's Chief of Planning, Management Assistant and then Assistant Superintendent during her career, as well as several long-term Acting Superintendent assignments), and Acting Chief of Protection Joe Nicholson retired after over 30 years with NPS, two of them at UPDE.

Sean McGuinness assumed the Superintendency on February 3, 2010, one month before the Assistant Superintendent departed; and, Natural Gas Drilling began to pervade nearly every aspect of the partner building process. UPDE's partners have come to recognize him as an outspoken and reliable consensus builder.

Administration

Assistance to Other Sites is in the fabric of UPDE's Administrative Staff, who: Provided mentoring to new Administrative Officers at WOR1 and FOST and closeout assistance to MAVA; managed GovTrip and Timekeeping for FOST and MAVA; provides assistance and management for the NPS Property Management system for the Upstate NY sub-cluster and UPDE. Our AO provides PCS support to several parks in upstate NY, PA and NJ, as well as UPDE. And she and the team of IPPM instructors re-wrote the IPPM course. She also taught two IPPM classes at the beginning of FY-2010.

Five permanent employees were hired at UPDE in FY-2010: Four 4 subject to furlough WG-05 positions in Maintenance and 1 part-time GS-05 Office Automation Assistant in the Superintendent's Office. 14 seasonal positions were shared among three divisions.

Purchasing overall took a lot longer to accomplish because of learning new requirements of the MABO. The park provided training in IDEAS and Agreements.

Construction on HQ buildings disrupted network and internet use for a few weeks and electrical storms caused feedback into systems at two other locations also disrupting network and internet use. The necessary services and equipment were purchased to repair damaged equipment. Radio system coverage was reviewed to provide information to assist in determining requirements for improvement.



² DRBC Webpage <http://www.state.nj.us/drbc/naturalgas.htm>

³ Greek philosopher Heraclitus

Maintenance

Removed 500 linear feet of chain link fence and installed a secure, automatic sliding gate at headquarters complex.

Completed an ARRA-funded weatherization project for three Headquarters buildings to replace deteriorated log siding and roofing. New thermal windows, insulation and a vapor barrier were installed on the main headquarters building.



Removed and installed new concrete sidewalks and steps and hand railings at the Headquarters complex.

Prepared the Zane Grey Museum for installation of new exhibitory by removing old exhibits, painting, and installing electrical wiring and devices.

Supervised replacement of the Zane Grey Museum roof with 35 Squares of Cedar shake shingles on the roof and dormers, replaced flashing, and re-pointed, cleaned and repaired the chimneys.

Painted the exterior of the Margold house adjacent to Roebling Bridge.

Completed UPDE Integrated Solid Waste Alternatives Plan.

The maintenance staff, Safety Officer and Safety committee chair attended the EPA training for Lead Safety for Renovation, Repair and Painting. All are certified for this new regulation.

UPDE Protection Division

In the wake of Chief Ranger Joe Nicholson's retirement one year after that of the former Chief Ranger, several protection employees have served as Acting Supervisory Park Ranger and Chief of Protection. Hot dry weather kept visitation high and our patrol function was altered to areas with the highest visitation. This flexibility, combined with an expanded boating and river safety program, resulted in **no** visitor fatalities in 2010.



The new joint NCSP/NPS Training curriculum allows both NCSP and NPS to advance through swift water rescue and motorboat operator certification

In partnership with the National Canoe Safety Patrol (NCSP), we developed a 4-tier curriculum which allows NCSP and UPDE employees to document training and advance through swift water rescue and MOCC (motorboat operator certification course). We co-instruct sessions during the NCSP training weekend and weekly skill drills (tailgate safety sessions).

Our staff assisted Delaware Water Gap (DEWA) with a wildfire at Sunfish pond by providing Firefighters, squad boss, and a FALB (class B faller). We also assisted DEWA in a multi-day search for a missing person in the spring of 2010, and with prescribed fire burns in fall of 2009.

We have merged our dispatch operation with DEWA, resulting in 24-hour coverage as required by DO/RM-9. As part of this merger, we worked with GIS staff to develop “duff” maps for use by dispatch personnel.

Protection staff also:

- Represents UPDE on the Delaware River Water Trail's signage and rivers and trails subcommittee.
- Participated in DRBC flexible flows, floods and other committees.
- Assisted Women's Rights NHP for a 3 week protection detail.

During the 2010 visitor season, 6 UPDE rangers closed 345 cases. We issued 115 citations, 105 verbal warnings, 95 case cards, 30 written warnings, and 343 case incident reports. A high percentage of these statistics were for violations pertaining to visitor safety, boating and PFD violations.

Interpretation

UPDE staff made nearly 81,000 visitor contacts in 2010. The greatest number of visitor contacts occurred at riverside kiosks and on roving patrols as the interpretive staff concentrated on providing safety information to river users. Water Safety was a major thrust in our curriculum-based education program with over 1,800 students participating. The *Delaware and Hudson Canal Days* off- and on-site programs, a partnership among divisions, involved eight schools and 718 4th grade students. Interpretive and Natural Resources staff collaborated to expand the *Water Snapshot* Program with 382 students participating in both classroom and the on-site water testing. Overall education programming increased by 20% this year as UPDE exceeded our GPRA goals for Visitor Satisfaction, Visitor Satisfaction with Facilitated Programs, Visitor Understanding, Visitors Attending Facilitated Programs, Visitor Safety, and Visitor Fatalities.

Centennial Initiative funding provided two Seasonal Interpretive Rangers, allowing UPDE to provide additional interpretive river safety patrols, increase our assistance to the cultural and natural resource management divisions, and to open the Zane Grey Museum daily from Memorial Day Weekend through the end of September.



We continue to support local partners by participating in numerous festivals, sponsoring river clean-up events with area high schools, conducting in-service training for teachers, and providing river safety training to public safety agencies and livery staff. In celebration of Public Lands Day, UPDE partnered with Kittatinny Canoes and Woodloch Resort to host a river clean-up event.

The Zane Grey House was open Memorial Day through mid-October. The annual Zane Grey Festival was presented in partnership with Zane Grey's West Society.

Eastern National sales at the Zane Grey House and the Narrowsburg Information Center totaled \$12,483.50, a 19% increase.

Volunteers – 409 Volunteers, including six interns, the National Canoe Safety Patrol, the Zane Grey's West Society, the Eagle Institute, and the annual summer River-Clean-Up in partnership with Kittatinny Canoes, contributed 11,977 hours.

Natural Resources

Tracking Marcellus Shale Natural Gas Development Issues near UPDE

On June 2, 2010, the [Upper Delaware Scenic and Recreational River gained the dubious distinction of being named "America's Most Endangered River" by the conservation organization American Rivers](#), due to impending natural gas development in the region. We are at the intersection of the largest and most rapidly developing natural gas field in the U.S., the Marcellus Shale, and the longest reach of Special Protection Waters in the country, the upper 197 miles of the main stem of the Delaware River.

We continue to spend a great deal of time focused on natural gas development issues, attending meetings, reading reports, participating in conference calls, keeping abreast of developments, and reviewing and commenting on proposed regulations in an effort to best protect UPDE resources and values. We continue to get a great deal of help with this issue from the NPS Geologic Resources Division, and the Air and Water Resources Division staff.

New York State Department of Environmental Conservation released an 809-page [Draft Supplemental Generic Environmental Impact Statement](#) on the Oil, Gas, and Solution Mining Regulatory Program. UPDE, the NPS Northeast Region, the Geologic Resources Division, the Water Resources Division, the North Country Trail, and the DOI Solicitor's Office collaborated to review and comment on this document.

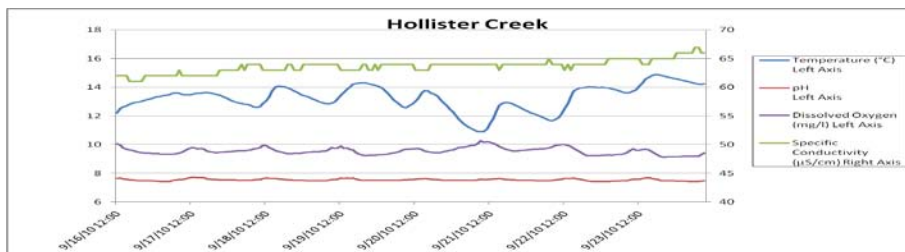
In mid-December, we reviewed and provided comments on DRBC draft dockets for a water withdrawal on the West Branch of the Lackawaxen River, and further development of the Matoushek well in Clinton Township, Wayne County, PA.

A submerged sonde, temporarily out of its protective, camouflaging PVC sleeve.



Continuous Water Quality Monitoring

UPDE instituted continuous water quality monitoring of Delaware River tributaries. Multi-probe instruments, or "sondes", are placed directly in the water flow to measure water quality parameters such as dissolved oxygen, pH, conductivity, temperature, and turbidity. The results are downloaded for analysis. Funds were provided by the NPS Northeast Regional Office for 7 additional instruments, four of which will be equipped with telemetry to allow off-site real-time monitoring, thus enabling rapid detection of significant water quality changes.

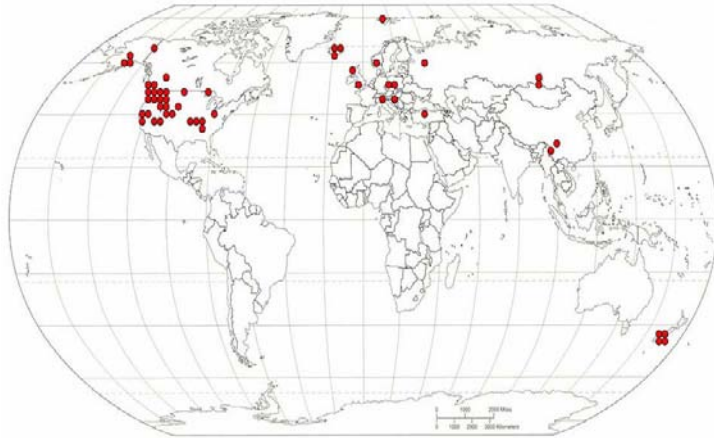


Hourly data collected for a one week period in Hollister Creek clearly shows the diurnal cycle of the water temperature and the corresponding changes in dissolved oxygen levels (mg/L). A lesser diurnal variation was also exhibited by pH. Conductivity remained relatively constant.

Scenic Rivers Monitoring Program

With the addition of a new site on the West Branch, 20 locations on tributaries and the main stem Delaware River were sampled bi-weekly from May through September. Fecal coliform, E.coli and enterococcus bacteria, and a host of chemical parameters including nutrient levels, total chloride, total alkalinity, and total hardness data is maintained in the national EPA STORET database by the Delaware River Basin Commission, as well as at UPDE.

The Lackawaxen Township, Pennsylvania, Sewage Enforcement Officer requested our assistance to collect and test water samples at an effluent “outfall” believed to be contributing point source pollution into the Delaware River.



Confirmed presence and portion of published records of *D.geminata* from around the world. Dots show rough geographic area of populations (From Spaulding and Elwell 2007; Map by Sarah Spaulding, USGS).

Addressing identified research needs for the nuisance freshwater diatom

Didymosphenia geminata

D. geminata (a.k.a. Didymo or “rock snot”) is expanding, emerging as an organism with extraordinary capacity to impact stream ecosystems on a global scale.

UPDE Resource Management Specialist Don Hamilton sought out and collaborated with a USGS scientist to develop a joint research request to better understand this organism in the Delaware and other river systems. The proposal, “*Determining the ecological and evolutionary processes associated with distribution and behavior of the nuisance freshwater diatom Didymosphenia geminata*”, was funded for FY2011-13.

Samples of *D. geminata* collected in 2010 from locations on the Delaware River mainstem were sent to the Academy of Natural Sciences in Philadelphia (ANSP) for confirmation. Dr. Marina Potapova, a world-renowned phycologist at ANSP and a Co-Principal Investigator in our study, is attempting to culture *D. geminata* in her lab using these samples (something that no researcher has been able to do so far). This would be an important step in further studying the species and better understanding factors linked to the vegetative stalk growth.

Biological Monitoring of Benthic Macroinvertebrates

Freshwater BMI are a very important part of stream food webs because they form the primary source of nutrition for many aquatic and terrestrial animals. UPDE is partnering with two entities to monitor benthic macroinvertebrates (BMI) as a means of assessing the health of stream ecosystems:

Biologists from the Delaware River Basin Commission have had a structured study and sampling program for BMI at UPDE and DEWA for the past 7 years. [A local newspaper article covered this program recently](#), helping the public to develop an understanding and appreciation of this component of the Delaware River’s ecosystem.

We are also partnering with the NPS Eastern Rivers and Mountains Network (ERMN) in a long-term BMI sampling effort on 12 UPDE tributaries as part of the Vital Signs program. The second season of monitoring UPDE tributaries was completed in fall 2009, and we recently received the [2008 Summary Report](#).

We continue to advise and share data with the Equinunk Watershed Alliance in stewardship of Equinunk Creek, which has the highest water quality of the UPDE tributaries sampled by ERMN staff.

Bald Eagle Essential Habitat Study

In cooperation with the *New York State Department of Environmental Conservation* and *The Eagle Institute*, a local organization dedicated to bald eagle conservation and education, a multi-year study to determine the most important habitats for bald eagles along the Upper Delaware River is in the data analysis and report writing phase. Sixteen birds fitted with satellite and radio transmitters provide information about their habitat use. The Data Manager/GIS Specialist from the Eastern Rivers and Mountains Network is assisting to model some of the habitat use data.

From a total of 18 active nests (that we know of) within the UPDE corridor, the successful nests produced about 30 fledglings in 2010.

Thousands of school children follow the migrations and movements of UPDE-tagged bald and golden eagles every year, and learn about their habits and habitat needs at <http://www.learner.org/jnorth/eagle/>.



Photo © Scott Rando. Used with permission.

Study bird R27 (lower, photographed in January 2010, carries a backpack transmitter from a 2008 capture

Targeted Mammal Inventory

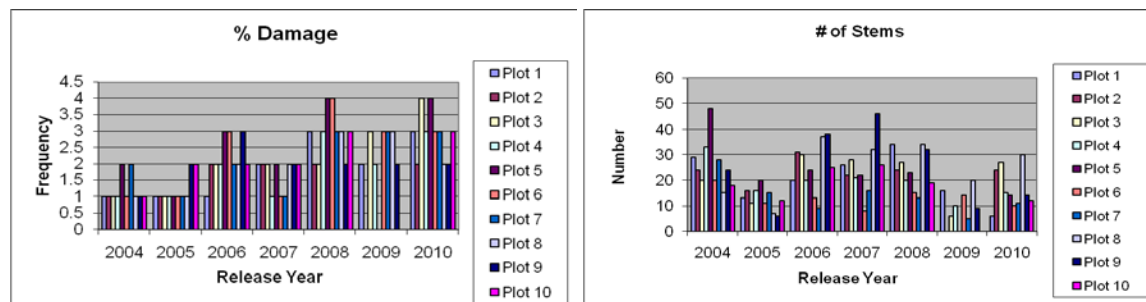
Fieldwork and review of the draft final Targeted Mammal Inventory (TMI) report was conducted under the direction of Dr. Howard Whidden of East Stroudsburg University (ESU). The three-part study of mammals supports a broader effort to catalogue the nation's natural resources throughout our national parks.

NPS Biological Resource Division provided \$2500 for ESU students to do a third year of acoustic monitoring to document declines in local bat populations as a result of white-nose syndrome (WNS), a cold-loving virus contributing to the deaths of over 100,000 hibernating bats in the northeastern United States.

Invasive Species

The NPS Northeast Region Exotic Plant Management Team (NER EPMT) came three times this season to treat and assist with removal of non-native invasive plants, targeting Japanese knotweed, Japanese barberry and multiflora rose at NPS-owned Towpath Trail in Minisink Ford, NY, and the D&H Canal site at Corwin Farm.

Monitoring shows a definite decline in the loosestrife population at Pond Eddy. This is our seventh year of releasing *Galerucella pusilla* beetles, which feed exclusively on the leaves, stems and shoot tips of purple loosestrife, preventing seed production and distribution.



Both *Galerucella* beetles and eggs of the *Galerucella* beetles were documented in 2010 in our study area

Thanks to local Boy Scout Troop 122 and their leader, NPS volunteer Rich Egan, four years of eradication resulted in no new infestations of the invasive plant, water chestnut (*Trapa natans*) in the Upper Delaware River in 2010.

We assisted the Pennsylvania Chapter of The Nature Conservancy to remove Japanese knotweed from Butternut Island, a critical link between the Delaware River's headwaters in New York's Catskill Mountains and the unique heaths and mountains of Pennsylvania's Pocono Mountains.

Study on Age Structure of Spawning Stock of American Shad in the Delaware River

[UPDE, the U. S. Fish and Wildlife Service \(FWS\), Pennsylvania Fish & Boat Commission \(PFBC\) and New York State Department of Environmental Conservation cooperated on a NPS-funded project to describe the age structure of the spawning stock of American shad \(AMS\) in the Upper Delaware River.](#)

From May 1 through June 19, 2010, UPDE staff contacted fishermen at twelve access points in a joint study. Using a FWS-designed creel survey valuable information was gathered from AMS anglers regarding 1) total length, 2) sex, and 3) scale samples. PFBC will study the scale samples to help provide a good sampling of the ages of AMS in the Upper Delaware basin. Data gathered in 2009 and 2010 will help to formulate the age range and obtain the percent of repeat spawning for the AMS in the Delaware River.



NPS volunteer Rich Egan reviewing Water Snapshot results with Damascus Elementary students.

Environmental Education

The *Water Snapshot* program was presented to over 400 local elementary school students, the biggest year to date. UPDE staff visited fourth through eighth grade students in two states, four school districts, six schools and twenty classrooms to explain concepts and principles of water quality and environmental stewardship. This basin-wide event helps students to look at water quality of the streams and rivers in their own backyards. The ["Upper Delaware Snapshot 2010" Water Snapshot booklet](#) is posted for students' and teachers' use. Students' posters were displayed at our Information Center for the month of July.

In its third year, *Trout in the Classroom* provides resources to teachers and helps students make the connection between Trout and local water quality issues.

UPDE Cultural Resources

Building on the existing National Register listing for Zane Grey's residence, a nomination for the Zane Grey site, (including Zane Grey's mother's house and ancillary buildings, the orchard and garden) was completed. A Historic Structures Report for the Alice Grey House and Ancillary Buildings (coal house, barn, cottage-kitchen) and a structural assessment and report of the Zane Grey house were also completed.

Installation of new exhibits at the Zane Grey Museum was completed with the assistance of Harpers Ferry Center.



Historic furnishings in Zane Grey's office completed the Zane Grey Museum exhibit.

Congressman Chris Carney was a speaker at the Zane Grey Exhibit Grand Opening, along with keynote speaker Henry Nardi from the Zane Grey's West Society. Collette Fulton from the Zane Grey's West Society presented the park with a book, The Young Lion Hunter, the first in a series of books for young people that the society is having printed.

With the addition of a Seasonal Museum Technician, we were able to improve documentation and care of museum collections. All new objects received were accessioned and cataloged. Monitoring environmental conditions allowed us to establish baseline data for the new museum exhibits. All GPRA goals for FY 2010 were met, and goal 1a6 (NPS preservation and protection standards) was exceeded.



Zane Grey Museum Exhibit Ribbon Cutting L-R: Museum Curator Dorothy Moon, former UPDE Superintendent John T. Hutzky, Carolyn Weidner, Collette Fulton, Congressman Chris Carney, Henry Nardi, and Superintendent Sean J. McGuinness.

Upper Delaware Council

Our key management partner, The Upper Delaware Council, Inc. (UDC), continued assessing potential impacts from the proposed development of natural gas in the Marcellus Shale play. Activities included gathering and disseminating information, attending meetings and hearings, submitting comment letters, and monitoring the status of regulatory programs by both states and the Delaware River Basin Commission.

Starting in March 2010, UDC's Water Use/Resource Management Committee devoted a portion of every monthly meeting to reviewing studies, hearing presentations, and discussing modifications of the Flexible Flows Management Program (FFMP). UDC is preparing recommendations for management of releases from New York City's Delaware River Basin reservoirs in advance of the FFMP's expiration date of September 30, 2011.

One hundred guests attended the UDC's 22nd Annual Awards Ceremony on April 25, 2010, with New York State Assemblywoman Aileen M. Gunther (98th District) as keynote speaker. [Awards were presented to individuals, organizations, and projects \(including the NPS Roebling Bridge and Towpath Trail Storm Damage Repair\), that have enhanced the quality of life or protected the resources of the Upper Delaware River Valley.](#)

Conclusion

In FY2010, we worked with 137 formal and informal partners to further the mission of the NPS in the Upper Delaware Scenic and Recreational River Corridor, on issues as diverse as The joint Upper Delaware Council & Common Waters Natural Gas Drilling Stakeholders' forums, Delaware and Hudson Canal Transportation Heritage Council, Penn State Science programs, Upper Delaware Visioning, Delaware River Flows, safety of river visitors with the National Canoe Safety Patrol and Upper Delaware liveries, camps and guides, and meetings with each of the 15 township Supervisors, as well as Delaware River Champion, Congressman Maurice Hinchey; to name a few.

FY 2010 has been a year of considerable change, with significant commitment by both our staff and partners to protect The Upper Delaware Scenic and Recreational River. The balance lies in constant vigilance while considering the increased need for sustainability and reason.

EXHIBIT J

NPS Stats

National Park Service Public Use Statistics Office

National Park Service
U.S. Department of the Interior



- [Home](#)
- [Reports](#)
- [MGM](#)
- [Acreage](#)
- [Contact Us](#)

Pennsylvania Parks

Upper Delaware S&RR

Year	Recreational Visitors
1980	77,764
1981	156,437
1982	106,502
1983	223,096
1984	159,854
1985	154,799
1986	162,598
1987	157,753
1988	207,465
1989	226,125
1990	215,924
1991	222,637
1992	207,751
1993	258,994
1994	270,922
1995	492,256
1996	494,267
1997	308,215
1998	292,245
1999	354,356
2000	276,178
2001	306,639
2002	296,095
2003	256,987
2004	225,565
2005	248,953
2006	200,338
2007	248,284
2008	284,347
2009	258,311
2010	306,468
Total	7,658,125

EXHIBIT K

**Socioeconomic Value of the Delaware River Basin
in Delaware, New Jersey, New York, and Pennsylvania**

The Delaware River Basin, an economic engine for over 400 years

October 11, 2011

Prepared by:

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Executive Summary

What do the Guggenheim Museum, New York Yankees, Boeing, Sunoco, Campbell's Soup, DuPont, Wawa, Starbucks, Iron Hill Brewery, Philadelphia Phillies, Camelback Ski Area, Pt. Pleasant Canoe Livery, Salem Nuclear Power Plant, and United States Navy all have in common? They all depend on the waters of the Delaware River Basin to sustain their businesses.

The Delaware River Basin is an economic engine that supplies drinking water to the 1st (New York City) and 7th (Philadelphia) largest metropolitan economies in the United States and supports the largest freshwater port in the world. The Delaware Basin's water supplies, natural resources, and ecosystems in Delaware, New Jersey, New York, Pennsylvania and a small sliver of Maryland:

- Contribute \$25 billion in annual economic activity from recreation, water quality, water supply, hunting/fishing, ecotourism, forest, agriculture, open space, potential Marcellus Shale natural gas, and port benefits.
- Provide ecosystem goods and services (natural capital) of \$21 billion per year in 2010 dollars with net present value (NPV) of \$683 billion discounted over 100 years.
- Are directly/indirectly responsible for 600,000 jobs with \$10 billion in annual wages.

The Basin

The Delaware River Basin occupies almost 13,000 sq mi (not including the river and bay) in Delaware, Maryland, New Jersey, New York, and Pennsylvania. In 2010, over 8.2 million residents lived in the basin including 654,000 people in Delaware, 2,300 in Maryland, 1,964,000 in New Jersey, 131,000 in New York, and 5,469,000 in Pennsylvania. Nearly 3,500,000 people work in the basin with 316,000 jobs in Delaware, 823,000 jobs in New Jersey, 70,000 jobs in New York, and 2,271,000 jobs in Pennsylvania. An additional 8 million people in New York City and northern New Jersey receive drinking water from the Delaware River via interbasin transfers. The Delaware Basin occupies just 0.4% of the continental U.S. yet supplies drinking water to 5% of the U.S. population.

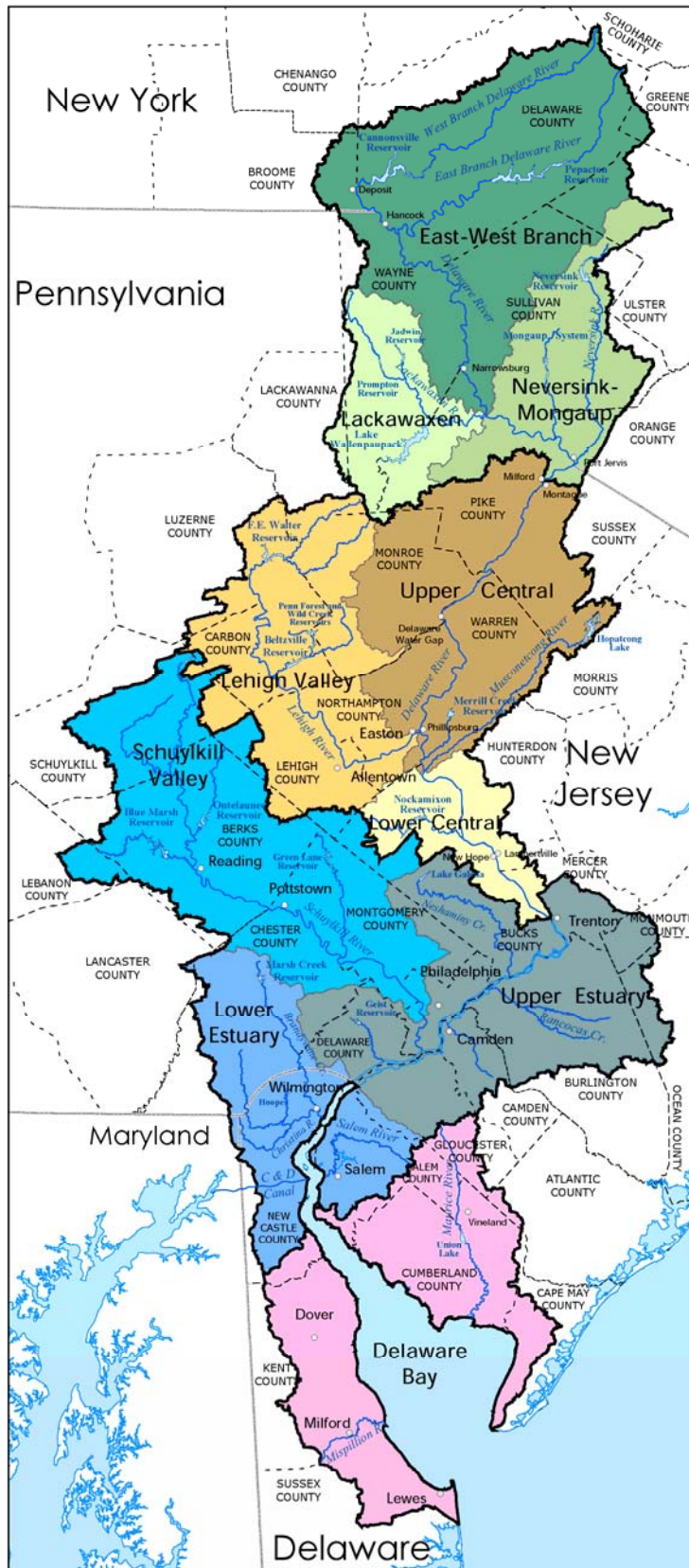
The Delaware Basin population exceeds 8.2 million which if counted together would be the 12th most populous state after New Jersey but ahead of Virginia. The Delaware Basin occupies:

- Delaware (50% of the State's area and 74% of the First State's population)
- New Jersey (40% of the State's area and 22% of the Garden State's population)
- New York (5% of the State's area and 0.7% of the Empire State's population)
- Pennsylvania (14% of the State's area and 43% of the Keystone State's population).

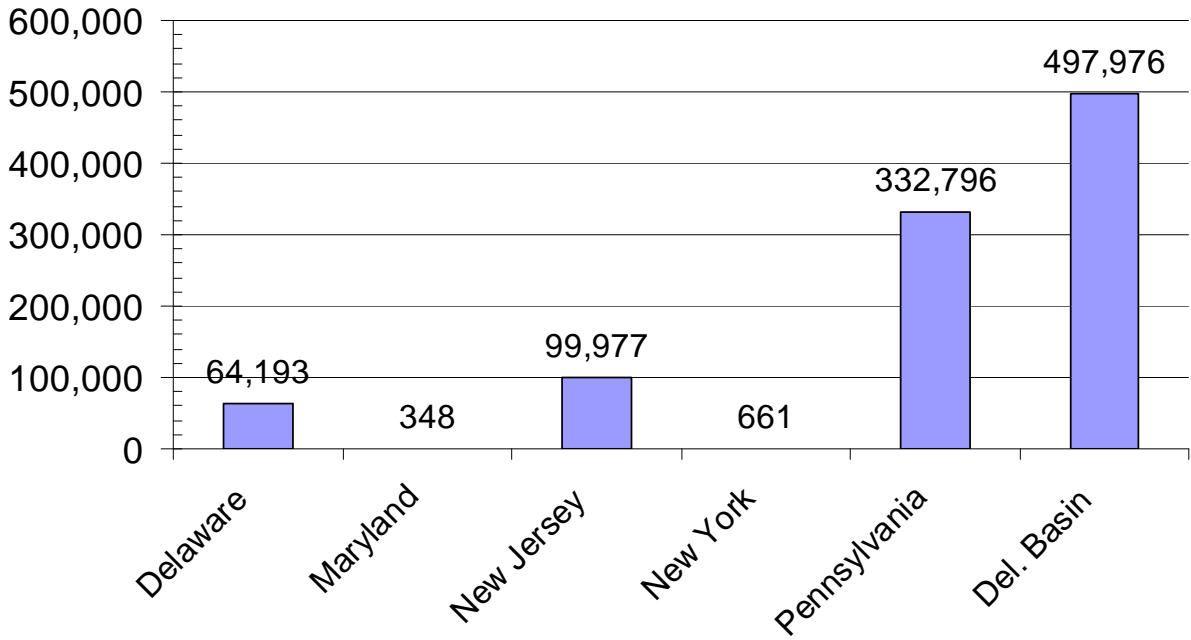
Between 2000 and 2010, the population in the Delaware Basin increased by 6.1% or 472,066 people. Over the last decade, the population increased by 30% in Pike County, Pa.; by over 20% in Kent and Sussex counties, Del. and Monroe County, Pa.; and by over 10% in Gloucester and Ocean counties, NJ, Orange County, NY, and Chester, Lehigh, and Northampton counties, Pa. For the first time in two generations, Philadelphia gained population. Several counties in the basin lost population since 2000: Cape May, NJ; Broome, Delaware, and Greene counties, NY; and Lackawanna, Luzerne, and Schuylkill counties, Pa.

Watersheds of the Delaware River Basin

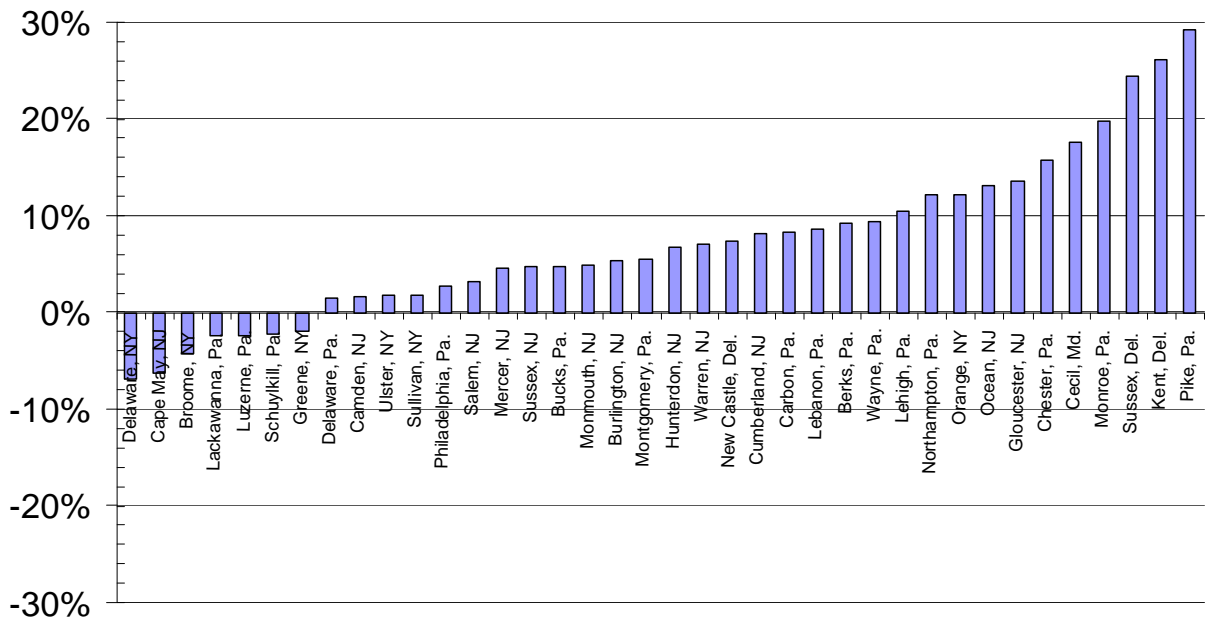
-  East-West Branch Watersheds
-  Lackawaxen Watersheds
-  Neversink-Mongaup Watersheds
-  Upper Central Watersheds
-  Lower Central Watersheds
-  Lehigh Valley
-  Schuylkill Valley
-  Upper Estuary Watersheds
-  Lower Estuary Watersheds
-  Delaware Bay Watersheds



Population Change Delaware Basin, 2000-2010



Population Change by County Delaware Basin, 2000-2010



Annual Economic Activity

The Delaware Basin contributes over \$25 billion in annual market/non-market value to the regional economy from the following activities:

- Recreation \$1.22 billion
- Fish and Wildlife \$1.55 billion
- Public Parks \$1.83 billion
- Water Quality \$2.46 billion
- Navigation/Ports \$2.62 billion
- Marcellus Shale Natural Gas (potential) \$3.30 billion
- Agriculture \$3.37 billion
- Water Supply \$3.82 billion
- Forests \$5.13 billion

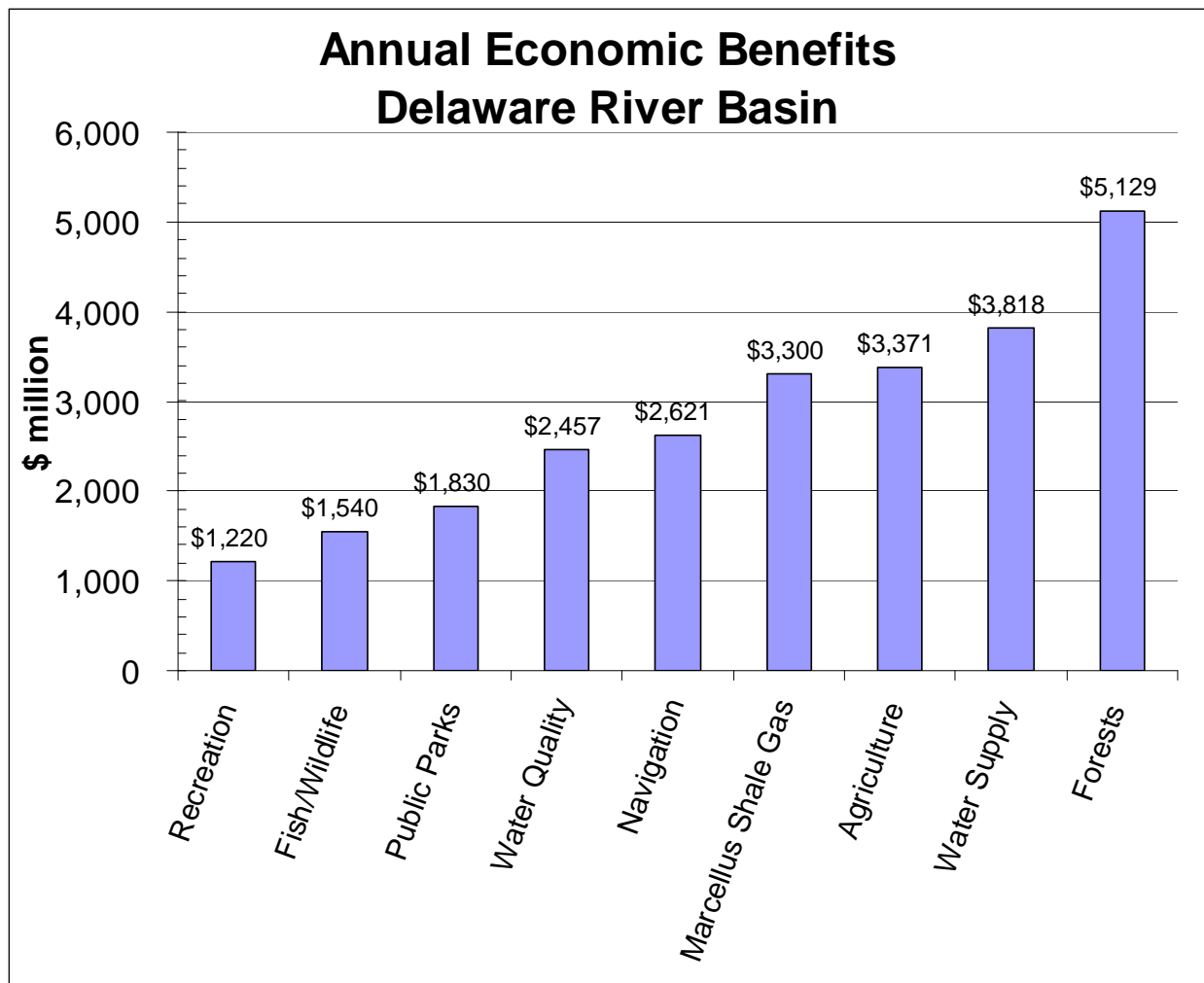


Table E1. Annual economic value supported by the Delaware River Basin.

Market Value	2010 (\$ million)	Sources
Recreation (Boating, Fishing, Swimming)		
Skiing (1.9 million ski-days @ \$45/day)	325	Penna Ski Areas Association (2010)
Paddling-based Recreation (620,860 paddlers)	362	Outdoor Industry Association (2006)
Del. Water Gap River Recreation (267,000 visits)	41	U.S. Forest Service, Nat'l Park Service (1990)
Canoe/Kayak/Rafting (225,000 visits)	9	Canoe and Kayak Liveries (2010)
Powerboating (232,000 boat registrations)	395	National Marine Manufacturers Assoc. (2010)
Water Quality		
Water Treatment by Forests (\$96/mgd)	63	Trust for Public Land, AWWA (2004)
Wastewater Treatment (\$4.00/1000 gal)	1,722	DRBC and USEPA
Increased Property Value (+8%, 2000 ft of river)	13	EPA (1973), Brookings Institute (2010)
Water Supply		
Drinking Water Supply (\$4.78/1000 gal)	3,145	UDWRA and DRBC (2010)
Reservoir Storage (\$0.394/1000 gal)	145	UDWRA and DRBC (2010)
Irrigation Water Supply (\$300/ac-ft)	32	Resources for Future (1996), USDA (2007)
Thermoelectric Power Water Supply (\$44/ac-ft)	297	EIA (2002), NETL (2009)
Industrial Water Supply (\$200/ac-ft)	179	Resources for Future (1996), DRBC (2010)
Hydropower Water Supply (\$32/ac-ft)	20	Resources for Future (1996), DRBC (2010)
Fish/Wildlife		
Commercial Fish Landings (\$0.60/lb)	34	NMFS, Nat'l. Ocean Econ. Program (2007)
Fishing (11-18 trips/angler, \$53/trip)	576	U. S. Fish and Wildlife Service (2001)
Hunting (16 trips/hunter, \$50/trip)	340	U. S. Fish and Wildlife Service (2001)
Wildlife/Bird-watching (8-13 trips/yr, \$27/trip)	561	U. S. Fish and Wildlife Service (2001)
Shad Fishing (63,000 trips, \$102/trip)	6	Pennsylvania Fish & Boat Comm. (2011)
Wild Trout Fishing	29	Sportfishing Assn./Trout Unlimited (1998)
Agriculture		
Crop, poultry, livestock value (\$1,180/ac)	3,371	USDA Census of Agriculture 2007 (2009)
Public Parks		
Del. Water Gap Natl. Rec. Area (4.9 million visits)	100	U.S. National Park Service (2002)
Marcellus Shale		
Natural Gas (potential)	3,300	USGS (2011), EIA (2011)
Maritime Transportation		
Navigation (\$15/ac-ft)	220	Resources for the Future (1996)
Port Activity	2,400	Economy League of Greater Phila. (2008)
Delaware Basin Market Value	≈ \$17.7 billion	
Non-Market Value		
Recreation (Boating, Fishing, Swimming)		
Clean Water Act Restoration		
Viewing/Aesthetics (\$0.58/person)	5	University of Delaware (2003)
Boating (\$0.76/person)	6	University of Delaware (2003)
Fishing (\$2.95/person)	24	University of Delaware (2003)
Swimming (\$6.88/person)	57	University of Delaware (2003)
Water Quality		
WTP for Clean Water (\$38/nonuser-\$121/user)	659	University of Maryland (1989)
Forests		
Carbon Storage (\$827/ac)	3,592	U.S. Forest Service, Del. Center Hort. (2008)
Carbon Sequestration (\$29/ac)	126	U.S. Forest Service, Del. Center Hort. (2008)
Air Pollution Removal (\$266/ac)	1,155	U.S. Forest Service, Del. Center Hort. (2008)
Building Energy Savings (\$56/ac)	243	U.S. Forest Service, Del. Center Hort. (2008)
Avoided Carbon Emissions (\$3/ac)	13	U.S. Forest Service, Del. Center Hort. (2008)
Public Parks		
Health Benefits (\$9,734/ac)	1,283	Trust for Public Land (2009)
Community Cohesion (\$2,383/ac)	314	Trust for Public Land (2009)
Stormwater Benefit (\$921/ac)	121	Trust for Public Land (2009)
Air Pollution (\$88/ac)	12	Trust for Public Land (2009)
Delaware Basin Non-Market Value	≈ \$7.6 billion	

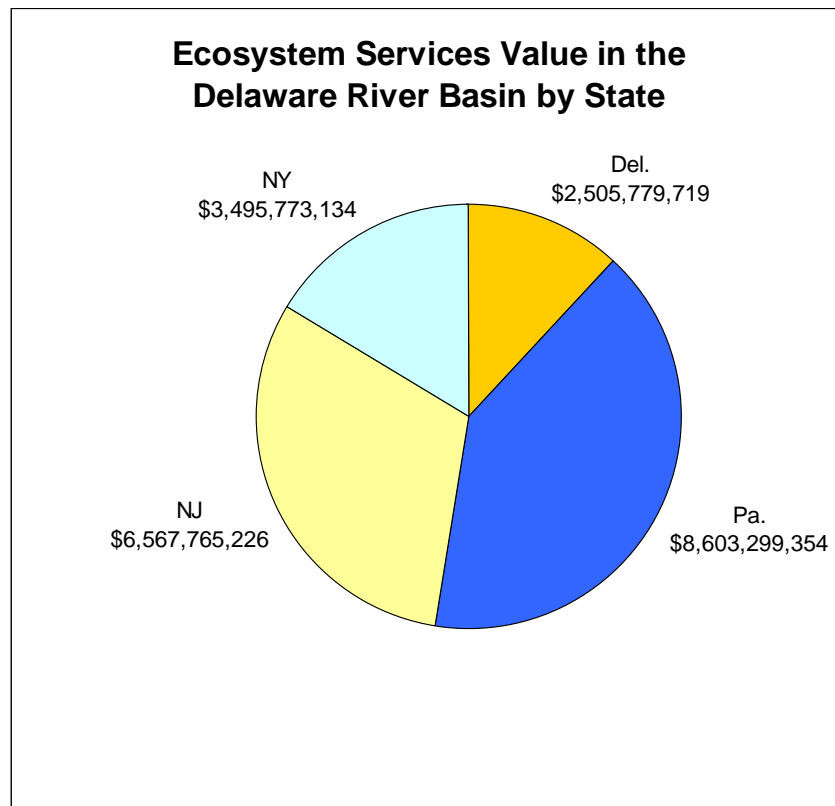
Ecosystem Services

The value of natural goods and services from ecosystems in the Delaware Basin is \$21 billion (\$2010) with net present value (NPV) of \$683 billion using a discount of 3% over 100 years. The contributions of ecosystem services by state include:

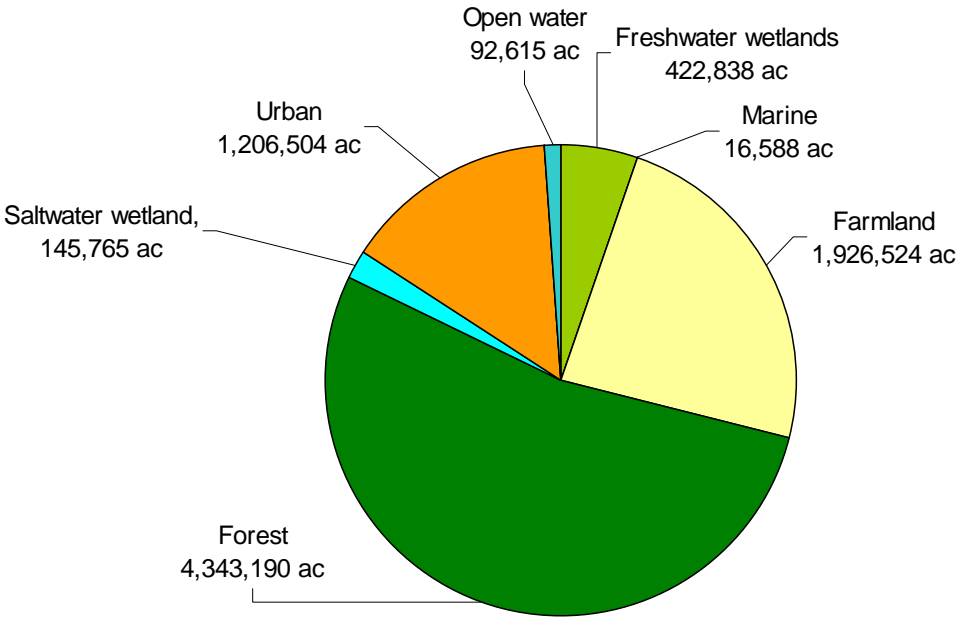
- Delaware (\$2.5 billion, NPV \$81.4 billion)
- New Jersey (\$6.6 billion, NPV \$213.4 billion)
- New York (\$3.5 billion, NPV \$113.6 billion)
- Pennsylvania (\$8.6 billion, NPV \$279.6 billion)

Table E2. Ecosystem goods and services provided by the Delaware River Basin

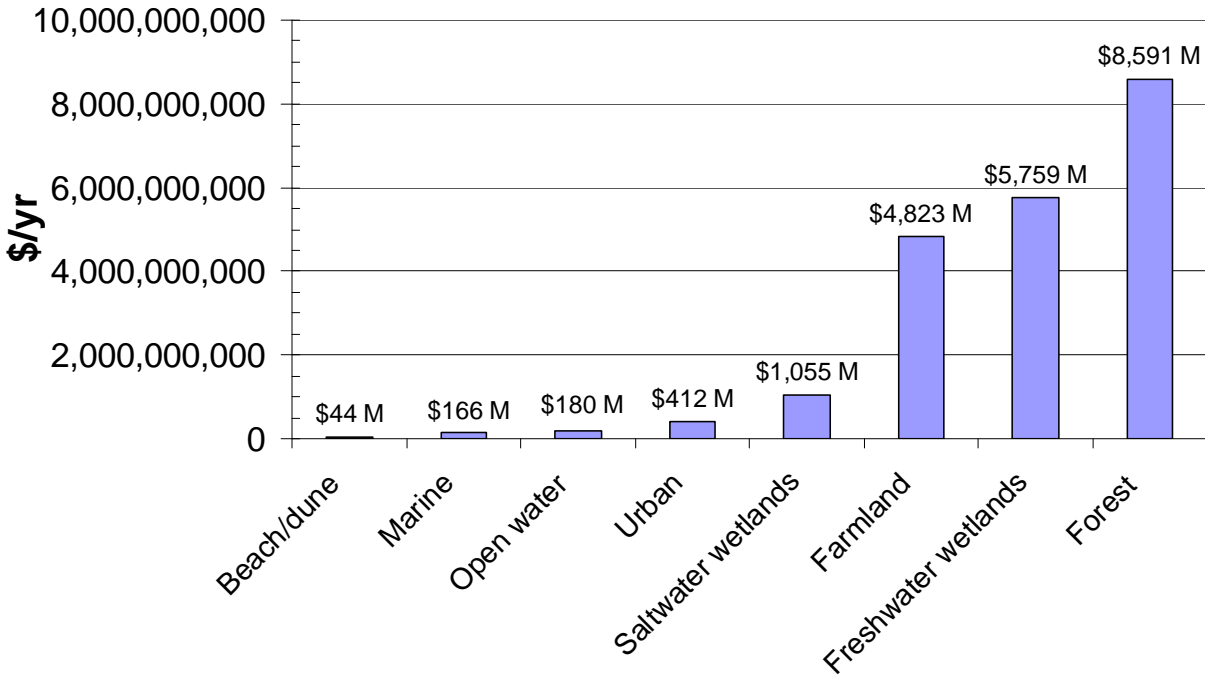
Ecosystem	Area (ac)	\$/ac/yr 2010	\$/yr 2010	NPV \$
Freshwater wetlands	422,838	13,621	5,759,329,048	187,178,194,067
Marine	16,588	10,006	165,982,947	5,394,445,767
Farmland	1,926,524	2,503	4,823,030,404	156,748,488,136
Forest land	4,343,190	1,978	8,591,367,360	279,219,439,184
Saltwater wetland	145,765	7,235	1,054,617,851	34,275,080,170
Urban	1,206,504	342	412,157,579	13,395,121,322
Beach/dune	900	48,644	43,758,633	1,422,155,566
Open water	92,615	1,946	180,210,703	5,856,847,857
Total	8,154,924		\$21,030,454,525	\$683,489,772,069

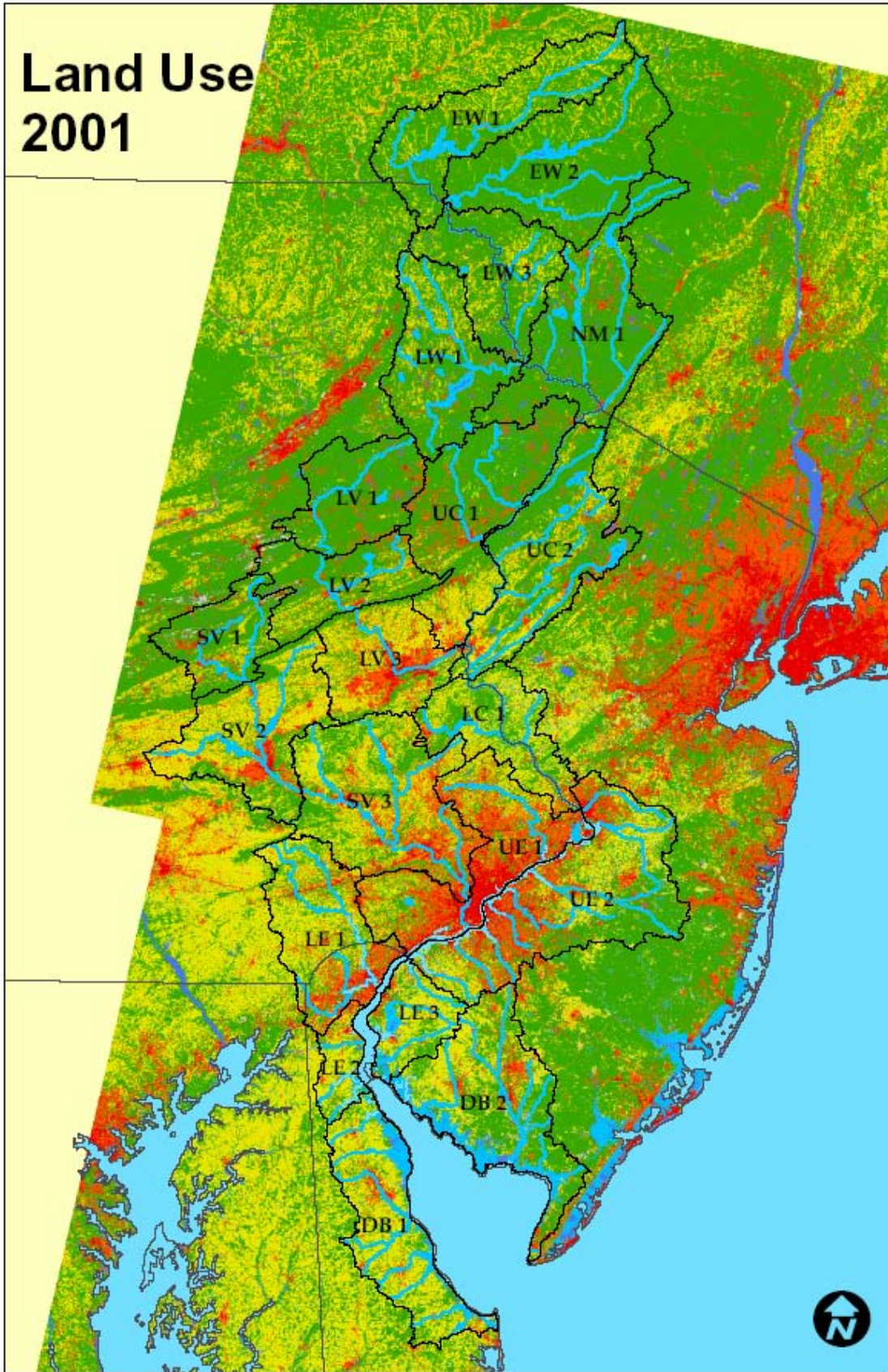


Ecosystems Area (acres) Delaware River Basin, 2005



Natural Capital Value of Ecosystems in the Delaware River Basin





Jobs and Wages

The Delaware River Basin is a jobs engine that supports 600,000 direct/indirect jobs with \$10 billion in annual wages in the coastal, farm, ecotourism, water/wastewater, ports, and recreation industries.

Table E3. Jobs and wages directly and indirectly supported by the Delaware River Basin

Sector	Jobs	Wages (\$ million)	Source
Direct Basin Related	240,621	4,900	U.S. Bureau of Labor Statistics, 2009
Indirect Basin Related	288,745	4,000	U.S. Census Bureau, 2009
Coastal	44,658	947	National Coastal Economics Program, 2009
Farm	45,865	1,376	USDA Census of Agriculture, 2007
Fishing/Hunting/Birding	44,941	1,476	U.S. Fish and Wildlife Service, 2008
Water Supply Utilities	8,750	485	UDWRA and DRBC, 2010
Wastewater Utilities	1,298	61	UDWRA and DRBC, 2010
Watershed Organizations	201	10	UDWRA and DRBC, 2010
Ski Area Jobs	1,753	88	Penna. Ski Areas Association
Paddling-based Recreation	4,226		Outdoor Industry Association (2006)
River Recreation	448	9	U. S. Forest Service/Nat'l. Park Service, 1990
Canoe/Kayak/Rafting	225		Canoe Liveries and UDWRA, 2010
Wild Trout Fishing	350	4	Maharaj, McGurrin, and Carpenter, 1998
Del. Water Gap Nat'l. Rec. Area	7,563	101	Stynes and Sun, 2002
Port Jobs	12,121	772	Economy League of Greater Phila., 2008
Delaware Basin Total	> 600,000	>\$10 billion	

Within the Delaware Basin are 3,480,483 jobs earning \$172.6 billion in wages including:

- Delaware (316,014 jobs earning \$16.5 billion in wages)
- New Jersey (823,294 jobs, \$38.1 billion in wages)
- New York (69,858 jobs earning \$2.5 billion in wages)
- Pennsylvania (2,271,317 jobs earning \$115.5 billion in wages)

Jobs directly associated with the Delaware River Basin (such as water/sewer construction, water utilities, fishing, recreation, tourism, and ports) employ 240,621 with \$4.9 billion in wages including:

- Delaware (15,737 jobs earning \$340 million in wages)
- New Jersey (62,349 jobs earning \$1.3 billion in wages)
- New York (32,171 jobs earning \$550 million in wages)
- Pennsylvania (130,364 jobs earning \$2.8 billion in wages)

Jobs indirectly related to the waters of the Delaware Basin (based on multipliers of 2.2 for jobs and 1.8 for salaries) employ 288,745 people with \$4.0 billion in wages including:

- Delaware (18,884 jobs earning \$270 million in wages)
- New Jersey (74,819 jobs earning \$1.0 billion in wages)
- New York (38,605 jobs earning \$400 million in wages)
- Pennsylvania (156,437 jobs earning \$2.2 billion in wages)

According to the National Coastal Economy Report (2009), coastal employment sectors within the Delaware River Basin are responsible for 44,658 jobs earning \$947 million in wages with contributions of \$1.8 billion toward the GDP including:

- Delaware (12,139 jobs, \$214 million in wages, \$392 million toward the GDP)
- New Jersey (4,423 jobs, \$140 million in wages, \$235 million toward the GDP).
- Pennsylvania (28,096 jobs, \$593 million in wages, \$1.2 billion toward the GDP).

Over 21,800 farms provide 45,865 jobs with \$1.9 billion in wages in the Delaware Basin including:

- Delaware (3,140 farm jobs earning \$129 million in wages)
- New Jersey (14,305 farm jobs earning \$587 million in wages)
- New York (2,410 farm jobs earning \$99 million in wages)
- Pennsylvania (26,010 farm jobs earning \$1.1 billion in wages)

Fishing, hunting, and bird watching/wildlife associated recreation employ 44,941 jobs with \$1.5 billion in wages in the Delaware Basin including:

- Delaware (4,080 jobs earning \$134 million in wages)
- New Jersey (17,477 jobs earning \$574 million in wages)
- New York (4,872 jobs earning \$160 million in wages)
- Pennsylvania (18,512 jobs earning \$608 million in wages)

Public and private water utilities that withdraw drinking water from the Delaware River Basin employ 8,750 people with wages of \$485 million including:

- Delaware (141 jobs earning \$7.8 million in wages)
- New Jersey (823 jobs earning \$46 million in wages)
- New York (5,600 jobs earning \$310 million in wages)
- Pennsylvania (2,186 jobs earning \$121 million in wages)

Wastewater utilities that treat and discharge wastewater to the Delaware River Basin employ 1,298 people with wages of \$61 million including:

- Delaware (108 jobs earning \$5 million in wages)
- New Jersey (257 jobs earning \$12 million in wages)
- New York (20 jobs earning \$1 million in wages)
- Pennsylvania (913 jobs earning \$43 million in wages)

Over 100 nonprofit watershed and environmental organizations employ at least 200 staff who earn at least \$9.5 million in wages to restore the watersheds in the Delaware River Basin.

In the Pocono Mountains of Pennsylvania, 9 ski resorts support 1,753 direct jobs in the Delaware Basin from aggregate annual revenues of \$87,655,063 from 1,908,228 skier visits.

Paddling-based recreation in the Delaware Basin is responsible for 620,860 participants and 4,226 jobs according to data prorated from the Outdoor Industry Association (2006).

The U. S. Forest Service and U.S. National Park Service estimated river recreation along the Upper Delaware River and Delaware Water Gap was responsible for 448 jobs with wages of \$8.8 million in 1986.

The 37 canoe/kayak liveries along the Delaware, Lehigh, and Schuylkill, and Brandywine Rivers have earnings of \$9 million per year and employ 225 people to lease watercraft to 225,000 visitors.

Along the Beaverkill, East Branch, West Branch, and upper main stem of the Delaware River in New York, wild trout fishing provides for 350 jobs with \$3.6 million in wages.

The Delaware Water Gap National Recreation Area recorded 4,867,272 recreation visits in 2001 that generated \$106 million in sales and 7,563 direct/indirect jobs with \$100 million in wages.

Delaware River ports from Wilmington to Philadelphia to Trenton are collectively the 5th largest port in the U.S. based on imports and the 20 largest U.S. port based on exports. These ports:

- Employ 4,056 workers who earn \$326 million in wages.
- Provide port jobs that support an additional two jobs each in port activity and employee spending for a total of 12,121 port related jobs with \$772 million in wages.
- Most of the 4,056 direct port jobs are in cargo handling and warehousing with petroleum port jobs adding up to less than 10% of employment
- Provides good jobs, the average salary of a port employee (with benefits) is over \$80,000.

River Recreation

Cordel et al. (1990) from the U. S. Forest Service and U.S. National Park Service estimated river recreation along the Upper Delaware River and Delaware Water Gap was responsible for \$13.3 million and \$6.9 million in total economic output, respectively, in \$1986 (Table 11). Adjusting for 3% annually, river recreation economic output along the Upper Delaware River and Delaware Water Gap is roughly \$27.1 million and \$14.1 million, respectively, or \$41.2 million total in \$2010.

Table 11. Economic impacts of river recreation along Upper Delaware and Delaware Water Gap

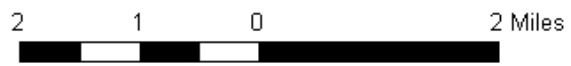
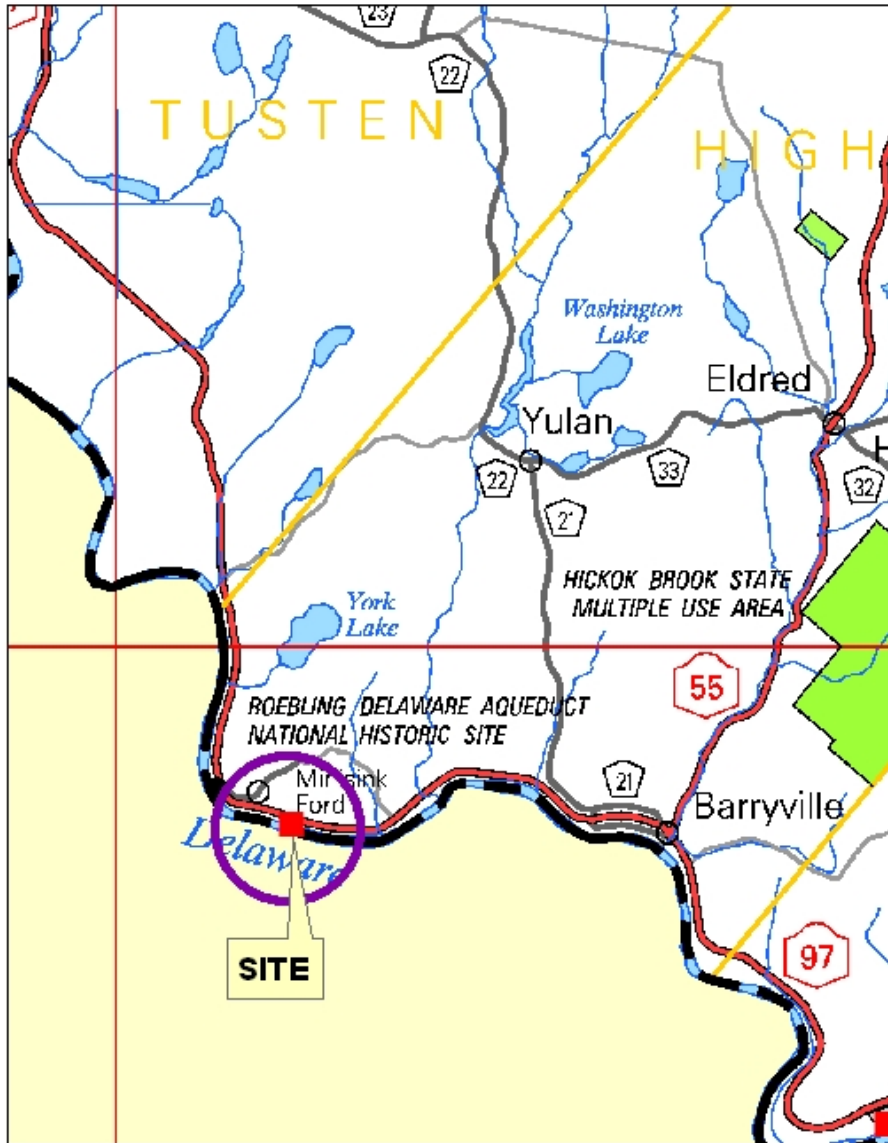
River	Participants	Jobs	Wages (\$1986)	Economic Output (\$1986)	Wages (\$2010)	Economic Output (\$2010)
Upper Delaware	232,000	292	5,582,800	13,351,000	11,408,000	\$27,100,000
Del. Water Gap	135,400	156	3,246,300	6,929,000	6,633,743	\$14,100,000
Total	367,400	448	8,829,100	20,280,000	18,041,743	41,200,000

1. Cordel et al. 1990. 2. Adjusted to \$2010 at 3% annually.

Canoe/Kayak/Rafting

Thirty seven (37) canoe and kayak liveries along the Delaware, Lehigh, and Schuylkill, and Brandywine Rivers lease watercraft to approximately 225,000 visitors with earnings of \$9 million per year assuming a daily rental fee of \$40 per person (Table 12).

EXHIBIT L



General Map



Detailed Map

NYS Off. Attorney General
 Envrl. Protection Bureau
 October 2011

■ Eagle Observation Blind

Delaware River and NY 97 Eagle Observation Blind

Eagle Observation Area

Is it an Eagle?
The Bald Eagle is a symbol of the United States. It is a large, powerful bird of prey. It has a white head and neck, a dark brown body, and a long, hooked beak. It is known for its ability to fly long distances and its fierce nature.

Eagle Etiquette


Human presence and disturbances can stress the eagles and affect their overall health. Whether a winter visitor or year-round breeder, the eagles should not be disturbed or harmed in any way.

Practice Eagle Etiquette for the least intrusive experience:

- Remain in or near your vehicle, or move quickly and quietly into this observation blind.
- Avoid loud noises. Yelling, car horns, slamming doors, and any unnecessary movements.
- Use binoculars or spotting scopes to view eagles. Window-mounted scopes in your vehicle work well.
- Keep your distance. Don't try to approach any eagles or try to get a little bit closer.
- Don't do anything to try to make the eagle fly.
- Obey the law! There are serious consequences (high fines and/or imprisonment) for disturbing, harming or killing eagles.

Because most eagle watching is done in winter, for your own safety:

- Be prepared for snow, ice, mud and frigid temperatures.
- Dress for extreme cold and avoid hypothermia.
- Limit exposure to the cold and wind; return to your vehicle often for warmth.



QUIET PLEASE
TURN OFF ENGINES
NO MUSIC
LOW VOICES ONLY





Mongaup Valley Wildlife Management Area



One of North America's largest birds of prey (raptors), bald eagles stand about 30 inches high, have a wingspan of 72-84 inches and weigh between 8 and 14 pounds. Their life span in the wild is more than 30 years. Their call has been described as a harsh cackle, kleeek-kik-ik-ik-ik or a lower kak-kak-kak.

Bald Eagle Restoration, Research and Management

During the 1800s and early 1900s, New York State was home to as many as 80 nesting pairs of bald eagles and served as wintering grounds for several hundred. By 1960, however, the state had only one known, active bald eagle nest remaining, and the number of wintering visitors had been reduced to only a few dozen.

About 20 years later, bald eagle populations experienced a dramatic turnaround thanks to a national ban on DDT, the federal Endangered Species Act, New York State's Endangered Species Program and the state's listing of eagles as endangered. Nationally, eagles are still protected under the Migratory Bird Treaty Act (MBTA) and the National Bald and Golden Eagle Act.

Successful bald eagle restoration in New York has resulted from DEC programs that:

- Restricted the use of toxic substances that interfere with their breeding
- Protected and restored their species in the wild
- Protected critical eagle habitat

Destruction of habitat is the most damaging activity to eagle populations. Therefore, we must secure sufficient, suitable eagle habitat and limit human disturbance within it.

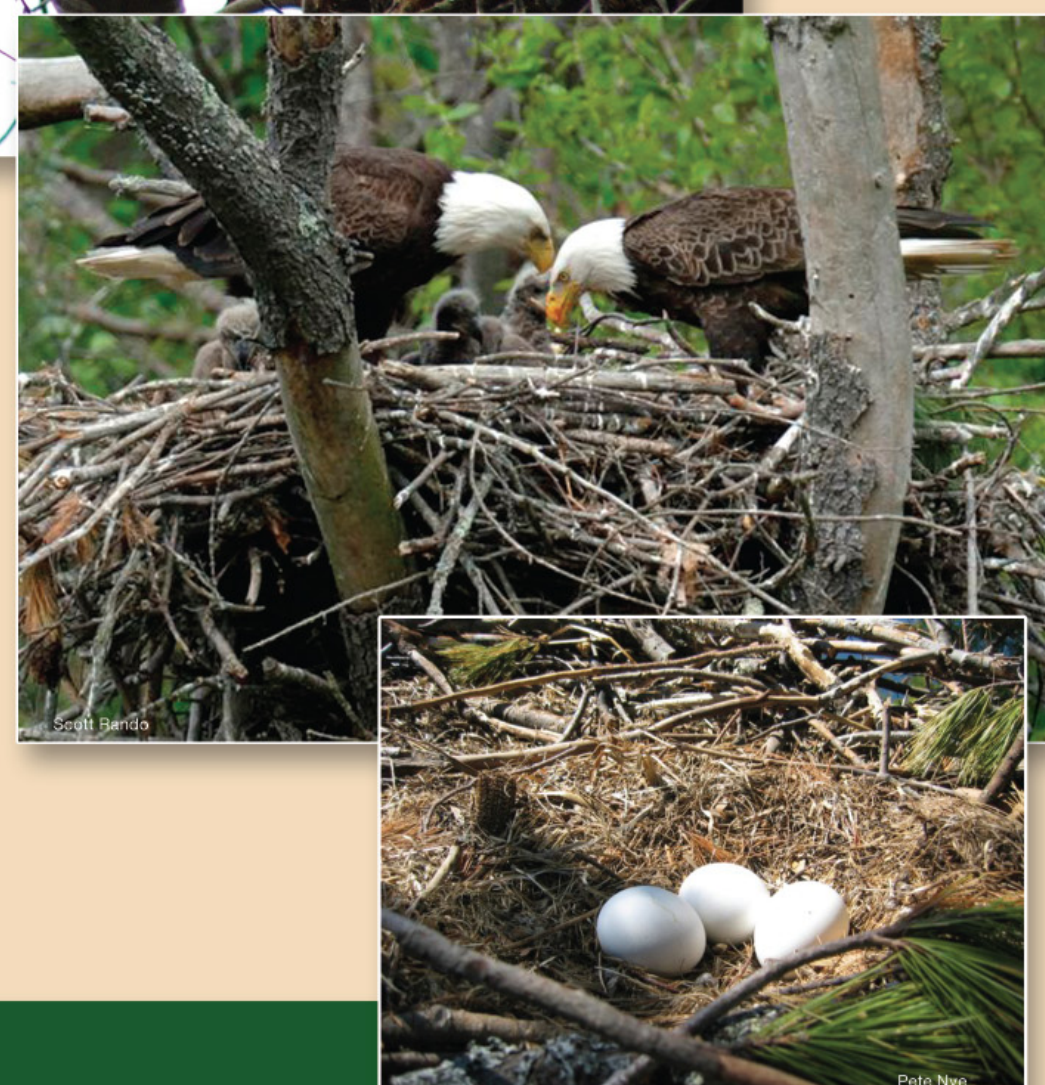


Spangler Jr.

This majestic bird is unmistakable in adult plumage, its brown body set off by a white head and tail and a bright yellow bill. Male and female bald eagles look identical except that the female is usually about one-third larger and heavier, as is typical in birds of prey. Sexual maturity and the characteristic white head and tail are achieved around five years of age. Bald eagles are found throughout Canada and in every state except Hawaii. Historically, they nested in forests along the shorelines of waterbodies throughout most of North America, often moving south in winter to areas where water remained open.



Immature bald eagles lack the characteristic white head and tail of adults. They are mostly chocolate brown, with varying amounts of white on the body, tail and under-wings, and their bills are grey. Juvenile bald eagles are often mistaken for golden eagles, which are much rarer in New York State.

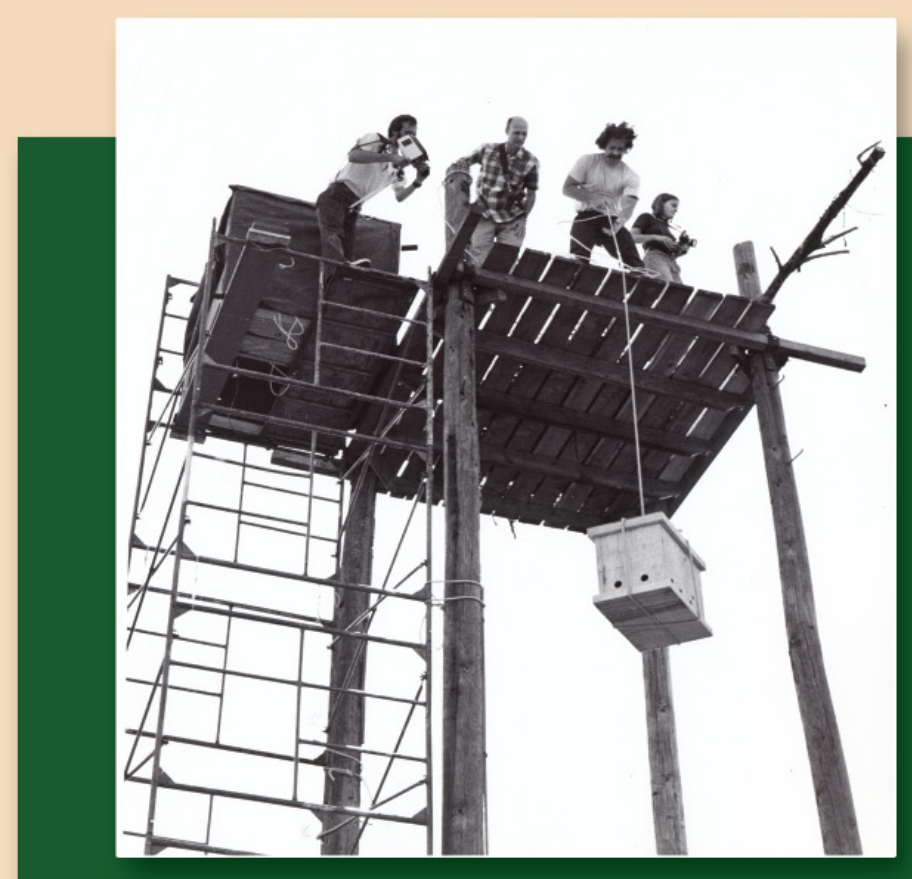
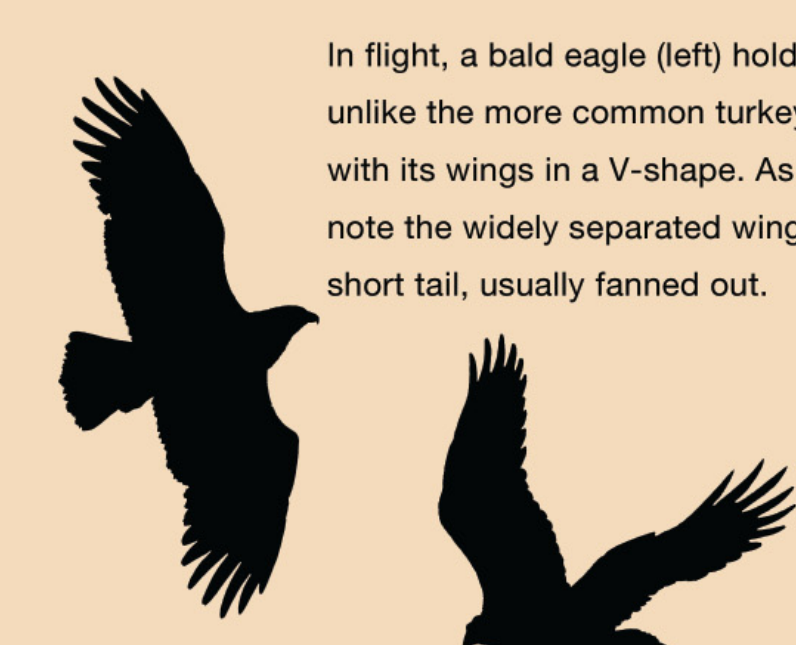


Bald eagles mate for life. Reaching sexual maturity around age 5, they return to nest in the general area within 250 miles from which they fledged. Once a pair selects a nesting territory, they use it for life. Bald eagles breed throughout New York State, usually in areas with large bodies of water that support high fish populations. Currently, breeding bald eagles are absent from Long Island, where they historically nested.

Nesting: The nesting season begins in late February and March. Males and females build nests together and continue to add sticks each breeding season. A bald eagle's nest is a large, flat-topped mass of sticks fixed with fine vegetation such as rushes, grasses and mosses. Usually located high in a tall, live, white pine tree near water, nests are reused and enlarged each year, often becoming eight or more feet deep, six feet across and weighing hundreds of pounds.

Eggs and young: Female bald eagles lay one or two eggs, occasionally three, in March. They are slightly smaller than domestic goose eggs and are dull white. Only one eagle egg is laid per day, although not always on successive days. The adults incubate and care for their young together; however, the female is primarily responsible for them. In New York State, the young fledge by mid- to late summer at about 12 weeks of age. By 25 weeks, they are largely independent.

In flight, a bald eagle (left) holds its wings straight out, unlike the more common turkey vulture, which soars with its wings in a V-shape. As an eagle passes overhead, note the widely separated wingtip feathers and the relatively short tail, usually fanned out.



The New York State Bald Eagle Restoration Project began in 1973 in an attempt to reestablish a breeding population through fledging (hand rearing to independence). During a 15-year period, 158 nestlings were collected (most from Alaska), transported and released in New York. The tracking project ended in 1988 after accomplishing its goal of establishing 16 breeding pairs.

New York State has been enjoying a long-term, consistent annual increase in the breeding bald eagle population of 10-15% per year. In 2006, there were approximately 201 occupied bald eagle nest sites in New York. Of these, 123 nests fledged 223 young.



Eagle Viewing Tips

Harassing, disturbing or injuring a bald eagle is a federal offense and carries a penalty of up to \$20,000 and/or one year in jail. Remember that eagles should remain undisturbed, and they must conserve energy during winter.

The following tips for eagle viewing will ensure the best possible experience:

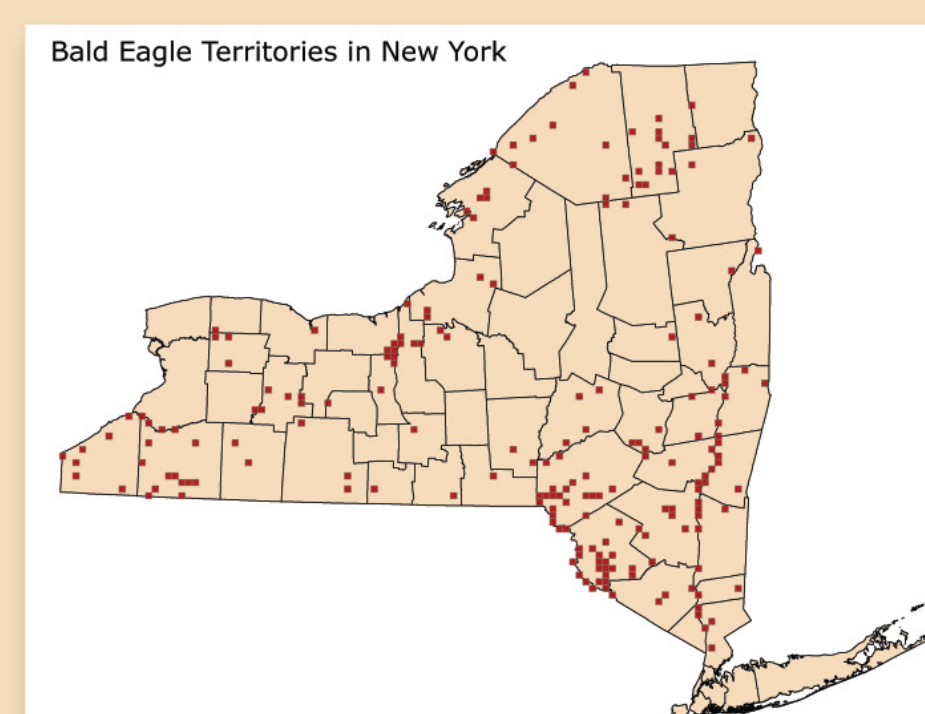
- Arrive early (7 AM - 9 AM), or stay late (4 PM - 5 PM), when eagles are most active.
- Use a designated bald eagle viewing site.
- Scan the tree line for eagles that are perched in tree tops.
- Look overhead for eagles soaring high in the sky.
- Check ice floes or river islands for eagles sunning themselves or enjoying a meal.
- Be patient; it's the key to successful viewing.

For the safest and least intrusive bald eagle viewing, we recommend the following:

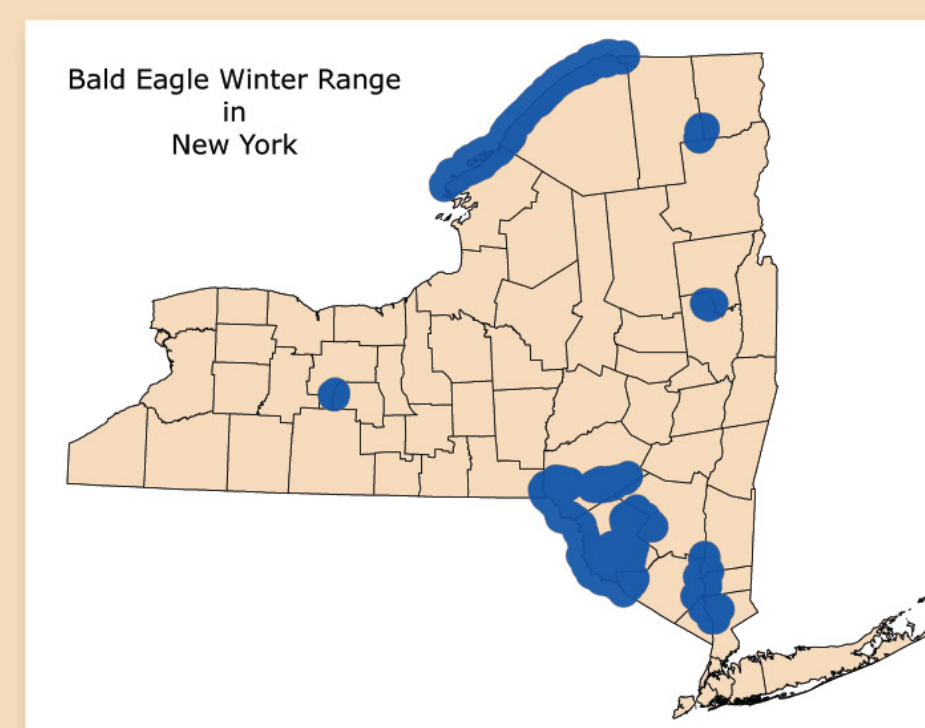
- Leave pets at home.
- Refrain from making loud noises, such as yelling, etc.
- Don't attempt to make an eagle fly.
- Use binoculars or spotting scopes instead of trying to get closer.
- Respect private property, and avoid restricted areas.



Winter is the best time to observe bald eagles in New York State. They begin arriving in December, with peak concentrations in January and February. During the non-breeding season, bald eagles tend to concentrate at wintering areas and roosts at four open-water sites: the upper Delaware River, the Saint Lawrence River, the lower Hudson River and the Sacandaga River. Many hydroelectric plants, such as in Mongaup Valley, provide suitable wintering habitat for bald eagles. Although their primary prey is fish, bald eagles will eat mammals, waterfowl, seabirds and carrion, especially in winter.



Bald eagles breed throughout New York State, usually in areas with large bodies of water that support high fish populations. Currently, breeding bald eagles are absent from Long Island, where they historically nested.



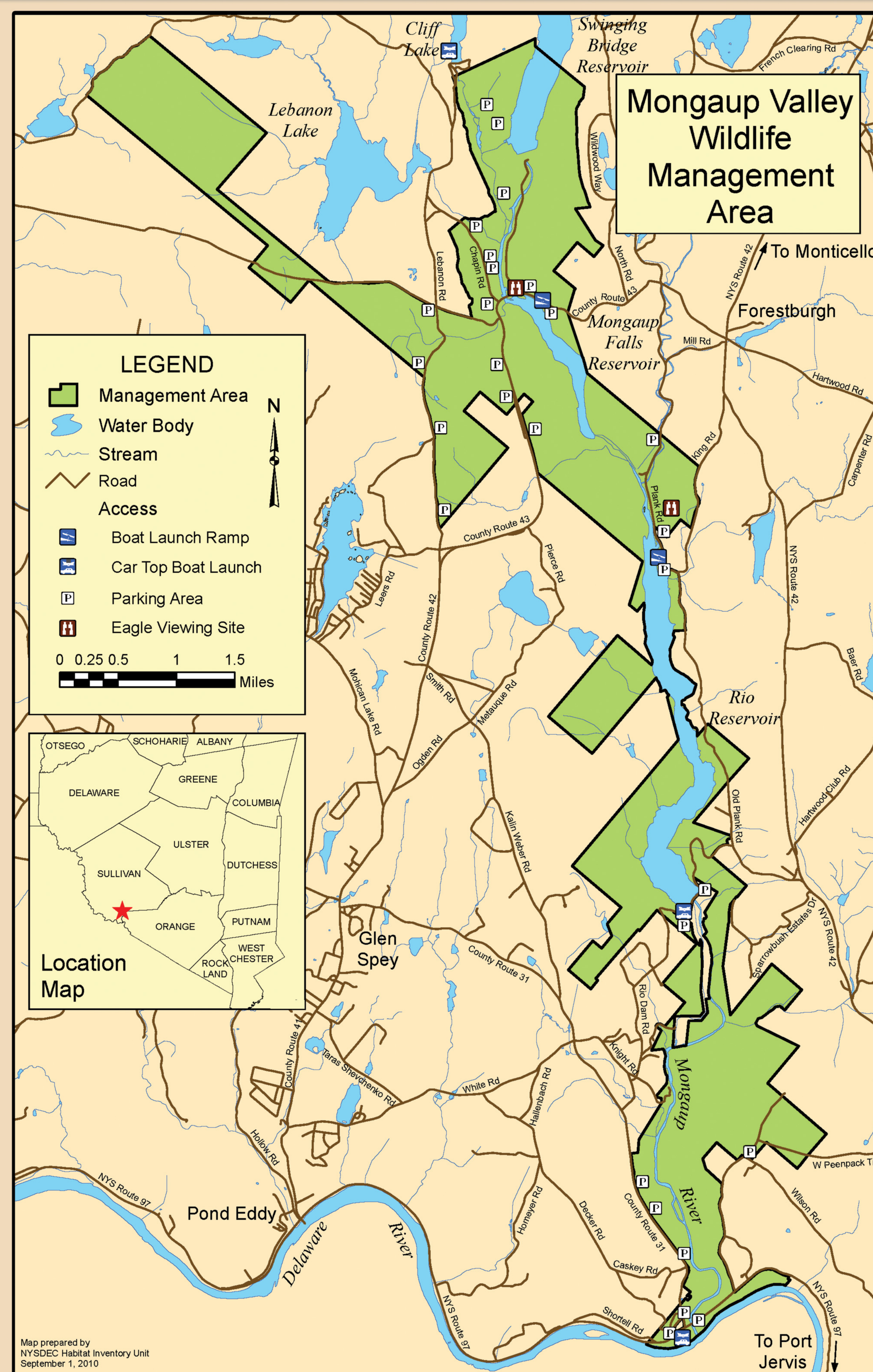
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Sound the Alarm-Support the Eagles

- If you see someone harassing or injuring an eagle, or if you spot destruction of eagle habitat or find an injured or dead eagle, report it at once to DEC Law Enforcement at 1-800-TIPP-DEC.
- Support legislation that helps protect the eagle and its habitat.
- Participate in local planning and development.
- Support organizations that work toward conservation of eagles and all wildlife.



Mongaup Valley Wildlife Management Area



Mongaup Valley Wildlife Management Area

Early Settlement

Mongaup Valley was initially settled by members of the Leni-Lanape or the Algonkian Nation who were then conquered by the Mengwe of the Iroquois Confederacy. In 1768, the Mengwe sold the lands, including all of the ancient territory of the Leni-Lanape, to European settlers—mostly trappers, hunters and lumbermen.

In 1798, the New York State Legislature created the Town of Lumberland. The early to mid-1800s saw the height of the lumber industry in the town due to tremendous resources of virgin forests, which were harvested for timber and bark used in the tanning industry.

The Delaware and Hudson (D&H) Canal, used for transporting coal from the mines of Pennsylvania to Kingston, opened in 1828 and brought increased settlement and growth to the area. By 1898, the canal had closed due to competition from railroads.

In 1891, Chester W. Chapin, Jr. began buying land in the area, eventually accruing 18,000 acres that became known as Chapin Park. After Chapin's death, most of his estate was purchased by the Atlantic Utilities Corporation and the Catskill Power Corporation. It was then sold to the Tenney Corporation, which held the title for Rockland Light and Power Company, predecessors of today's Orange and Rockland Utilities (O&R). By the 1920s, much of the Mongaup Valley had reverted to forest.



Hydroelectric Power

The era of hydroelectric power generation began in 1922. By the 1940s, the former Chapin estate and other lands in the lower Mongaup Valley totaled more than 20,000 acres, with a system of seven reservoirs. Until 1999, the reservoirs were owned and operated by O&R.

Monitoring of this area in the 1970s showed that bald eagles wintered in the valley due to the rivers, reservoirs, extensive forests and low human population density found here.

During 1984, O&R announced plans to develop their holdings within the area, and, in August 1985, O&R presented their Mongaup Lands Master Plan to DEC. With the exception of a narrow "green belt" along the river, almost all of their holdings were to be developed to include golf courses, houses, apartments and a shopping center.

Land Acquisition by DEC

DEC acquired the property in 1990 from O&R and Clove Development Corporation and formed the Mongaup Valley Wildlife Management Area (WMA). This area includes 6,315 acres of state-owned land and an additional 5,542 acres of privately owned land managed as a conservation easement to the WMA totaling 11,857 acres. Mongaup Valley encompasses the Mongaup River Valley, several reservoirs, and adjacent uplands in the towns of Lumberland, Highland, Forestburgh, and Bethel in Sullivan County and the town of Deer Park in Orange County. The land was acquired with funding provided by the 1986 Environmental Quality Bond Act, primarily to protect the wetlands and bald eagle breeding and wintering habitat.

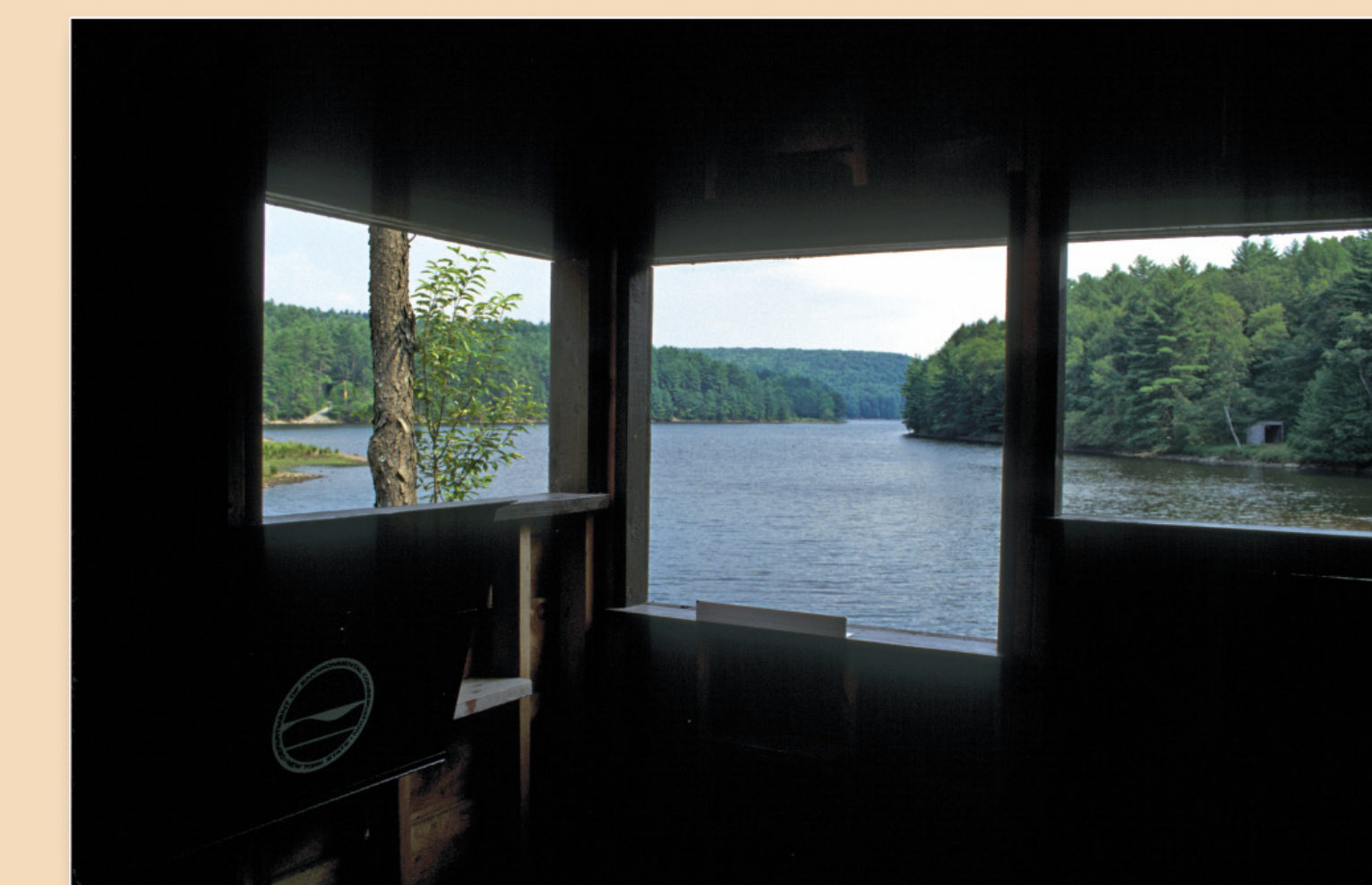
Eagle Management at Mongaup Valley WMA

This area is managed primarily as habitat for wintering bald eagles. Several decisions concerning fisheries management and recreational uses of the WMA have been made based on potentially negative impacts on eagle use or eagle habitat. For this reason, all access to the reservoirs, the river corridor and the associated uplands is restricted from December 1 through March 31 to minimize stressing the eagles.

Typically in winter, bald eagles search for food, eat and perch or roost. It is imperative that the birds conserve energy during the winter by spending much of their time perching or roosting. Access to a reliable food supply is critical to the continued use of the WMA by bald eagles. It has been documented that the primary food for eagles wintering within the area is alewives. The alewife (*Alosa pseudoharengus*) is a species of herring. Without such prey available, bald eagles would simply stop using the WMA.

Frequent hydroelectric generation in the winter maintains areas of open water in the reservoirs, thus enabling eagles to take alewives. Limited water resources must be budgeted for this need against other competing water uses.

Active bald eagle nests are usually found along or near the shorelines of quiet lakes or reservoirs. Only electric outboard motors are allowed in the WMA lakes and reservoirs.



In Addition to Eagles...

In addition to bald eagles, Mongaup Valley is also home to many other species of wildlife and a few rare ecological communities. The NYS-threatened timber rattlesnake and red-shouldered hawk, black bears, deer, neo-tropical migrant birds, perched bog and pitch pine-oak-heath woodland are just a few examples.

Today, in addition to eagle observers, the property is used by hunters, trappers, fishers, hikers, kayakers and other outdoor enthusiasts.

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

STATE OF NEW YORK,)
)
Plaintiff,) No. 11-Civ.-02599 (NGG) (CLP)
)
v.) ECF Case
)
UNITED STATES ARMY CORPS)
OF ENGINEERS, ET AL.,)
)
Defendants.)

DECLARATION OF LYLE CHINKIN

Pursuant to 28 U.S.C. § 1746, I, Lyle Chinkin, declare as follows:

1. I am the President of Sonoma Technology, Inc. (“STI”), which specializes in air quality and meteorological research and services. I joined STI in 1992 and have worked on projects for federal, state, and local government agencies; universities; public and private research consortiums; and major corporations.

2. I submit this declaration in opposition to defendants’ motions to dismiss and for summary judgment, and in support of plaintiff New York’s motion for summary judgment. The purpose of this declaration is to evaluate the impacts of natural gas development in the Pennsylvania portion of the Delaware River Basin (DRB) on ozone levels in New York State.

3. In brief, as explained in more detail below, I conclude that natural gas development in the Pennsylvania portion of the DRB would likely increase ozone levels in New York State, and in particular in the New York City metropolitan area and other downstate areas close to Pennsylvania.

I. Personal Background and Qualifications

4. I received Master of Science (1984) and Bachelor of Science (1981) degrees in Atmospheric Sciences from the University of California at Davis.

5. I have over 25 years of experience in professional consulting regarding air quality and over five years of experience at the California Air Resources Board working on air pollution issues. I have been appointed to and served on the National Research Council (NRC) of the National Academy of Sciences Committee on the Effects of Changes in New Source Review Programs for Stationary Sources of Air Pollutants. I have been appointed to and served on a NRC panel to review “Improving Emission Inventories for Effective Air Quality Management Across North America, a NARSTO Assessment.” I have also served as a United States Environmental Protection Agency (EPA) invited peer-reviewer of the EPA Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS) Criteria Document, as an expert panel member for the Prince William Sound Regional Citizens' Advisory Council's review of the Valdez Air Health Study, and as an expert witness for the United States Department of Justice in environmental enforcement actions in various federal courts. My resume is Appendix A to this declaration and a list of my publications is found at Appendix B

II. Summary of Conclusions

6. At the request of the New York State Office of the Attorney General (NYSOAG), I performed an analysis of the potential for emissions from natural gas development in the Pennsylvania portion of the DRB to impact ozone levels in New York State.

7. Based on the analysis below, I have concluded, with a high degree of certainty, that such activities will result in increased ozone levels in New York State. A list of documents considered in forming these opinions is provided at Appendix C to this declaration.

III. Background Information

8. The DRB covers parts of New York, Pennsylvania, New Jersey, and Delaware. Water resources in the region are managed by the Delaware River Basin Commission (DRBC), which consists of the governors of the four basin states and a federal representative from the U.S. Army Corps of Engineers.

9. As part of its role, the DRBC has proposed draft regulations for natural gas drilling operations in the DRB, including portions of northeastern Pennsylvania and southern New York. This drilling would occur in portions of the DRB that overlay the Marcellus Shale formation, a large natural gas play¹ in the Appalachian Basin extending from New York southward through Pennsylvania, West Virginia, and eastern Ohio (see **Figure 1**). Because the Marcellus Shale is a deep, low-permeability gas reservoir, horizontal drilling and hydraulic fracturing techniques must in many cases be used to extract the natural gas.

10. The DRBC has given some indication that drilling in the Pennsylvania portion of the DRB will largely occur in Wayne County, which lies across the Delaware River from New York State (see **Figure 1**). For example, the DRBC Natural Gas Well Estimate Summary (DRBC, 2012), which was provided to the NYSOAG on January 29, 2012, indicates that portion of the DRB in Pennsylvania that the DRBC has asserted is “economically viable” for gas development may be a 180 square mile area in northeastern Pennsylvania that primarily falls within Wayne County (see **Figure 2**).

¹ A play is a set of known or postulated oil and/or natural gas accumulations sharing similar geographic, geologic, and temporal properties.



Figure 1. Map showing the extent of the Marcellus Shale and the Delaware River Basin.²

² This map was developed from geographic information systems (GIS) shapefiles for the DRB from the DRBC (<http://www.state.nj.us/drbc/basin/map/GIS.html>) and for the Marcellus Shale from the U.S. Geological Survey (<http://certmapper.cr.usgs.gov/noga/servlet/NogaNewGISResultsSubServ?page=gis&tps=506704>).

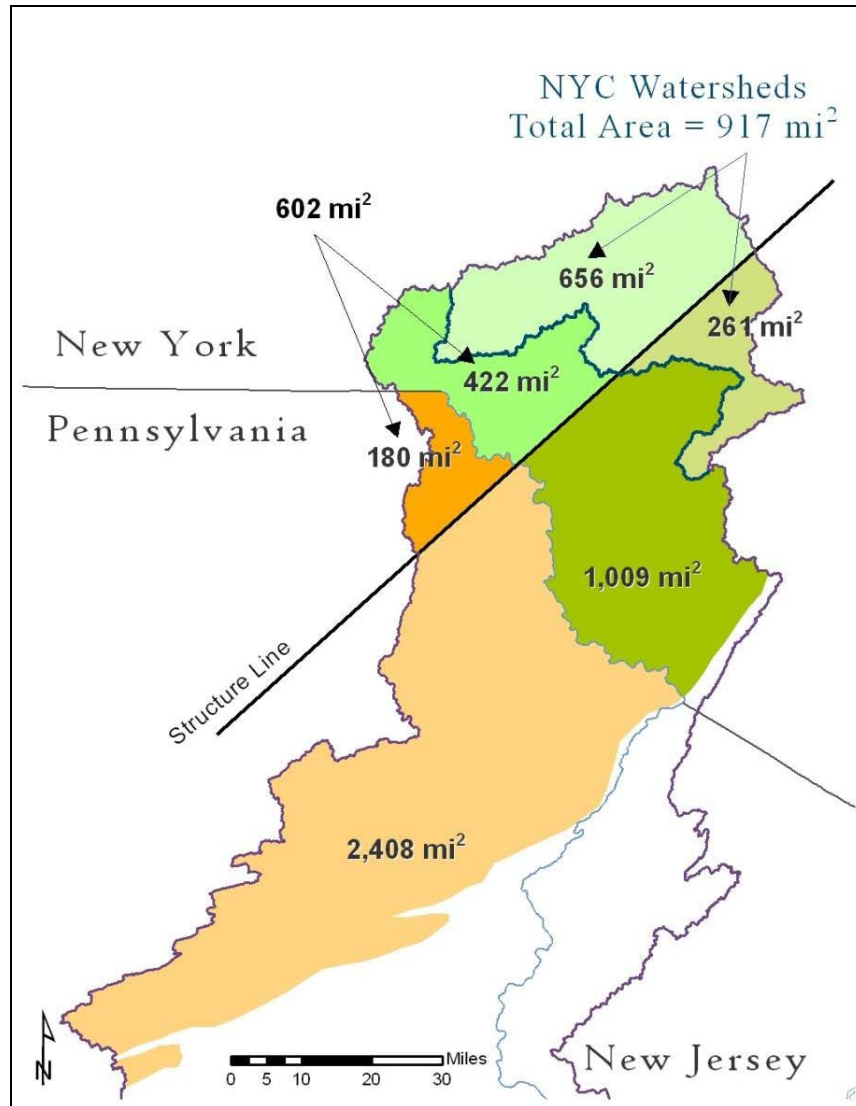


Figure 2. DRBC map of potential well development areas (DRBC, 2012).

11. Wayne County, Pennsylvania is immediately adjacent to New York State and is in the vicinity of several areas in New York that exceed the U.S. Environmental Protection Agency's (EPA) National Ambient Air Quality Standards (NAAQS) for ozone. The NAAQS are the maximum pollutant concentrations allowed under federal law, and as the name indicates, these standards apply nationwide. Under the Clean Air Act, EPA has established NAAQS for six pollutants, including ozone, that are considered harmful to public health and the environment.

12. In 2008, EPA promulgated the current 8-hour NAAQS for ozone of 75 parts per billion (ppb). Subsequently, EPA's Clean Air Scientific Advisory Committee proposed lowering the ozone NAAQS to between 60 and 70 ppb (CASAC, 2007), though reconsideration of the standard has been delayed until 2013.

13. **Figure 3** below shows that, based on the most recent three years of monitoring data (2008-2010)³, multiple Metropolitan Statistical Areas in New York State have ozone levels that exceed the current 75 ppb standard, including much of New York City and its suburbs. Other areas are at or near the 75 ppb standard and would exceed a lower standard. Such areas include Orange County, partially located within the DRB. (NYSDEC, 2011a).

³ It should be noted that the 2008-2010 monitored ozone levels reflect an economic downturn and two years of cooler, wetter weather that was not conducive to ozone formation (Ozone Transport Commission, 2011); therefore, the 2008-2010 numbers may not be representative of future trends in ozone levels.

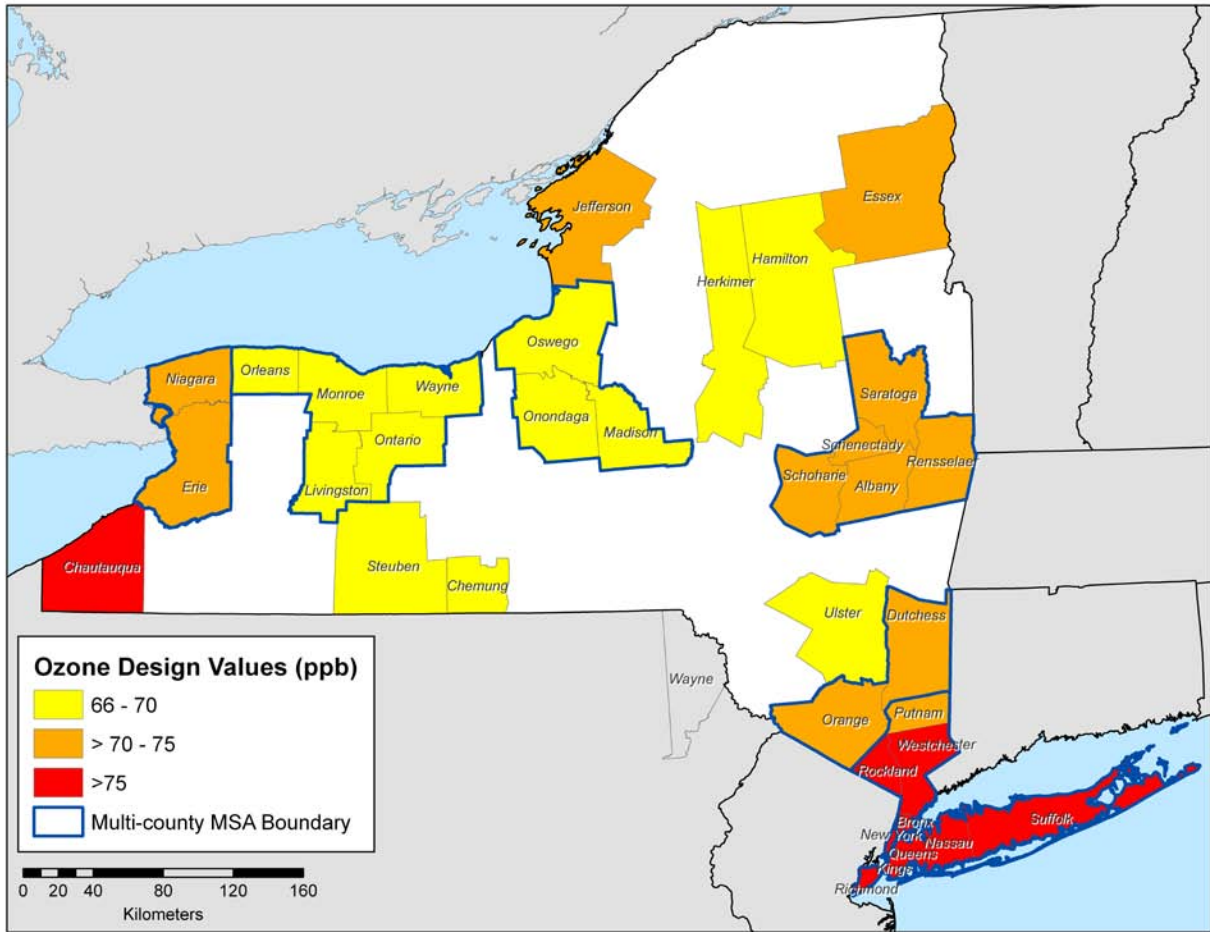


Figure 3. 2008-2010 ozone design values⁴ for New York State.

14. Ozone (O₃) is a secondary pollutant formed through the photochemical reactions of nitrogen oxides (NO_x), volatile organic carbons (VOCs), and sunlight in the atmosphere. The precursors to ozone (VOC and NO_x) are emitted into the atmosphere by both anthropogenic (man-made) and biogenic (naturally occurring) sources. In areas with high VOC-to-NO_x ratios (e.g., rural areas with significant VOC emissions from biogenic sources), ozone production is limited by the supply of NO_x emissions, and these areas are called “NO_x-limited.” Similarly,

⁴ Design values are statistical calculations based on measured data that are used to represent the ozone level in a given area. They are calculated as the 3-year average of the fourth-highest daily maximum 8-hour ozone concentration at a given monitoring site. Monitors are sited to be representative of a metropolitan area and are not necessarily located in each individual county.

“VOC-limited” areas have relatively low VOC-to-NO_x ratios, and the supply of VOCs limits the ozone production rate.

IV. Analysis

15. My evaluation of the potential for emissions from natural gas development activities in the Pennsylvania portion of the DRB to impact air quality in New York State required several steps. First, I evaluated the trajectory of air parcels originating in Wayne County, Pennsylvania and determined that air emissions from the Pennsylvania portion of the DRB would be frequently transported into New York State. Second, I evaluated several scenarios regarding the number of wells that would be developed in the Pennsylvania portion of the DRB and estimated the magnitude of emissions resulting from each of those scenarios. Lastly, I evaluated the likelihood that these emissions from the Pennsylvania portion of the DRB would result in increased ozone concentrations in New York State.

A. Evaluating Whether Pennsylvania Emissions Reach New York

16. To examine the potential for emissions from natural gas development activities in the Pennsylvania portion of the DRB to impact air quality in New York State, I first evaluated the likelihood and extent to which air parcels from natural gas extraction areas would reach New York State. I did so by performing wind trajectory analyses using the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model (Draxler and Hess, 1997).

17. HYSPLIT is a widely used, peer-reviewed tool that can calculate air parcel trajectories from one region to another and, therefore, demonstrate the likelihood of potential air pollution transport between two regions. Gridded, hourly meteorological data from the National Weather Service’s Eta Data Assimilation System (EDAS) are used as inputs to HYSPLIT, which

calculates trajectories by the time integration of the position of an air parcel as it is transported by three-dimensional wind fields. My firm, STI, has developed geographic information systems-based procedures for aggregating these trajectories and calculating spatial probability density (SPD) values that identify where air parcels have spent the most time under the conditions of interest.⁵

18. **Figures 4 and 5** show maps of SPD values produced by running HYSPLIT with 2006-2010 meteorological data,⁶ a start height of 7 meters,⁷ and using the centroid, or geographic center, of Wayne County, PA as a starting point. These results indicate that air parcels from Wayne County reach metropolitan New York during 10% to 20% of total hours each year, and on one-third of all days on average. Similarly, air parcels from Wayne County reach other regions in New York State (e.g., Orange County) during 20% to 40% of total hours each year, and on about half of all days on average. These results are consistent for HYSPLIT runs using data from complete years (Figure 4) and from the summer season months only (Figure 5).

⁵ These techniques were developed to assist the Central Regional Air Planning Association (CENRAP) in determining causes of regional haze in national parks and Class I areas (Sullivan et al., 2005). Subsequently these techniques have been used for a wide variety of analyses, including helping EPA to evaluate the potential impact of off-shore shipping emissions in Puerto Rico and the U.S. Virgin Islands (Reid et al., 2010).

⁶ HYSPLIT was run with five years of meteorological data to develop representative results that are not unduly influenced by a single year with unusual meteorological conditions.

⁷ This start height was selected as representative of an emissions release height for a typical well drilling rig.

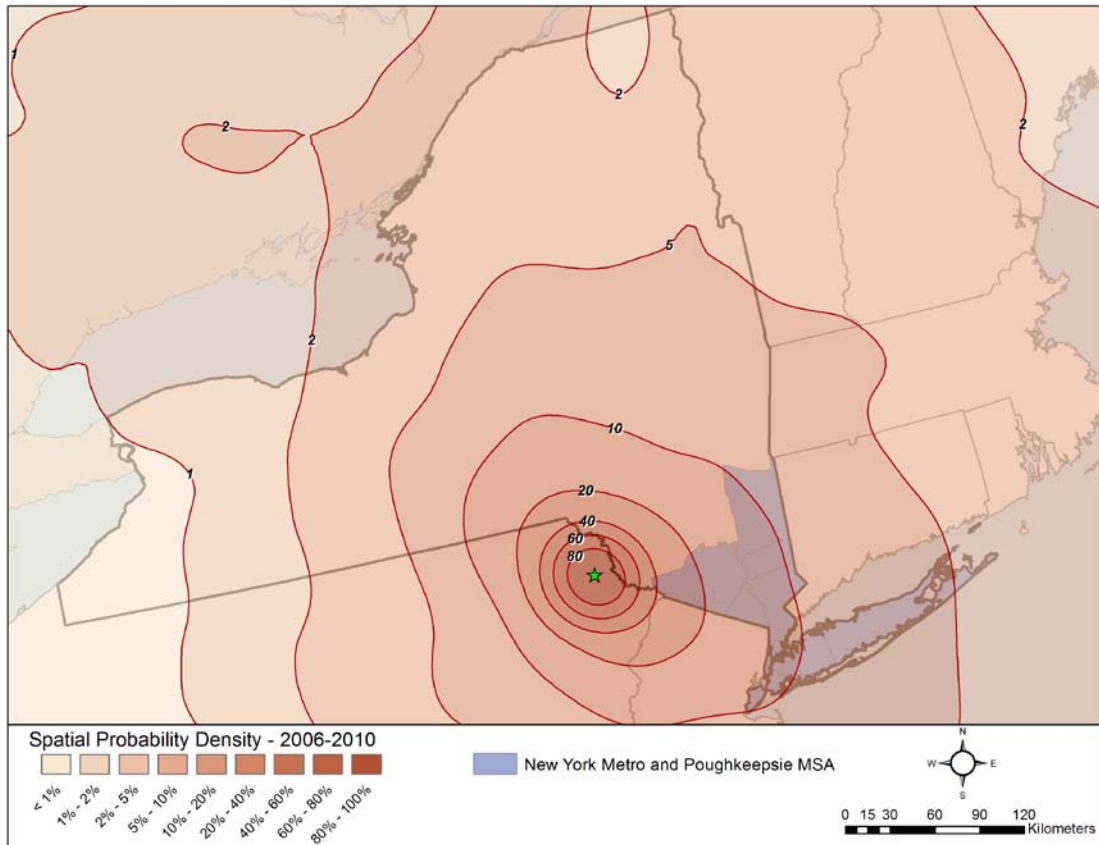


Figure 4. Spatial probability density plot for transport from Wayne County, PA for 2006-2010 (darker colors represent increased transport probability).

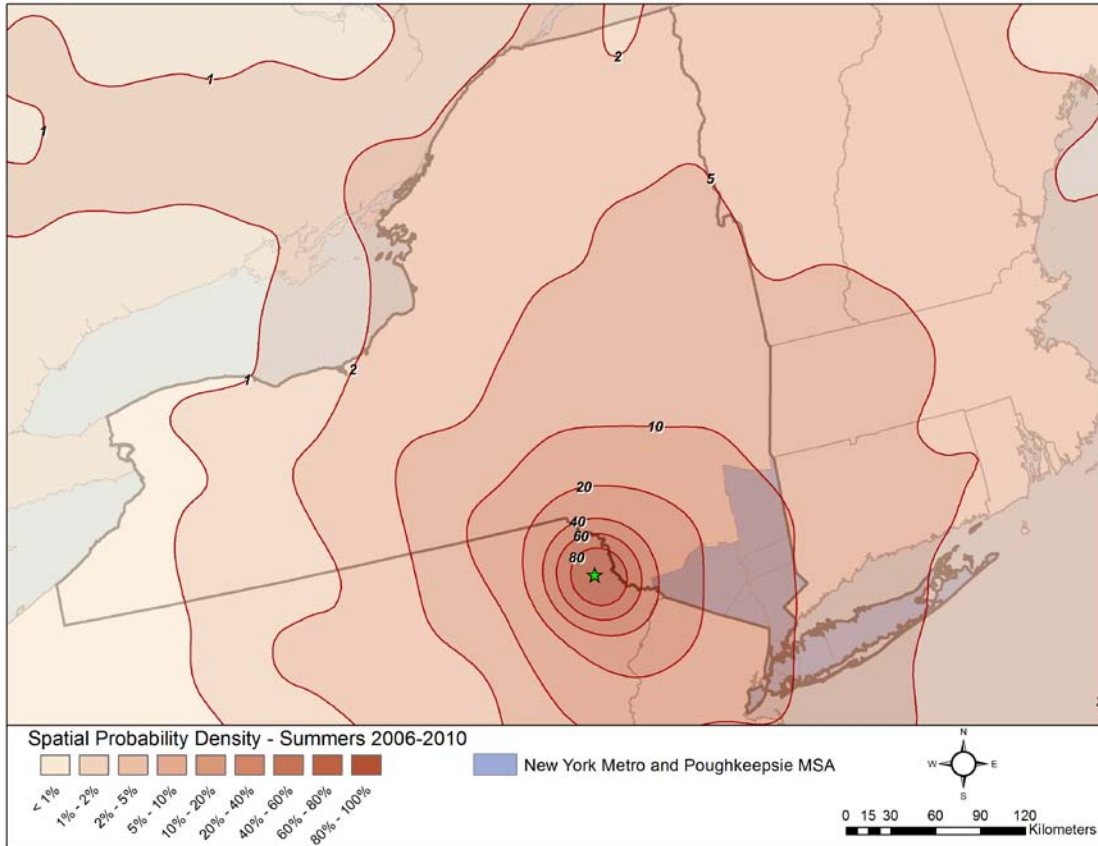


Figure 5. Spatial probability density plot for transport from Wayne County, PA for summer months, 2006-2010 (darker colors represent increased transport probability).

B. Evaluating the Emissions Impact in New York

19. Having established that emissions from natural gas development in Wayne County, PA are likely to reach areas in New York State on a significant number of days each year, I then evaluated the potential magnitude of those emissions.

1. Estimating Emissions from Pennsylvania DRB Well Development

20. To calculate the magnitude of emissions that might be released from well drilling activities in the Pennsylvania portion of the DRB, I relied on New York State Department of Environmental Conservation (NYSDEC) estimates of air emissions associated with various stages of natural gas development at individual wells, including well drilling, well development

(including hydraulic fracturing) and natural gas production. These per-well air emission estimates were then multiplied by the average and peak amount of well drilling activity (e.g., number of wells drilled per year), associated with three different well development scenarios to estimate total annual emissions for each scenario. The three average year well development scenarios are described below.

1.1 Well Development Scenarios

21. I developed annual air emissions estimates for the following three natural gas well development scenarios for the Pennsylvania portion of the DRB based on information provided to me by the NYSOAG.

22. **Scenario 1** is an estimate of 214 wells per year. This estimate was presented in industry comments on DRBC's Proposed Natural Gas Development Regulations submitted by ALL Consulting, on behalf of the Marcellus Shale Coalition and the American Petroleum Institute (ALL Consulting, 2011).

23. **Scenario 2** is an estimate of 58 wells per year. This estimate is based upon the following assumptions: (a) a DRBC estimate that 4,816 wells may be drilled in the 602 square mile "economically viable" portion of the DRB that overlies the Marcellus shale and excludes the New York City Watershed (DRBC, 2012); (b) a calculation that 29.9% of this "economically viable" DRB land area is within the Pennsylvania portion of the DRB (180 square miles out of 602 square miles, as shown in **Figure 2**); and (c) a 25-year period for natural gas development in the DRB, which is the high end of a 20- to 25-year development timeframe given by DRBC staff (Muszynski, 2011).

24. **Scenario 3** is an estimate of 828 wells per year. This estimate is based upon the following assumptions: (a) a DRBC estimate that 32,152 wells may be drilled in the entire

portion of the DRB that overlies the Marcellus shale, excluding the New York City Watershed but including areas south of the “Structure Line” shown in Figure 2 (DRBC, 2012); (b) a calculation that 64.4% of this DRB land area is within the Pennsylvania portion of the DRB (2,588 square miles out of 4,019 square miles); and (c) the 25-year period for natural gas development in the DRB cited in paragraph 23 above.

25. Based on these three average year well development scenarios, I then developed three peak year well development scenarios (i.e., worst-case estimates). I calculated the peak year well scenarios by multiplying each average year scenario by 1.5. This 1.5 multiplier was used by industry to estimate peak year natural gas development in New York State (ALL Consulting, 2010).

26. These average year and peak year well development scenarios are summarized in **Table 1**. Across the three scenarios, peak year well development estimates range from 87 wells to 1,242 wells.

Table 1. Estimates of average and peak year well development in the Pennsylvania portion of the DRB.

Scenario	Average Year Well Development (Number of wells)	Peak Year Well Development (Number of wells)
1	214	321
2	58	87
3	828	1,242
Range	58 to 828	87 to 1,242

1.2 Estimates of Air Emissions Per Well

27. To develop per-well air emission rates I reviewed estimates documented in the NYSDEC draft Supplemental Generic Environmental Impact Statement (draft SGEIS) on well permit issuance for horizontal drilling and hydraulic fracturing in the Marcellus Shale. This

document was prepared to satisfy New York State Environmental Quality Review Act (SEQRA) requirements by evaluating potential adverse impacts of natural gas development associated with hydraulic fracturing activities (NYSDEC, 2011b). Projections of air emissions set out by NYSDEC in the draft SGEIS are based on industry estimates (ALL Consulting, 2009, 2010) of per-well emission rates associated with the various stages of natural gas development activities at individual wells, including well drilling, well development (including hydraulic fracturing) and natural gas production. These per-well emission rates were combined with estimates of peak well development to calculate the annual emissions estimates shown in **Table 2**.

Table 2. NYSDEC estimates of peak annual emissions (tons/year) from natural gas development activities in the Marcellus Shale.

Activity	NO _x	VOC
Drilling	8,785	369
Completion	6,248	927
Production	9,274	5,974
Truck traffic ^a	687	70
Total	24,994	7,340

^a Truck traffic emissions were not included in the industry reports but were calculated by NYSDEC for the SGEIS.

28. The total emissions in Table 2 were calculated based on peak well estimates of 2,462 wells per year (2,216 horizontal wells and 246 vertical wells). Therefore, per-well emission rates derived from Table 2 amount to 10 tons per year (tpy) of NO_x and 3 tpy of VOC. For ozone formation in the region, the NO_x emissions are of the greatest concern, due to their magnitude and the fact that Wayne County, Pennsylvania is a rural area with significant pre-existing VOC emissions from biogenic sources (see previous discussion of ozone formation in Paragraph 14).

1.3 Calculating Peak Year NO_x Emissions for the Pennsylvania Portion of the DRB

29. Peak year NO_x emissions for the various well development scenarios were then calculated by multiplying the number of wells to be drilled in the Pennsylvania portion of the DRB by the per-well emission rates calculated in paragraph 28 above. The results range from 870 to 12,420 tons of NO_x per year, as shown in **Table 3**.

Table 3. Peak year NO_x emissions estimates from natural gas development activities in the Pennsylvania portion of the DRB.

Scenario	Peak Year Well Development (Number of Wells)	Peak Year NO _x Emissions (Tons per year)
1	321	3,210
2	87	870
3	1,242	12,420

30. These emissions levels are significant on a regional basis. For comparison purposes, data from EPA's 2008 National Emissions Inventory (NEI) show that the two largest point sources of NO_x in New York State are the AES Somerset coal-fired power plant in Niagara County and John F. Kennedy International Airport in New York City, both of which emitted about 4,900 tons of NO_x in 2008.⁸ Therefore, NO_x emissions from the maximum peak-year estimate for drilling activities in the Pennsylvania portion of the DRB would be the equivalent of adding 2.5 major airports or coal-fired power plants similar to the AES plant to an area adjacent to New York State and less than 30 miles from areas of New York that do not meet the ozone NAAQS.

31. In addition, EPA's MOVES mobile source model (EPA, 2010) indicates that the average passenger car in the U.S. emits 36 lb of NO_x per year. Therefore, NO_x emissions from

⁸ EPA's 2008 National Emissions Inventory is available online at <http://www.epa.gov/ttnchie1/net/2008inventory.html>.

the maximum peak-year estimate for drilling activities in the Pennsylvania portion of the DRB would be the equivalent of adding 690,000 cars to the roads of Wayne County, Pennsylvania. And even for the lowest emissions scenario (Scenario 2, with 870 tons of NO_x), the NO_x emissions are equivalent to those of more than 48,000 cars.

32. To further place emissions from the proposed drilling activities in context, I also evaluated the most recent NYSDEC State Implementation Plan for ozone submitted to EPA (2008). This plan documents ozone modeling conducted by NYSDEC to evaluate current and future year ozone concentrations in the New York metropolitan area. To improve air quality in the region, a variety of control measures were evaluated for inclusion in the New York SIP to reduce ozone precursor emissions of NO_x in the region, some of which were initially identified and evaluated by the Ozone Transport Commission (OTC), a multi-state organization created to develop and implement regional solutions to elevated ozone concentrations in the Northeast and Mid-Atlantic regions. In 2007, the OTC recommended that states consider control measures that would reduce ozone precursor emissions from several source categories, including consumer products, diesel engines, asphalt paving, cement kilns, and glass furnaces (MACTEC, 2007). For New York and Pennsylvania, these measures were estimated to result in 2009 NO_x reductions of 0.2 to 40.8 tons per day (tpd) and total reductions of 80.1 tpd in New York and 73.9 tpd in Pennsylvania.

33. By comparison, peak year daily estimated emissions from natural gas development activities in the Pennsylvania portion of the DRB range from 2.4 to 34.0 tpd of NO_x (calculated by dividing Table 3 annual NO_x estimates by 365 days). Therefore, the additional emissions estimated from natural gas development in the Pennsylvania portion of the DRB are comparable

to statewide reductions in New York State from control measures recommended by OTC for New York's state implementation plan (SIP) (see **Figure 6**).

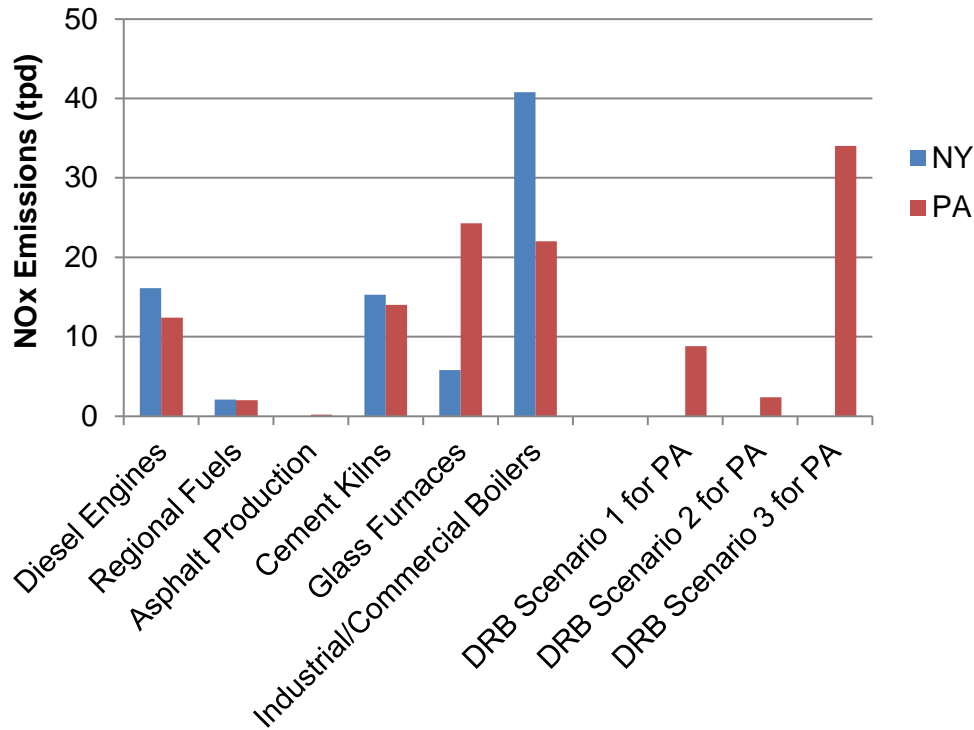


Figure 6. Comparison of NO_x emissions from DRB gas development in PA with 2009 statewide emission reductions for control measures recommended by the OTC (OTC recommendations from MACTEC, 2007).

1.4. Evaluating the Impact of Emissions from the Pennsylvania Portion of the DRB on Ozone Concentrations in New York

34. It is my opinion that, with a high degree of scientific certainty, the NO_x emissions associated with natural gas development in the Pennsylvania portion of the DRB would result in ozone formation in the region, and some portion of that ozone will be transported to New York State, resulting in increased ozone concentrations in that state. This conclusion is based on my knowledge of ozone formation mechanisms and my analysis of meteorological data (i.e., wind trajectories) for the region. The magnitude of the air quality impacts is dependent upon the annual number of wells drilled in the Pennsylvania portion of the DRB, but even at the lowest

projected drilling levels (i.e., Scenario 2 from Table 3), additional ozone formation and transport would occur.

35. This conclusion is supported by previously completed air quality studies of ozone transport in the northeastern U.S. For example, I reviewed results of air quality modeling performed by EPA in support of the Cross-State Air Pollution Rule (CSAPR), which requires states in the eastern U.S. to reduce NO_x emissions that contribute to ozone in other states.⁹

36. In developing CSAPR, EPA used the Comprehensive Air Quality Model with Extensions (CAMx) software to (1) identify locations expected to be in nonattainment or have maintenance problems in 2012 for the 8-hour ozone, annual PM_{2.5}, and/or 24-hour PM_{2.5} NAAQS; (2) quantify the contributions of state-level NO_x emissions on 8-hour ozone concentrations in downwind states; and (3) quantify the contributions of state-level NO_x and SO₂ emissions on annual and 24-hour PM_{2.5} concentrations in downwind states (EPA, 2011).

37. EPA's CSAPR modeling results for 2012¹⁰ show that total anthropogenic NO_x emissions from Pennsylvania contribute from 6.1 to 8.4 ppb of ozone to ozone concentrations observed by monitors in the metropolitan New York area. These results demonstrate that emissions from Pennsylvania have impacts on ozone concentrations in New York State.

38. In addition, analyses by the Ozone Transport Assessment Group (OTAG), a partnership between EPA, states, and industrial and environmental groups in the northeastern U.S., showed that during periods when New York experiences high ozone concentrations, the average range of ozone transport is from 30 to 150 miles. This transport associated with high

⁹ Information on the CSAPR is available online at <http://epa.gov/airtransport/>.

¹⁰ These results are available online at http://www.epa.gov/airtransport/pdfs/CSAPR_Ozone%20and%20PM2.5_Contributions.xls (Tab "CSAPR Ozone Contributions," lines 217-218, 226-231, 233).

ozone events results from the fact that such events require the sunlight of daylight hours and are associated with light winds and conditions that suppress vertical mixing in the atmosphere.

39. Given these considerations, it is reasonable to conclude that elevated ozone concentrations in the metropolitan New York area are primarily impacted by Pennsylvania emission sources that lie within 150 miles. **Figure 7** shows that Wayne County, Pennsylvania lies within a 150-mile radius of both nearby Orange County, New York, and New York City and its suburbs. Therefore, any additional NO_x emissions resulting from natural gas development in Wayne County would be occurring in a geographic area that has demonstrable impacts on ozone concentrations in New York.

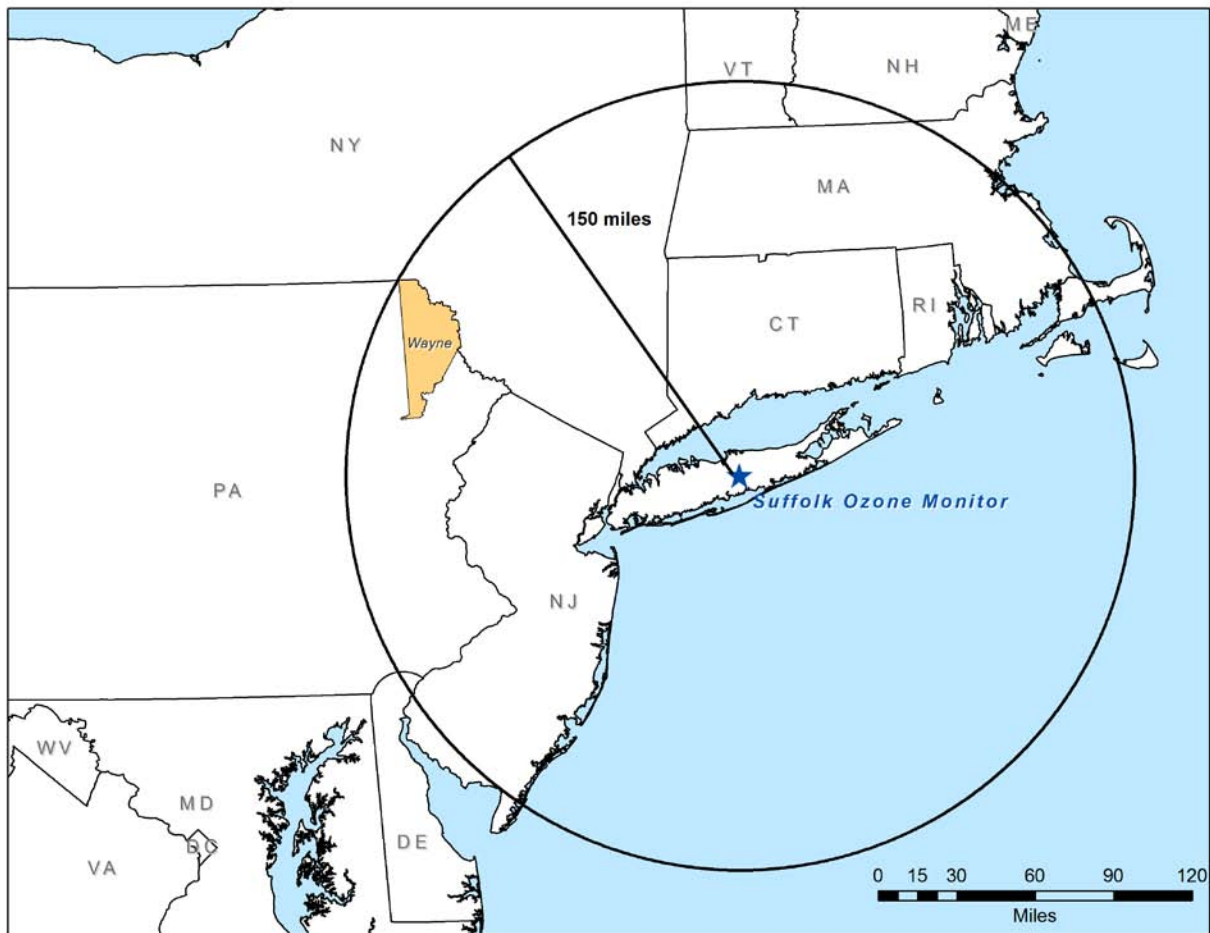


Figure 7. Map showing a 150-mile radius around a Suffolk County ozone monitoring site in the New York City metropolitan area.

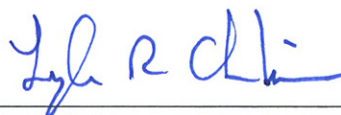
V. Conclusions

40. In summary, I conclude that emissions from proposed natural gas drilling operations in the Pennsylvania portion of the DRB are likely to be significant and increase ozone concentrations in New York State, particularly the New York metropolitan area and surrounding counties. This conclusion is based on a number of considerations, including:

- The proximity of Wayne County, Pennsylvania (where DRBC states that most of the natural gas development in the Pennsylvania portion of the DRB is expected to occur) to New York State and areas within New York that exceed or approach the NAAQS for ozone;
- The results of trajectory analyses indicating that air parcels from Wayne County reach metropolitan New York 10% to 20% of the time and impact other regions in the state (e.g., Orange County) 20% to 40% of the time;
- The substantial NO_x emissions expected to result from natural gas development in the Pennsylvania portion of the DRB, which I have estimated could be equivalent to adding 2.5 coal-fired power plants, 2.5 major airports, or over 690,000 passenger cars to an area that is adjacent to New York State and less than 30 miles from areas in New York where ozone levels exceed the NAAQS;
- The additional emissions expected to result from such natural gas development are comparable to statewide NO_x reductions from controls measures recommended for state implementation plan (SIP) development in the region; and
- The potential increase in ozone pollution in New York resulting from emissions from such natural gas development; this increase in ozone is based on a well-established scientific understanding of the role of NO_x emissions on ozone formation and is further supported by results from EPA modeling and transport analyses for the region.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 8, 2012, at Petaluma, California.



Lyle R. Chinkin

REFERENCES CITED

- ALL Consulting (2009) NY DEC SGEIS information requests and industry responses. Prepared for the Independent Oil & Gas Association of New York, October 14, 2009.
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- CASAC (2007) Clean Air Scientific Advisory Committee's Review of the Agency's Final Ozone Staff Paper, EPA-CASAC-07-002, March 26.
- Draxler R.R. and Hess G.D. (1997) Description of the HYSPLIT 4 modeling system. Technical memorandum by the National Oceanic and Atmospheric Administration, Silver Spring, MD, ERL ARL-224, December 24.
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- NYSDEC (2011b) Supplemental generic environmental impact statement on the oil, gas, and solution mining regulatory program, September 7, 2011.
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- MARC (2005) A clean air action plan for the Kansas City region. Prepared by the Mid-America Regional Council with support from Sonoma Technology, Inc., May, 2005.
- Muszynski, W. (2011) Statement by William Muszynski, DRBC Special Projects Coordinator, from the transcript of a DRBC public hearing at Honesdale, Pennsylvania, February 22.

Reid S. B., Wheeler N.J.M., Pollard E.K., Du Y., and Craig K.J. (2009). Impact of offshore ship emissions on Puerto Rico and the U.S. Virgin Islands. Prepared for the U.S. Environmental Protection Agency, Office of Transportation and Air Quality, by Sonoma Technology, Inc., Petaluma, CA, STI-901201-3729-FR, October.

Sullivan D.C., Hafner H.R., Brown S.G., MacDonald C.P., Raffuse S.M., Penfold B.M., and Roberts P.T. (2005) Analyses of the causes of haze for the Central States (Phase II) summary of findings. Executive summary prepared for the Central States Regional Air Planning Association by Sonoma Technology, Inc., Petaluma, CA, STI-904780.08-2754-ES, August.

APPENDIX A

Lyle R. Chinkin Resume

LYLE R. CHINKIN

President



Educational Background

B.S. Atmospheric Science, summa cum laude, University of California at Davis

M.S. Atmospheric Science, University of California at Davis

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Professional Experience

Mr. Chinkin joined Sonoma Technology, Inc. (STI) in 1992 and is STI's President. He has over 25 years of professional consulting experience in air quality and over 5 years of experience at the California Air Resources Board.

Mr. Chinkin is a nationally recognized expert in emissions inventory preparation and assessment and air quality analysis. He has worked on projects for federal, state, and local government agencies; universities; public and private research consortiums; and major corporations. Mr. Chinkin's areas of expertise include (1) developing and improving regional emission inventories; (2) providing independent assessments of emissions inventories using bottom-up and top-down evaluation techniques; (3) conducting field studies to obtain real-world data and improve activity estimates and emission factors; (4) conducting scoping studies to develop conceptual models of community-scale air quality; (5) assisting with State Implementation Plan (SIP) development; and (6) providing expert testimony and presentations to public boards. He has been appointed to the National Research Council of the National Academy of Sciences Committee on the Effects of Changes in New Source Review Programs for Stationary Sources of Air Pollutants and to a panel to review "Improving Emission Inventories for Effective Air Quality Management Across North America, a NARSTO Assessment".

Mr. Chinkin served as (1) an EPA-invited peer-reviewer of the EPA particulate matter (PM) National Ambient Air Quality Standards Criteria Document and the draft EPA Report on the Environment (ROE) 2006; (2) an expert panel member for the review of the Valdez Air Health Study; and (3) an expert witness for U.S. Department of Justice environmental enforcement actions. Mr. Chinkin was the project manager and co-author of the EPA national guidance document on the preparation of emissions inputs for photochemical air quality simulation models. In addition, his projects have included improving estimates of PM and ammonia emissions, evaluating internal combustion engine activity profiles and emissions, determining emissions from propane use and distribution systems, determining air toxic emissions from wood-preservation activities, and improving biogenic emission estimation tools. He frequently directs studies that combine public- and private-sector participation (e.g., an assessment and ground-truth study of industrial emissions in the Houston Ship Channel under the joint direction of the Texas Natural Resource Conservation Commission [now Texas Commission on Environmental Quality] and local industry). Mr. Chinkin has also assisted numerous industrial clients with projects such as development of emission-estimation tools for

the American Petroleum Institute and top-down evaluations of emissions inventories for the Coordinating Research Council.

Mr. Chinkin is frequently called upon by clients to explain complicated technical information to other air quality professionals, advisory boards, and members of the public. He presented research findings to public advisory committees in Ohio, Kansas, and Missouri and to senior federal and state government officials in Minnesota and at numerous scientific conferences. EPA selected Mr. Chinkin to help prepare a summary of the proceedings of the 2003 NARSTO air quality research conference, and to help an audience of air quality officials from four western U.S. states understand technical air toxics assessment techniques.

Chronology of Education and Work Experience

- 1978-1979: Assistant Weather Producer, KCRA-TV Channel 3, Sacramento, CA
 - Decoded weather data and prepared in-studio weather displays for broadcast
- 1979-1981: Student Assistant, Meteorology Section, California Air Resources Board
 - Evaluated meteorological data
 - Analyzed isobaric pressure charts and wind flow patterns
- 1980: Weather Reporter, KDVS Radio Station, Davis, CA
 - Prepared and presented weather broadcasts for California
- 1980: Instrument Technician, Air Quality Group, University of California, Davis
 - Maintained and calibrated particulate samplers in remote areas of the western U.S.
- 1981: B.S. Atmospheric Science, *summa cum laude*, University of California at Davis
- 1981-1982: Air Pollution Specialist, Analysis and Projects Section, California Air Resources Board
 - Prepared comprehensive technical reports requiring computer programming and statistical analyses
 - Produced the “California Air Quality Data Report”
- 1982-1984: Assistant Meteorologist, Meteorology Section, California Air Resources Board
 - Conducted climatological studies relating to air pollution in California
 - Applied meteorological principles to engineering evaluations and statistical analyses
 - Developed guidelines for agricultural burning
- 1984: M.S. Atmospheric Science, University of California at Davis
- 1984-1989: Senior Atmospheric Scientist, Systems Applications, Inc., San Rafael, CA
 - Conducted emissions inventory studies relating to air pollution in various regions of the U.S.
 - Developed software to process emissions inventory data into model-ready inputs for comprehensive 3-dimensional photochemical models

- 1989-1992: Manager of Emissions Modeling Group, Systems Applications, Inc., San Rafael, CA
 - Managed emissions inventory studies relating to air pollution throughout the U.S. and Asia
 - Conducted air quality studies for government and private industry
- 1992-1998: Manager of Emissions Modeling, Sonoma Technology, Inc., Petaluma, CA
 - Managed emissions inventory studies relating to air pollution worldwide
 - Managed air quality studies for government and private industry
 - Managed a multi-million dollar level-of-effort contract with the U.S. Environmental Protection Agency for air quality modeling assistance
- 1998: Vice President, Sonoma Technology, Inc., Petaluma, CA
 - Managed emissions modeling group and meteorological programs group
- 1999: Vice President and General Manager, Sonoma Technology, Inc., Petaluma, CA
 - Managed emissions modeling group and meteorological programs group
 - Responsible for financial oversight of company operations including financial performance (e.g., cash flow, profit and loss, backlog, and overhead rates)
- 2000: Appointed to the Board of Directors, Sonoma Technology, Inc., Petaluma, CA
- 2002: Senior Vice-President, Sonoma Technology, Inc., Petaluma, CA
- 2004: Appointed to the National Research Council of the National Academy of Sciences Committee on the Effects of Changes in New Source Review Programs for Stationary Sources of Air Pollutants
- 2005: Selected as peer-reviewer for NARSTO report “Improving Emission Inventories for Effective Air Quality Management Across North America”
- 2006-Present: President, Sonoma Technology, Inc., Petaluma, CA

Professional Memberships

Air & Waste Management Association

American Meteorological Society (1979-1984)

California Registered Environmental Assessor (REA-00715) (1984–1989)

Professional Development

1982: Statistics for Decision Makers

1982: Air Pollution Enforcement Symposium, California Air Resources Board

2001: Understanding Finance and Accounting

Peer Reviewer

U.S. Environmental Protection Agency

Journal of the Air and Waste Management Association

International Journal of Environmental Studies

North American Research Strategy for Tropospheric Ozone (NARSTO)

APPENDIX B

List of Publications

This appendix contains the list of publications by Lyle R. Chinkin

LYLE R. CHINKIN

Book Chapter

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APPENDIX C

Documents Considered

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IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK

----- X
STATE OF NEW YORK, :
 :
 : Plaintiff, :
 : No. 11 Civ. 02599 (NGG) (CLP)
 : v. :
 : ECF Case
 : UNITED STATES ARMY CORPS OF ENGINEERS, :
 : *et al.*, :
 : Defendants. :
----- X

DECLARATION OF DR. JOEL SCHWARTZ

Pursuant to 28 U.S.C. § 1746, I, DR. JOEL SCHWARTZ, declare as follows:

1. I am a Professor in the Departments of Environmental Health and Epidemiology at the Harvard School of Public Health and in the Department of Medicine at Harvard Medical School, am Director of the Harvard Center for Risk Analysis, am a member of the University's faculty in the Environmental Biostatistics program and the Cardiovascular Epidemiology program, and serve on the Steering Committee of the Harvard University Center for the Environment.

2. I submit this declaration on the relationship between ozone levels and human health in opposition to defendants' motions to dismiss and for summary judgment, and in support of the cross motion for summary judgment of plaintiff State of New York.

3. As discussed in more detail below, ozone (O₃) constitutes a health risk to New Yorkers. As ozone is a long lived secondary pollutant, increased emissions of ozone precursors in states that are generally upwind of New York, such as Pennsylvania, would result in increased ozone concentrations in New York's air, and would impair the health of New Yorkers.

I. Personal Background and Qualifications

4. In addition to my work at Harvard University discussed in paragraph 1 above, I am a former member of the board of Councilors of the International Society for Environmental Epidemiology and of the Editorial Board of the American Journal of Respiratory and Critical Care Medicine. I have served on two National Academy of Sciences panels concerning air pollution, and was a recipient of a John D. and Catherine T. MacArthur Fellowship.

5. I am the most frequently cited author in the scientific literature on the health effects of air pollution. I have over 470 peer-reviewed papers published or in press, which have been cited over 24,000 times in other peer-reviewed publications.

6. I have made particulate air pollution and ground-level ozone (smog) a major focus of my research, which ranges from studies focused on critical events (e.g., deaths, heart attacks) to studies addressing mechanisms and exposure modeling.

7. I have testified before Congress twice about particulate air pollution and testified as an expert in the health effects of air pollution in federal court.

8. I have a BA in mathematics and physics from Brandeis University, a Ph.D. in physics from Brandeis University, and an MD from the University of Basel. A copy of my curriculum vitae is attached as Exhibit A. A list of references that I relied on in this declaration is attached as Exhibit B.

II. Summary of Conclusions

9. Ozone pollution has serious health effects, ranging from respiratory problems to mortality. Moreover, if there is any threshold concentration for these effects, it is so low (e.g. below 20 parts per billion, or ppb) as to be meaningless, since such low levels are almost never seen in the Eastern United States.

10. Consequently, any exposure to ozone at least above 20ppb causes adverse effects on human health in the locations where that exposure occurs.

11. This is not just my opinion: it is the scientific consensus, as reflected in the U.S. EPA's external Clean Air Scientific Advisory Committee's recommendations and EPA's 2011 Integrated Science Assessment for ozone (ISA), which is available on the internet at <http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=226363#Download>.

12. In the ISA, EPA states:

The last review [of the literature] concluded that there was clear, consistent evidence of a causal relationship between short-term exposure to O₃ and respiratory health effects. This causal association was substantiated in this ISA by the coherence of effects observed across controlled human exposure, epidemiologic, and toxicological studies indicating associations of short-term O₃ exposures with a range of respiratory health endpoints from respiratory tract inflammation to respiratory emergency department (ED) visits and hospital admissions (HA). Across disciplines, short-term O₃ exposures induced or were associated with statistically significant declines in lung function. An equally strong body of evidence from controlled human exposure and toxicological studies demonstrated O₃-induced inflammatory responses, increased epithelial permeability, and airway hyper-responsiveness. Toxicological studies provided additional evidence for O₃-induced impairment of host defenses. Combined, these findings from experimental studies provided support for epidemiologic evidence, in which short-term O₃ exposure was consistently associated with increases in respiratory symptoms and asthma medication use in asthmatic children, respiratory-related hospital admissions, and asthma-related ED visits. Although O₃ was consistently associated with nonaccidental and cardiopulmonary mortality, the contribution of respiratory causes to these findings was uncertain. The combined evidence across disciplines **supports a causal relationship between short-term O₃ exposure and respiratory effects.**

(ISA, p. 81 (Executive Summary § 1.61) (emphasis in original)).

13. Hence, any exposure to ozone as a result of increased emissions of ozone precursors in upwind states such as Pennsylvania would negatively impact the health of New York State citizens.

III. Background on Ozone

14. Ozone is a ubiquitous pollutant, but is not emitted directly. Rather, it is formed in the atmosphere by the chemical reaction of other substances. For example, hydrocarbons in the air known as volatile organic compounds, from man made or natural sources, can react with nitrogen oxides (NO_x), which are combustion byproducts, in the presence of light and heat, to form ozone.

15. Because it is the product of a chemical reaction, ozone concentrations are not limited to, or even highest, in the locale where the precursors were emitted. Ozone concentrations can increase downwind as ozone precursors continue to react as they are carried by the wind.

16. Ozone itself is a powerful oxidant, capable of harming living organisms.

IV. Ozone and Human Health

A. Ozone and Asthma

17. A key finding of the EPA ISA regarding the health effects of ozone is that the research literature:

provide[s] biological plausibility for associations in epidemiologic studies of short-term ambient O₃ exposure with respiratory symptoms and respiratory-related hospitalizations and emergency department (ED) visits.

(ISA, p. 6-1).

18. The ISA then states:

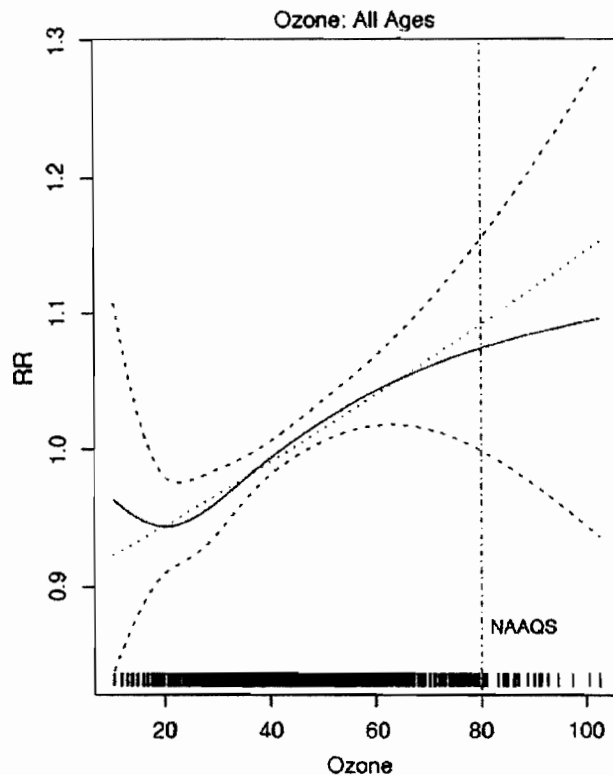
In addition to [harm to] lung function, ambient O₃ exposure has been associated with increases in respiratory symptoms (e.g., cough, wheeze, shortness of breath), especially in large U.S. panel studies of children with asthma (Gent et al., 2003; Mortimer et al., 2000).

(ISA, p. 6-4).

19. One of the papers cited by the ISA, by Silverman and Ito, examines asthma hospital admissions in New York City (Silverman and Ito 2010). The solid line in the figure below,

reproduced from the ISA (p. 6-123), shows the positive association between the Relative Risk (RR) of hospital admission and ozone concentration (ppb) from that study. The positive relationship continues down to very low levels (20 ppb), making it clear that additional exposure to ozone results in additional hospital admissions.

Figure 1: Relative Risk of Hospital Admission for Asthma Versus O₃ in NY (Silverman and Ito, 2010)



20. There is also ample evidence that short-term ozone exposure is associated with reductions in lung functions, increased respiratory symptoms, and lung inflammation (Hazucha 1987). Some studies have showed that this effect is higher in asthmatic individuals and in individuals with already impaired respiratory function (Hoppe et al. 2003; Arjomandi et al. 2005; Lagorio et al. 2006).

21. From my work, I know that, through its Medicaid program, New York State directly pays for some of the emergency department visits and respiratory related hospitalizations of New York residents.

22. Asthma rates, emergency visits, and admissions are higher in the Medicaid population.

23. Accordingly, if New Yorkers' ozone exposure increases due to emissions from upwind states, I would expect an increased number of emergency department visits and hospitalizations for asthma and other respiratory problems in New York, which in turn would increase New York's Medicaid expenses.

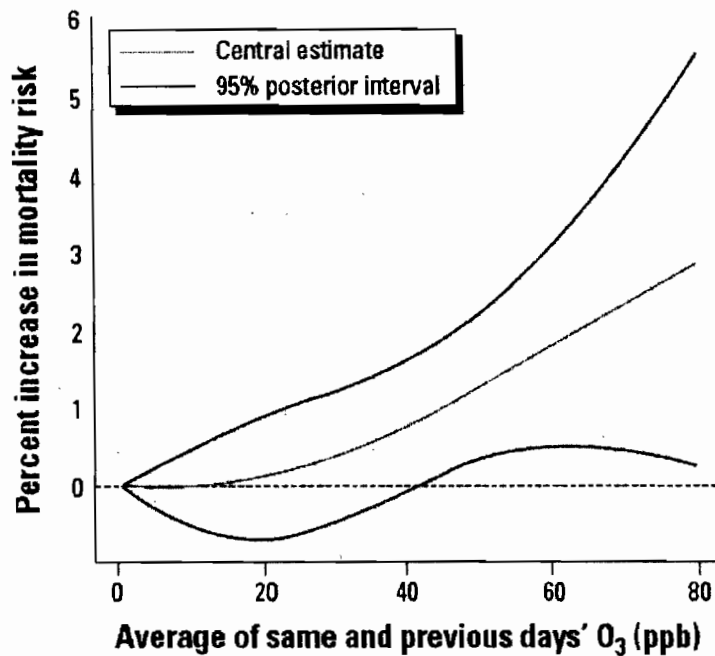
B. Ozone and Mortality

24. While studies have reported adverse health impacts from ozone for decades, reports that ozone exposure might hasten deaths have been more recent. While some individual reports were available earlier (Verhoeff et al. 1996), the first large scale report came from Europe, where seven cities were studied using identical methods and the results combined. That report concluded that ozone was associated with increased risk of death (Touloumi et al. 1997).

25. Since then a number of studies have reported similar results in both the U.S. and Europe, including three large meta-analyses commissioned by the US EPA (Bell et al. 2005; Levy et al. 2005; Ito et al. 2005).

26. Moreover, a large multicity study has found no evidence of a threshold for mortality risk due to ozone down to very low levels (Bell et al. 2006). The figure below is reproduced from that study: the central line shows a constantly increasing mortality risk as the ozone level increases.

Figure 2. Percent Increase in Mortality Risk Vs Ozone in US Cities (Bell, 2006).



Source: Bell et al. (2006).

27. Long term exposure to ozone and mortality is a serious issue since it is clear such associations could not be detected without significant reductions in life expectancy. Until recently, only one cohort study has examined this question, and that study reported an association between long term average ozone exposure and long term average mortality rates from respiratory disease (Jerrett et al. 2009). More recently, we published a paper that examined Medicare beneficiaries in multiple cities. In an important distinction from the Jerrett study, we only looked within each city, eliminating the effect of factors that vary between cities. What we showed was that year to year variations of summer ozone concentrations around the trend line for each city were associated with year to year variations in mortality rates around the trend lines in that city (Zanobetti and Schwartz 2011).

28. Accordingly, I would expect increased mortality among New Yorkers should their ozone exposure increase due to emissions from upwind states.

C. Evaluating Possible Confounding Exposures

29. The major concern of observational epidemiology studies is whether some other exposure that is correlated with the exposure of interest – ozone, in this case – may explain the observed association. This correlation of other exposures with the exposure of interest is known as confounding, and the other exposures are known as confounders.

30. To confound the observed relationship between ozone and daily deaths, for example, such confounders must co-vary with – that is, move in the same direction as – ozone over the same timescale. There are two primary candidates for such a confounder—temperature and other secondary pollutants.

31. As noted above, ozone is a secondary pollutant in that it is not directly emitted by polluting sources. It is produced by chemical reactions in the atmosphere between nitrogen oxides and hydrocarbons, and those reactions are driven by sunlight and temperature. Hence ozone co-varies with temperature, so temperature is a possible cofounder.

32. All studies of the effect of ozone on daily deaths have therefore controlled for temperature. The association of temperature with death is highly nonlinear, with heat wave conditions associated with much larger increases in deaths than temperatures just a few degrees cooler. A question thus presents itself: how can we be sure that those studies correctly captured the relation between ozone and mortality, and that the association is not in fact capturing some of the effect of temperature?

33. I addressed this issue in an analysis of over one million deaths in 14 cities (Schwartz 2005). Rather than examine the correlation between daily ozone and daily deaths, I converted the

analysis into a case-control study and chose controls with the same temperature exposure as the cases.¹ Using this alternative approach, I found the same association with ozone that I found analyzing the data using the more traditional time series analysis. Thus, this research indicates that temperature does not explain the observed ozone-mortality association.

34. The same type of chemical process in the atmosphere (reactions driven by light and heat) that produces ozone also produces other secondary pollutants (secondary because they are not what were primarily emitted). Among these secondary pollutants is fine particulate matter, which includes (a) sulfate particles, produced from the reaction of sulfur oxides with ammonia, and (b) organic particles, which like ozone are produced from reactions of hydrocarbons. Historically, ozone studies rarely control for these other secondary pollutants.

35. To address this issue, a colleague and I analyzed data from the U.S. EPA's chemical speciation monitoring network (Franklin and Schwartz 2008). Using data from 18 cities, we showed that controlling for certain secondary pollutants, namely, nitrate particles and organic carbon particles, did not change the estimated effect of ozone on mortality.

36. In contrast, controlling for sulfate particles reduced the estimated ozone health effect by about 25%, although statistical analysis included the possibility of no reduction.

37. Hence about one-quarter of the mortality effect attributed by past studies to ozone may have been due to sulfate particles, but the rest was not, and none of the effect attributed to ozone was due to organic and nitrate particles.

¹ More specifically, using a variant called a case-crossover analysis, I matched each decedent with themselves, on a control day in the same month of the same year that they died, which also had the same temperature (rounded to the same degree). This matching controlled for season and time trend, by choosing a control day in the same month and year as the date of death, and since the temperature was the same on the control day as the case day, it could not explain which day the death occurred on. I then compared the ozone levels on the two days to see if they predicted which day was the date of death.

38. These results regarding the lack of effect, or minimal effect, of possible cofounders further support the scientific consensus that ozone causes negative health effects.

D. Biological Mechanisms

39. A review of toxicological studies found decreases in heart rate, metabolism, blood pressure, and cardiac output when laboratory rats are exposed to typical concentrations of ozone. The authors conclude that while there is limited experimental evidence that addresses the underlying mechanisms of these health responses, there is some indication that they may be related to the stimulation of pulmonary irritant receptors (Watkinson et al. 2001).

40. Others studies have showed that the respiratory inflammation from ozone exposure may inhibit recovery from infection, or produce systemic responses such as systemic oxidative stress or pathologies of the electrical control of the heart (Romieu et al. 2008; Rich et al. 2006).

41. A recent panel study found that ozone was associated with increased levels of various markers of systemic inflammation, cardiac thrombosis, oxidative stress and impaired autonomic function, including decreased heart rate variability² (Chuang et al. 2007). Two previous papers had also reported decreases in heart rate variability (Gold et al. 2000) (Park et al. 2005).

42. These findings support an association between ozone exposure and cardiovascular mortality.

V. Conclusion

43. Based on research I have performed, my review of the general literature on the health effects of ozone, and my other experience, I conclude that any increase in ozone levels in New York due to increases in emissions of a principal ozone precursor, NO_x, in upwind states would

² Decreased heart rate variability is associated with death from arrhythmia.

cause: increases in respiratory illness, including asthma attacks; increases in respiratory related emergency department visits and hospitalizations; and increases in premature mortality.

44. In addition, I conclude that because New York State government pays Medicaid costs for some respiratory-related emergency department visits and hospitalizations, an increase in those visits and hospitalizations in New York resulting from such increased ozone levels would increase New York State's Medicaid expenditures.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 9, 2012



Joel Schwartz

EXHIBIT A

EXHIBIT A

CURRICULUM VITAE

February 2, 2012

NAME: JOEL SCHWARTZ

ADDRESS: 207 Lincoln Street, Newton Highlands, MA

PLACE OF BIRTH: New York, New York

EDUCATION:

1969	B.A.	Brandeis University
1980	Ph.D.	Brandeis University (Theoretical Physics)
2010	M.D.	University of Basel

ACADEMIC APPOINTMENTS:

2005 to present	Professor of Environmental Epidemiology, Harvard School of Public Health Director, Harvard Center for Risk Analysis
1994 -2004	Associate Professor of Environmental Epidemiology, HSPH
1994 -	Associate Professor of Medicine, Harvard Medical School
1991-1993	Lecturer, Department of Environmental Health, Harvard School of Public Health

HOSPITAL APPOINTMENTS:

1994 -	Associate Epidemiologist, Brigham and Women's Hospital
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OTHER PROFESSIONAL POSITIONS AND MAJOR VISITING APPOINTMENTS:

1977-1979	Legislative Assistant for Energy and Environment, Congressman Timothy Wirth
1979-1987	Staff Scientist, U.S. Environmental Protection Agency
1987-1988	Visiting Scientist, Department of Biostatistics, Harvard School of Public Health
1989, 1994	Visiting Scientist, Department of Social and Preventive Medicine, University of Basel, Switzerland
1990	Visiting Scientist, Department of Occupational Safety and Environmental Health University of Wuppertal, Germany
1989-1993	Senior Scientist, U.S. Environmental Protection Agency

HONORS AND DISTINCTIONS:

2008	John Goldsmith Career Achievement Award, International Society for Environmental Epidemiology
2001	Nichols Teaching Award, Harvard School of Public Health

2001	International Union of Environmental Protection Agencies World Congress Award
1999	Twentieth Century Distinguished Service Award, Lukacs Symposium for Statistical Ecology and Environmental Statistics
1991	John D and Catherine T MacArthur Fellowship
1984,1986	U.S. Environmental Protection Agency Silver Medal
1988-89-90-92	U.S. Environmental Protection Agency Scientific Achievement Award
1991	Alumni Achievement Award, Brandeis University

MAJOR COMMITTEE ASSIGNMENTS:

National

1985	Preventing Lead Poisoning in Young Children document, Consultant, Centers for Disease Control
1988	Advisory Committee, Boston Soil Lead Study
1989-1992	EPA Environmental Health Review Panel, Environmental Protection Agency
1989-1993	National Academy of Science, Committee on Assessing Lead Exposure in Critical Populations
1990-1993	National Academy of Science, Committee on Environmental Epidemiology
1992	Advisory Committee, Resources for the Future Center for Risk Management, Public Health/ Environmental Health Risk Studies
1992	Environmental Epidemiology Advisory Committee, Pew Memorial Trusts
1992	Ethics Committee, International Society for Environmental Epidemiology
1992	Reviewing Committee, Office of Technology Assessment for Identifying and Controlling Pulmonary Toxicants
1992-present	Technical Advisory Committee, Alliance to End Childhood Lead Poisoning
1992	Technical Advisory Committee, New York State Environmental Externalities Cost Study
1993	Subcommittee on Lead, National Advisory Committee on Environmental Policies and Technology
1993-present	Research Advisory Committee, National Center for Lead Safe Housing
1994-2002	Center for Disease Control, Advisory Committee on Childhood Lead Poisoning Prevention
1994-2005	Mickey Leland National Urban Air Toxic Research Center, Scientific Advisory Panel
1995-7	Environmental Statistics Subcommittee, National Advisory Committee on Environmental Policy and Technology
1998	Franklin Institute Science Medal Prize Committee
2003-2005	HSPH Disciplinary Committee
2004	Steering Committee, Harvard University Committee on the Environment
2005	EPA Science Advisory Board, Ad Hoc All Ages Lead Committee
2005-2008	Councilor, International Society for Environmental Epidemiology
2005-present	Editorial Board, American Journal of Respiratory and Critical Care Medicine
2005-2008	EPA Lead Clean Air Science Advisory Committee

International

1993-2004	European Economic Community Studies on Air Pollution, Daily Mortality, and Hospital Emergency Visits, Advisor
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1993	Advisory Committee, European Economic Community Panel Studies on Air Pollution, Pulmonary Function, and Respiratory Function
2000-2004	Chair, Statistics Advisory Committee, APHEIS Project

PROFESSIONAL SOCIETIES:

1987	American Statistical Association
1988	American Thoracic Society
1990	Society for Epidemiologic Research
1991	International Society for Environmental Epidemiology

Editorial Board

2003-4	Epidemiology Editor, International Journal of Biometeorology
2005-2010	Editorial Board, American Journal of Respiratory and Critical Care Medicine

MAJOR RESEARCH INTERESTS:

1. Respiratory Epidemiology
2. Air, Water and Lead Epidemiology
3. Epidemiologic Methods
4. Cost-Benefit Analysis

TEACHING EXPERIENCE:

1992-2008	Environmental Epidemiology Course, University of Basel @ 30-40 Graduate Students 120 Preparation Time each year, 35 class hours
1994, 97,99, 2009, 10	Advanced Topics in Environmental Epidemiology, University of Basel, @ 20 Graduate Students, 35 class hours
1995	Short Course on Advanced Regression Analysis in Environmental Epidemiology, San Miniato, Italy @ 23 Graduate Students, 35 class hours
1996–present	Professor, ID 271 HSPH, joint course on Advanced Regression Analysis for Departments of Epidemiology, Environmental Health, and Biostatistics, 21 Graduate Students, 35 class hours 2010-present Professor, EPI 204, Methods for analyzing case control, cohort, and other studies, 100 graduate students, 35 class hours
2007-present	Professor, EH520 Seminar on preparing research proposals
2007-present	Environmental Epidemiology, Cyprus International Institute

- 1998 European Course on methods for Poisson Time Series, Santorini Greece, @40 Graduate Students, 35 hours
- 1998 Short Course on Advanced Regression in Environmental Epidemiology, Annual meeting of International Society for Environmental Epidemiology, 45 Graduate Students, 7 hours
- 1999 European Course on methods of Meta-analysis. Santorini Greece, 40 students, 24 course hours
- 2006 Environmental Epidemiology, National Institute of Public Health, Mexico 40 students 30 hours

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3. Marcus A, **Schwartz J**. Dose-response curves for erythrocyte protoporphyrin vs blood lead: Effect of iron status. *Environ Res* 1987;44:221-227.
4. **Schwartz J**, Otto D. Blood lead levels, hearing thresholds, and neurological development in NHANES II children. *Arch Environ Health* 1987;42:153-162.
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16. **Schwartz J.** Multinational trends in cancer mortality rates: Methodological issues and results. *Ann New York Acad Sci* 1990;609:136-145.
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Sung Kyung Park	HSPH, Environmental Health “Genetic polymorphisms, heart rate variability, and environmental exposures to metals and air pollution”
Cathryn Tonne	HSPH, Environmental Health and Epidemiology, “Pollution and social position as predictors of Heart Attacks and survival in a population based study”
John McCracken	HSPH, Environmental Health and Epidemiology, “Cardiovascular effects following interventions with clean cooking stoves in rural Guatemala”
Elissa Wilker	HSPH, Environmental Health “Gene-Environment Interactions in the effects of air pollution and lead”
Sara Cabelli	HSPH, Epidemiology
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Antonella Zanobetti	University of Florence, Applied Statistics “A Nonparametric Distributed Lag Model to Evaluate Harvesting in the association between Air Pollution and Daily Deaths”

Yawen Cheng	HSPH Epidemiology “Lead, Hypertension, and Cardiovascular Disease”
Elizabeth Platz	HSPH Epidemiology “Thorotrast Exposure and Cancer in radiology patients”
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Paul Stark	HSPH, Environmental Health “Asthma and aeroallergen exposure”
Sharon Tsaih	HSPH, Epidemiology “Biomarkers of Lead and Bone Turnover and Their Relationship to Kidney Function”
Hung Yi-Chuang	HSPH Environmental Health “Structural Equation Models for Lead Exposure of the Fetus, Lead and Vibration Threshold in Battery Plant Workers”
Hae Kwang Cheong	HSPH Environmental Health “Longitudinal model of the cognitive effects of lead”
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Hsing Jasmin Chao	HSPH, Environmental Health “Longitudinal Variations in Office Building Fungi and their Associations with Work–Related Symptoms”
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Paolo Saldiva	(from University of Sao Paulo) “Air pollution and mortality in elderly people: A time series study in Sao Paulo, Brazil”
Erica von Mutius	(Ludwig Maximillian University, Munich) “Dietary factors and Asthma”
Marie O’Neill	“Social factors in the dependence of mortality on air pollution and weather”
Tom Bateson	“Selection Bias and Confounding in Case- Crossover Analyses of Environmental Time Series Data”
Amanda Wheeler	“Air pollution and heart rate variability”
Dawn Demeo	“Air pollution and oxygen saturation in the elderly”
Francine Laden	“Association of fine particulate matter from different sources with daily mortality in six US cities.”

Nicole Janssen	“Air conditioning and combustion related particles as modifiers of the effect of PM10 on hospital admissions for heart and lung diseases”
Eun-Hee Ha	“Is air pollution a risk factor for low birth weight in Seoul?”
Jon-Tae Lee	“Bidirectional case-crossover studies of air pollution: bias from skewed and incomplete waves.”
Ahmed Gomaa	“Pre and Postnatal lead exposure and children’s cognitive function”
Sahar Elmarsafawy	“Interaction of lead and calcium in predicting hypertension”
Alfesio Braga	“The time course of weather related deaths”
Yon-Chul Hong	“Effects of Air Pollutants on Acute Stroke Mortality”
Babette Brumback	“Transitional Regression Models with Application to Environmental Time Series”
Ariana Zeka	“Effects of Air pollution on Pregnancy Outcomes”
Andrea Baccarelli	“Cardiovascular Effects of Air Pollution”
Mercedes Medina-Ramon	“Effects of traffic pollution on survival of heart failure patients”
Alexandros Gryparis	“Spatio-Temporal modeling of traffic related air pollution and birth outcomes”
Nicos Middleton	“Traffic related pollution and mortality”
Stephanie von Klot	“GIS based Exposure to Heat, Mortality, and Myocardial Infarctions”
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John McCracken	“Cardiovascular Effects of Wood Smoke Exposure in Guatemala”
Cizao Ren	“Gene Environment interactions and Air Pollution”
Jaana Halonen	“ Physiologic effects of Temperature”
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EXHIBIT B

EXHIBIT B

REFERENCES

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