

Recreational Resources in the Upper Delaware Watershed

A Technical Report for the Upper Delaware
Watershed Management Project

July 2002



Fishing at Swartswood Lake- photo by Blanca Chevestt



Canoeing on Musconetcong River- Photo by John Brunner



North Jersey
Resource
Conservation
and
Development

1100 Black River Road
Far Hills, NJ 07931

(908)441-9191
(908)439-2518

www.northjerseyrcd.org

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Acknowledgements

Project Manager: Donna Drewes, USDA Natural Resources Conservation Service
North Jersey Resource Conservation and Development
Annandale, NJ

Project Coordinator: Christine Hall, USDA Natural Resources Conservation Service
North Jersey Resource Conservation and Development
Annandale, NJ

Principal Authors: Grace Messinger, Watershed Specialist
North Jersey Resource Conservation and Development
Annandale, NJ

Sean McGinnis, Geographic Information System Specialist
North Jersey Resource Conservation and Development

The North Jersey Resource Conservation and Development (RC&D) Council is a six-county regional nonprofit supported by the Soil Conservation Districts and county governments from Hunterdon, Somerset, Sussex, Morris, Warren, and Union Counties. Though organized by local communities, RC&D Councils nationwide receive technical and administrative support from the United States Department of Agriculture Natural Resources Conservation Service through the Resource Conservation and Development Program.

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Recreational Resources in the Upper Delaware Watershed

Introduction

The Upper Delaware Watershed region of New Jersey located within the Northwest section of the state offers a wide variety of active and passive recreation throughout the many state, county, municipal and local parks, state forests, national recreational areas, and wildlife management areas. The Upper Delaware Watershed provides exceptional opportunities for outdoor recreation both in quantity and quality. The 1,300 miles of streams and over 5,500 acres of lakes, ponds and reservoirs within this area are available to the recreational enthusiast. There are over 106,000 acres of federal, state, county and municipally owned public lands in this watershed representing about 22% of the Upper Delaware Watershed's land area. Scenic mountains and valleys, mature forests, numerous lakes and high quality trout streams provide a superior setting for boating, hiking, fishing, swimming and many other natural resource dependent recreational activities.

The definition for recreation from The Random House Dictionary of the English Language states:

"Rec-re-a-tion, n 1. Refreshment by means of some pastime, agreeable exercise, or the like, as after work. 2. A pastime, diversion, exercise or other resource affording relaxation and enjoyment. 3. An act of recreating or the state of being recreated"

Recreation enriches people's lives' and serves as a pastime or diversion from the every day hustle and bustle that life can bring. Recreational activities satisfy the basic human need to play. Rivers and lakes serve as a backdrop for many of our favorite recreational activities. The Recreational Resources Report and the supporting data collected as part of the Public Recreational Resource Inventory and Assessment contained within, addresses the active and passive water-based recreation. Special emphasis was placed on identifying fishing, boating and swimming opportunities in the Upper Delaware Watershed Area.

Recreation in the Upper Delaware region plays an important role in the economic livelihood of the residents. Tourists visit this mostly pristine 746 square mile area of the Upper Delaware Watershed Management Area to enjoy hiking, mountain biking, horseback riding, canoeing and boating, fishing, swimming, hunting, cross-country skiing, birding and wildlife observation. In addition to providing immeasurable social benefits to millions of recreational users, the recreation attributes of the Upper Delaware Watershed are important to the local, regional and State economies.

The recreational inventory and database focuses mainly on the quality and quantity of the access sites that exist in the region was compiled as part of the characterization and assessment for the Upper Delaware Watershed. The technical report and inventory takes a look at how the recreational access sites impact the various waterways and how those impacts affect the overall quality of the water resources. This type of assessment had not been completed in the past, so an initial inventory and database of the public recreational resources had to be created and collected. This inventory focuses on the activities that have direct contact with water and are dependent on water along the Delaware River tributaries.

This report should be helpful in the future to municipalities and various businesses in the areas to understand the link that recreation has with the economy of an area. Recreation brings money into an area from outside visitors. It is important that the recreational opportunities available are kept up to date, clean and environmentally friendly. Maintenance and management of recreational resources must be a high priority in order to prevent negative impacts on the natural resources and high water quality that exist. It is the natural beauty of the region that draws tourists.

There is a need, especially within the Upper Delaware Watershed, which is within 75 miles of the New York greater metropolitan area, to have high quality waterways that can be used for various types of recreation. The secluded, pristine, peaceful settings of the state parks, forests and wildlife management areas draw people in. Holding to a high quality standard will protect the economies of surrounding towns.

Economic Importance of Recreational Opportunities

The presence of a recreational body of water can expand a region's economy and job base. According to the Longwood Study for "Travel & Tourism in New Jersey: A Report on the 2000 Travel Year" prepared by the NJ Commerce and Economic Growth Commission for the Skylands Region, an estimated 15.8 million trips were taken in 2000. The Skylands Region includes all of Warren, Sussex, Hunterdon, Morris and Somerset Counties. Of the 15.8 million trips taken in 2000 throughout the Skylands Regions, 3.8 million were estimated as overnight trips and 12.0 million were estimated as day trips. The Longwood Study identified five destinations located within the Upper Delaware Watershed Region on a statewide list of "Places Seen/Visited or Experienced – Overnight Trips". These included the Delaware Water Gap National Recreation Area, High Point State Park, Lake Hopatcong, Wild West City and Waterloo Village. These five destinations accounted for an estimated 1.6 million overnight trips.

According to the Longwood Study for travel year 2000, recreational-based tourism generated about \$39 million dollars in Warren and Sussex Counties. During 2000 in Warren County about 75% of campgrounds and hotels/motels/resorts were occupied. During 2000 in Sussex County about 38% of hotels/motels/resorts and campgrounds were occupied. According to "New Jersey's Common Ground Report of 1994-1999, New Jersey Open Space and Outdoor Recreation Plan Summary", tourism has become a major industry in the state generating over \$22 billion in annual revenues thus making it the state's largest employer. It is the second largest industry in the state. According to NJ Fish and Wildlife reports Warren County anglers contributed \$20 million dollars annually to the local economy. The impact of recreational resources on the local economy is enormous.

Every travel dollar spent changes hands several times before leaving the locality in which it is spent. For example, over 500,000 people visit Lake Hopatcong every year to take advantage of its recreational facilities. This is very important to the surrounding communities economy and makes the lake a valuable economic asset. Only a small portion of tourism dollars is spent in the parks themselves. The majority of tourism money is paid to private businesses for gas, food, lodging and other goods. Many local businesses depend on the park clientele for profitable operations and rely on park promotions to attract new consumers.

There are significant socioeconomic incentives to protect and improve natural habitat and water quality, and to ensure that the recreational facilities and lands are adequate to serve the needs of the public. As stated earlier, recreation is an opportunity to satisfy the basic human need to play. Having access to natural settings including recreational and cultural opportunities, open space, greenways, rivers and trails located in and adjacent to communities adds to the regions economic sustainability as well as to its overall quality of life.

Recreational Opportunities within the Upper Delaware Watershed

Recreation can be placed into two different categories, passive or active. Passive recreation can mean anything that is non-athletic in nature or those recreational pursuits that require less strenuous physical participation, i.e. walking/hiking trails, picnicking, or birding. Active recreation can mean pursuits that entail more than the usual physical motion or action and could include organized sports; biking; swimming; baseball/softball, soccer and football. Both of these types of recreation can be found within the Upper Delaware Watershed.

As of June 2001 the Upper Delaware Watershed recreational opportunities include a federal national recreation area; 6 state parks; 3 state forests; 25 wildlife management areas; 2 county parks in Hunterdon, Morris and 1 in Warren County; and several municipal and local parks that provide a wide array of outdoor recreational activities. The following is a list highlighting some of the regions recreational areas.

Federal Recreational Area

Delaware Water Gap National Recreation Area is located both in New Jersey and Pennsylvania. The New Jersey portion is found solely within the Upper Delaware Watershed. As previously noted the Water Gap welcomes a significant amount of over-night visitors. The Delaware Water Gap National Recreation Area is the ninth most visited in the National Park System. It encompasses 70,000 acres of ridges, forests, lakes and rivers on both sides of the Delaware River in both states. The 40-mile section of the Delaware River that runs through the recreation area in New Jersey had been placed in the National Wild and Scenic River System in 1978. Recreational opportunities offered in this area include hunting, fishing, hiking and boating. There is a rich and diverse sampling of regional flora and fauna, historic structures, craft centers, cultural resources, environmental and outdoor education facilities, and other recreational and educational offerings.

State Parks and Forests

There are a total of 9 state parks and forests found within the watershed region. From the northern most park working southward includes High Point State Park, Stokes State Forest, Swartswood State Park, Worthington State Forest, Kittatinny Valley State Park, Hopatcong State Park, Jenny Jump State Forest, Allamuchy Mountain State Park and Stephens State Park.

High Point State Park is located in the most northwest corner of the state in Sussex County. This state park is about 14,200 acres at 1803 feet about sea level being known as New Jersey's highest point the state and is adjacent to Stokes State Forest. High Point State Park allows boating at Sawmill Lake and Steenykill Lake which both offer a boat ramp where "Electric motors only" are allowed. Lake Marcia is a 20-acre natural, glacial lake that offers a guarded swimming beach in the summer, fishing year round including ice fishing in the winter. High Point offers camping; picnicking; mountain biking; hiking along the Appalachian Trail that runs through the entire length of the park from Maine through Georgia; cross country skiing; horseback riding; bird watching and wildlife viewing sites; swimming; boating; snow mobiling in the winter time; it is partially handicap accessible; has interpretive programs; and has a visitor center/office. A unique feature to the park is the High Point Monument, which is a 220-foot structure where observers can take in breathtaking views of the Pocono Mountains to the west, the Catskill Mountains to the north, and the Walkkill River Valley to the southeast. There is a fee to enter the park that is charged between Memorial Day and Labor Day.

Stokes State Forest incorporates about 16,000 acres in northern Sussex County. At the northern end the state forest connects to High Point State Park. Tillman Ravine Natural Area located within the state forest offers the striking beauty of an evergreen forest of hemlock trees found along Tillman Brook in a 525-acre setting. This state forest offers several amenities including a visitor center/office; camping; picnicking; restrooms and it is partially handicap accessible. The activities allowed include mountain biking; horseback riding; hiking; cross country skiing; birding and wildlife viewing sites; deer, small game, turkey and waterfowl hunting; swimming; boating; fishing; snow-mobiling. The Appalachian Trail runs through the entire length of High Point State Park and Stokes State Forest as it continues south to the Delaware Water Gap eventually ending in Georgia. Stokes State Forest offers many access sites for fishing and boating. Boating access sites include Stony Lake where fishing, swimming and boating with electric motors only are allowed. At Lake Ocquittunk both warm and coldwater species of fish can be caught and non-motorized boating is allowed. There is a fee to enter the park that is charged between Memorial Day and Labor Day.

Swartswood State Park is about 1,800 acres that includes both Swartswood Lake and Little Swartswood Lake it is located west of Newton in Sussex County. Boat ramps are available at both lakes, where electric motors only are permitted. The park offers camping; picnicking; mountain biking; hiking; horseback riding; cross-country skiing; birding; interpretive programs; deer, small game, turkey and waterfowl hunting; warm and cold-water species fishing; swimming; sailing and boating; and the park is partially handicap accessible. In the summer months, Swartswood Lake has a swimming area with lifeguards; a food vendor and an opportunity to rent non motorized boats for a leisurely trip around the lake. On weekends, there are guided canoe trips by the park naturalist. A fee to enter the park is charged between Memorial Day and Labor Day.

Worthington State Forest runs along the Delaware River and the Kittatinny Mountains just north of the Delaware Water Gap in Warren County. This state forest incorporates about 5,900 acres and includes Dunnfield Creek Natural Area, which is designated as a Wild Trout Stream. Sunfish Pond Natural Area is a glacial lake located on top of the Kittatinny Ridge. A 3.5-mile trail through rugged terrain must be followed in order to get to this pond. Sunfish Pond with its highly acidic glacial lake water is home to some unique fish species that can tolerate low pH waters. Some other highlights of this state forest include its access to the Delaware River for fishing and a boat ramp. Other offerings at the state forest include: a visitor center/office; camping; picnicking; restrooms; hiking; cross country skiing; birding and other wildlife viewing; mountain biking; horseback riding; deer, small game and turkey hunting.

Kittatinny Valley State Park is one New Jersey's newest state parks located in Sussex County. Acquired in 1994 it encompasses 1,700 acres. Kittatinny Valley State Park offers 3 bodies of water that are used for recreation; Lake Aeroflex, Gardner's Pond and Twin Lakes. Part of the headwaters of the Pequest River the 117-acre Lake Aeroflex allows all forms of boating with restrictions on mast height for sail boats and electric motors only. There is a boat ramp and dock available for public use. This lake offers excellent fishing for both warm and coldwater species. To gain access to the 39-acre Gardner's Pond one must be able to hand-cart their boat less than ¼ mile from the parking area to the pond where all forms of boating with electric motor only and mast height restrictions apply. Gardner's Pond is also an excellent location for warm and coldwater species fishing. Overall the park offers picnicking; mountain biking; hiking; horseback riding; cross country skiing; deer, small game, and turkey hunting is available. Kittatinny Valley State Park also manages and oversees two very important footpath trails that run through Warren and Sussex Counties: the Paulins Kill Valley Trail and the Sussex Branch Trail. These trails are beneficial in that they provide recreation as well as a very valuable riparian buffer along the Paulins Kill. The 21-mile Sussex Branch Trail begins in Stanhope and ends in Branchville. The 26-mile Paulins Kill Valley Trail begins in Sparta, heads southwest through Blirstown and ends near the Delaware River at the Columbia Lake Wildlife Management Area. The multi-use trails are suited to walking, jogging, horseback riding and cross-country skiing. Some areas provide access for fishing and canoeing along the Paulins Kill. For both trails be observant of "No Trespassing" and "Private Property" signs that are posted between the trail and the river.

Hopatcong State Park is located at the southwest corner of Lake Hopatcong within Morris, Sussex and Warren Counties; the park is about 110 acres. The park includes Lake Hopatcong and manages Lake Musconetcong. Lake Hopatcong covers about 2700 acres, is 9 miles long and is New Jersey's largest freshwater lake. Lake Hopatcong offers all forms of boating, electric and gas motors are allowed. A boat ramp is available for use at the state park only on weekdays from Memorial Day till Labor Day, this ramp is not accessible in-season during the weekend due to the proximity of the swimming beach. A swimming beach with lifeguards is available during the summer months from Memorial Day till Labor Day. Food vendors, changing areas and showers are available to the public. Activities that are permitted include picnicking; birding; boating; in winter months snow mobiling; ice fishing and sledding, the park also has several basketball courts, playgrounds and a large playing field. There is a fee to enter the park that is charged between Memorial Day and Labor Day. Hopatcong State Park is accessible for handicap with concrete paths to beach and access to a surf chair. Lake Musconetcong is a 329-acre lake located 4 miles west of Lake Hopatcong. This is a popular recreation area where boating, fishing, ice fishing, and jet skiing are allowed; no fee is charged at this location.

Jenny Jump State Forest is about 3,000 acres located along the Jenny Jump Mountain Range in Warren County. Panoramic views of the Highlands Mountains and the Kittatinny Valley to the west, along with the scenic views to the east of the Great Meadows are highlights to be noted when hiking in this state forest. This park offers car-top launch at Ghost Lake where all forms of boating are allowed with the environmental restriction of electric motors only. There is camping; picnicking; restrooms; mountain biking; warm water fishing; hiking; cross country skiing; deer, small game, turkey, and waterfowl hunting is allowed. The park has a visitor center/office and is partially handicap accessible.

Allamuchy Mountain State Park includes about 8,400 acres located within Warren and Sussex Counties and includes the Allamuchy Mountain Natural Area. At the Allamuchy Mountain Natural Area ample recreational activities including access for fishing at Deer Park Pond are provided. There is an access to Allamuchy Pond where fishing and boating, with electric motor only is allowed. A boat ramp can be found at Cranberry Lake in Sussex County where all forms of boating without restrictions are permitted. At Jefferson Lake in Sussex County, electric motors only can be used. Several public access points to the

Musconetcong River can be found along the boundaries of Allamuchy Mountain State Park. This park offers mountain biking; warm and cold water fishing; hiking, deer, small game, turkey and waterfowl hunting; cross-country skiing and birding. The Sussex Branch Trail crosses through this state park and offers hiking opportunities.

Stephens State Park located in Morris and Warren Counties along the Musconetcong River and covers about 800 acres. This park offers camping, picnicking, restrooms, cold-water fishing, hiking, birding, waterfowl hunting, cross-country skiing, and a historic site. The park is partially accessible for the handicap with some paved paths to the picnic areas. A portion of the Morris Canal Historic Site runs through the park. The Morris Canal, 90 miles in length from Newark to Phillipsburg, was the primary means of transporting coal and iron across the state during the 19th century.

County Parks and Forests

Hunterdon, Morris and Warren Counties have designated recreational areas within the county.

Warren County

The county is currently in the process of establishing a county park system and Warren County co-manages White Lake Natural Area along with NJ Fish & Wildlife.

White Lake Natural Area

The county owns about 397 acres that includes the 69-acre glacial lake where car-top access is permitted. The property was acquired through the state Green Acres Program.

Morris County

Lee's County Park Marina Located on the east shore of Lake Hopatcong in Mount Arlington Borough. This marina offers another place for the public to have access to the lake. There are about 98 boat slips, 3 boat launches and moorings available for use for a fee ranging from \$5 a day up to \$850 a year from March 15th to November 30th.

Mahlon Dickerson Reservation is the largest park in Morris County encompassing about 3200 acres of which 2127 acres or about 62% of the park is located within the Upper Delaware Watershed. This area has over 20 miles of multi-use trails of wilderness and recreational areas. The park offers biking; camping; fishing, boating and canoeing on Saffin Pond; equestrian trails; picnic areas; educational programs; cross country skiing & ice skating in the winter months; and an informational/visitors center. Canoe rentals are available between 2 and 4pm on weekends in July and August on Saffin Pond, life jackets provided and private boats or canoes are not permitted. The camping facilities are open all year offering 8 tent sites, 4 Adirondack Shelters and 18 paved trailer sites with electric hook-ups. The Park Commission sponsors free workshops here on topics such as Backcountry Camping Basics and Mountain Biking 101.

Hunterdon County

Musconetcong River Reservation, Point Mountain Section is located on the Hunterdon County side of the Musconetcong River in Lebanon Township. The Hunterdon County Park System manages this facility. There is a parking lot at the base of the mountain to be used while enjoying this 697acre park. The park offers a scenic overlook and various nature study programs. A variety of activities are available at the park including hiking and nature trails, mountain biking trails, picnic sites, hunting with a park permit, and cross county skiing trails in winter months. Since the Musconetcong River borders this park, fishing and canoeing are also available. Park naturalist lead programs are available to scout and school programs upon request to the Hunterdon County Park System.

Musconetcong River Reservation, Musconetcong Gorge Section is located on the Hunterdon County side of the Musconetcong River in Holland Township off Route 519 and Dennis Road encompasses 405 acres. The Hunterdon County Park System manages this park and offers the following activities: fishing along the Musconetcong River, hiking and nature trails, hunting with a park permit, parking, a scenic overlook, an informational board and a self-guided nature trail with a trail brochure created by the boy scouts. Park naturalist lead programs are available to scout and school programs upon request to the Hunterdon County Park System.

Other Recreational Areas within Watershed

Mohican Outdoor Center is a former boy scout camp located on the banks of Catfish Pond that is now operated by the Appalachian Mountain Club in Blirstown in partnership with the National Park Service. Hiking on the Appalachian Trail, fishing, swimming, canoeing, biking, rock climbing, bird watching, cross-country skiing, snow shoeing, ice-skating, campsites and lodging are available. The center offers outdoor programs for all ages and levels of interest year round for members and non-members. Six cabins have bunkroom accommodations. Most have hot and cold running water and wood burning or gas heat. The main lodge features furnace heat, central living/dining room and kitchen.

New Jersey Natural Lands Trust is an independent agency housed within the Department of Environmental Protection that owns lands designated for open space and holds conservation easements that are monitored annually. It manages these properties to conserve endangered species habitat, rare natural features and significant ecosystems, and for enjoyment by the public. Access to Trust lands generally is not restricted. Passive recreational and educational use by the public is invited, as long as it does not adversely affect natural communities and biological diversity. The organizations main mission is to preserve land in its natural state for enjoyment by the public and to protect natural diversity through the acquisition of open space within New Jersey. The trust owns an area of land, shown on Figure 8, near the Blirstown Airport in Blirstown Township.

Wildlife Management Areas (WMA)

In the Upper Delaware Watershed as of June 2001 there are 25 state-managed Wildlife Management Areas encompassing over 16,000 acres of land that can be utilized for public recreational uses. Wildlife Management Areas are multiple-use, public lands that are administered by the state Division of Fish and Wildlife. They are primarily managed for hunting and fishing, but can also be prime locations for hiking, birding, wildlife viewing and photography, cross country skiing and mountain biking. The funds used to purchase lands for Wildlife Management Areas come from the sale of hunting and fishing licenses and through the Green Acres Program. The lands that are designated Wildlife Management Areas are marked by white diamond-shaped signs on trees and fence posts with the Fish and Wildlife logo on it.

Table 1 shows a list of 25 Wildlife Management Areas that can be found within the Upper Delaware Watershed. Only the Wildlife Management Areas that offered either boating and/or fishing on the tributaries of the Delaware River were assessed for the Public Recreation Inventory and Assessment. Existing Wildlife Management Areas, as well as new tracts of land are established or added to almost daily. The acreage varies constantly due to the addition of new purchases.

**Table 1. Wildlife Management Areas within Upper Delaware Watershed
As of June 2001**

Wildlife Management Area (WMA) Name	Acres In WMA	County WMA located in	Accessed for Recreation Inventory	Is Boating Available at WMA?	Is Fishing Available at WMA?
Beaver Brook	433	Warren	Yes		Yes
Bear Swamp	2,054	Sussex	No	No	No
Belvidere Access Delaware River	2.5	Warren	No	Yes	Yes
Columbia Lake	654	Warren	Yes	Yes	Yes
Culvers Brook Access	4	Sussex	Yes	No	Yes
Flat Brook-Roy	2,081	Sussex	Yes	No	Yes
Hackettstown Fish Hatchery (Private)	234	Warren	Yes		
Hainesville	282	Sussex	Yes	Yes	Yes
Harmony Access Delaware River	5.3	Warren	No		
Holland Church Access- Delaware River	8	Hunterdon	No		Yes- Delaware-River
Honey Run	115	Warren	No		
Hummers Beach Access	3.2	Warren	No		
Knowlton Access Delaware River	2	Warren	No		
Little Flat Brook Access	4	Sussex	Yes	No	Yes
Musconetcong River	820	Warren	Yes	Yes	Yes
Paulins Kill	644	Sussex	Yes	Yes	Yes
Pequest	4,096	Warren	Yes	Yes	Yes
Pohatcong Creek	72	Warren			
Rockport Game Farm	498	Warren	No	No	No
Trout Brook	930	Sussex	Yes		Yes
Walpack	388	Sussex	Yes		Yes
Weldon Brook	829	Sussex	No		Yes
White Lake	767	Warren	Yes	Yes	Yes
Whittingham	1929	Sussex	Yes		Yes
TOTAL ACRES	16,621				

Public Water-Based Recreation Inventory

Water-based recreational opportunities are an important component of the Characterization and Assessment of the Upper Delaware watershed. Due to funding constraints only publicly accessible and/or owned water based recreation sites were inventoried for this report. Information on publicly accessible areas is useful to a broader audience due to the vast number of state parks, forests, and wildlife management areas as well as various county and local parks located in the region. Publicly accessible access sites were surveyed between July and November of 2001. Figure 1 illustrates all the recreational data points by HUC-11 (Hydrologic Unit Code) sub watershed area where boating, fishing or swimming was permitted.

Completing the Inventory

Information on the individual publicly accessible water-base recreational sites was compiled into an Access database. A survey form was created to collect information that would provide general site characteristics as well as additional detailed information on the site resources; health of the area; recreational resource opportunities; and site contact information. During field investigations at each access site a survey form was completed and the longitude and latitude coordinates for that site were determined using a Global Positioning System (GPS). A complete description of the “Methodology for Inventorying and Assessing Public Water-Based Recreational Resources in the Upper Delaware Watershed” can be found in Appendix A. This includes the complete survey form and a detailed description of how the form was completed. The detailed table of the survey results by the five sub watersheds can be viewed in Appendix B.

The following is a brief description of the recreational resource assessment form. The field survey included information about the following five categories:

- 1) Geographic location and general characteristics of the site
- 2) General overview of what is available at the access site and the type of recreation area
- 3) Detailed inventory of the access site, including water-body name and recreational opportunities that exist at that location
- 4) “Health” or quality assessment of the site, including amount of trash visible, erosion of the banks of the waterway and general observations and comments about the environmental characteristics of the site
- 5) Additional information such as who to contact for further information or resources about a particular site

Representatives from the State Parks, including the park superintendents provided critical information on the location of many of the access sites. They were also helpful in identifying how the public was using each area and providing information on the permitted uses, site activities and environmental restrictions on the state owned lakes and beaches. The access site information focused on the property location information, identified what water resource the site was located on and identified who owned or managed the site. During the onsite visit the information on the “Put-in” ability or how easy it was to launch a boat or canoe was noted. Information collected on the uses and physical characteristics of the sites included: parking availability and fees, availability of restrooms, picnic areas and handicap accessibility of the site.

There were several factors that went into determining the environmental quality and condition for each site was compiled by each sub-watershed group in the Upper Delaware. Conditions assessed included:

- Amount of erosion of the stream or shoreline bank at the fishing or boating access areas
- Amount of litter visible, location of trash and the presence of garbage receptacles
- How well was the site maintained, -did it look overused or underused
- Was the use of the area causing an environmental impact
- General comments on the site condition

The assessment and survey information was completed from July to November 2001 and reflects conditions and restrictions present at that time. It must be noted that some conditions or even the

availability of the site for water based recreational activities may change over time. Please keep in mind that all private property should be respected as such and all laws should be followed. This organization does not condone or promote trespassing on private property. This report is meant to serve as a starting point in determining the quality and quantity of the public accesses within the watershed and can in turn be used as a foundation for the subsequent watershed planning efforts.

Inventory and Assessment Results

The following summary will illustrate a break down of the survey results by the 5 Sub-Watershed Groups within the Upper Delaware Watershed. The summary of the survey results will include the following information:

- General overview about the sub-watershed group
- What types of access sites were located within the area and their specific names
- Tables showing how many sites were accessed and what resources were available. A brief description highlighting any unique opportunities that exist within that area.
- An explanation of the overall quality of the access site in conjunction with the condition of the site, looking at various environmental factors such as amount of litter seen on day of assessment and stream bank erosion.
- An explanation of the physical characteristics of the site along with the ease of use of the access site.

Flat Brook Watershed Group

The Flat Brook Watershed Group includes the most northwestern townships in Sussex and Warren Counties. This watershed group and its tributaries drain an area of about 130 square miles. The access sites include a federal park, state parks and forests, municipal parks, Wildlife Management Areas and trout stocked water areas. They include Delaware Water Gap National Recreation Area; High Point State Park; Stokes State Forest; Hainesville Wildlife Management Area; Flat Brook-Roy Wildlife Management Area; and Walpack Wildlife Management Area. Figures 2-5 shows the 4 HUC-11 sub watersheds that make up this watershed group, which include Shimers Brook & Clove Brook, Big Flat Brook, Flat Brook below Tillman's Brook and Van Campens Brook & Dunfield Creek.

The access sites within this watershed were marked either by state park and forest signs, trout stocked water signs or wildlife management area white diamond signs. Of the 27 sites accessed for this watershed, 26 had clear directional signs indicating the presence of a publicly accessible area while the remaining site had no clear signs indicating a publicly accessible area but were known to the locals as an access area. Three access areas within this watershed group were handicap accessible. An access ramp to the beach for handicap was available at Lake Marcia in High Point State Park. A fishing area for people with disabilities is available at the Lower Flat Brook-Roy Wildlife Management Area, Three Bridges site where the New Jersey Division of Fish and Wildlife and a Flatbrook Trout Unlimited Chapter built this "handicap accessible fishing area". There were handicap facilities found at the Watergate Recreation Site in the Delaware Water Gap area. All areas inventoried offered some sort of parking either in a lot or a pull-off area. The fees charged for entrance into Stokes State Forest and High Point State Park between Memorial Day and Labor Day ranged from \$5 to \$7 during the week and weekend respectively. Restroom facilities were available at 11 of 27 sites. The restroom facilities available were located at the following: 2 at High Point State Park, 4 at Stokes State Forest, 1 at Worthington State Forest, and 1 at Blue Mountain Lakes, Van Campens Glen, Watergate and Millbrook Village all in Delaware Water Gap National Recreation Area.

Site Activities

Table 2a illustrates that the majority of the access sites within this watershed group offered fishing access. Two of the 28 fishing sites had restrictions of "Fly Fishing Only", and these are located within the Flat Brook and Flat Brook-Roy Wildlife Management Area in Sussex County. Twenty boating access sites were located. At 4 areas, all forms of boating were available with the use of "Electric Motor Only" and there is a trailer launch available at two sites, one on Steenykill Lake and one on Sawmill Lake. The other 14 sites were only suitable for man-powered watercraft, such as canoes or kayaks. These boating access sites were available at the lakes within the state parks and along the Flat Brook. There were 2

swimming areas within this group located at Stokes State Forest and High Point State Park, and two sites have guarded beaches between Memorial Day and Labor Day.

Table 2a. Inventory Sites Flat Brook Watershed Group

Total Number of Sites	27
Swimming Access	2
Fishing Access	25
Boating Access	18

Site Quality and Condition

Table 2b illustrates the amount of trash observed at each site based on the number of pieces seen on the day of the assessment. The results are as follows:

Table 2b. Trash Category of Flat Brook Watershed Group

Trash Category	Number of Sites
No Trash Visible	21
Minimum – Less than 10 pieces	5
Moderate –between 10-50 pieces	1
Excessive- over 50 pieces	0

For the total 27 sites accessed in the Flat Brook Watershed Group, the overall quality of the sites was good with respect to the amount of trash visible. Only 6 of the 27 sites had trash visible observed at the minimum and moderate levels. The majority of the sites accessed for this watershed group are located within the federal or state park and forest system. Sites within the state parks and forests are designated as “Carry In/Carry Out” facilities where plastic bags are provided upon entrance to the park and no garbage receptacles are present.

Site Use and Environmental Impact

The majority of the sites, 16 of 27, were determined “Not to be having a negative environmental impact on the area”, while the remainder were determined “To be having a negative environmental impact on the area.” The sites determined to potentially be having a negative impact include the swimming beaches within the state parks due to potential fecal coliform contamination from wildlife or humans, fishing and boating access sites at various locations of the Flat Brook. The bank condition at the fishing and boating sites was observed by determining the amount of erosion visible. Two areas within Stokes State Forest along the Big Flat Brook and one area at the Lower Flat Brook-Roy Wildlife Management Area (Three Bridges) fell into the severe erosion category for fishing and boating due to the presence of a vertical streambank, with a significant drop off to the waterway. The overuse of natural access areas causes a significant potential for sediment export in to the waterway.

Paulins Kill Watershed Group

The Paulins Kill Watershed Group includes townships from southern Sussex and northern Warren Counties. This watershed and its tributaries drain an area of about 157 square miles. The access sites include municipal parks, state parks and forest, wildlife management areas, trout stocked water areas and legal access sites located along roadways. The municipal park found within this area is the Lafayette Township Park; the state park is Swartwood State Park; the Wildlife Management Areas include Paulins Kill Wildlife Management Area and Columbia Lake Wildlife Management Area. Figures 6-9 show the 4 HUC-11 watersheds that incorporate this watershed group. The streams included in this group include the Upper Paulins Kill, Trout Book, Lower Paulins Kill and Delawanna Creek and Stony Brook.

The access sites within this watershed were marked either by state park and forest signs, trout stocked water signs or wildlife management area white diamond signs. Of the 37 sites accessed for this watershed, 30 had clear directional signs indicating the presence of a publicly accessible area while the remaining 7 sites had no clear signs indicating a publicly accessible area but were known to the locals as an access area. An access ramp to the beach for handicap access was available only at one site; Swartwood State Park has a surf chair and concrete ramp into the lake. All areas assessed offered

some sort of parking. Fees were charged for entrance into Swartswood State Park between Memorial Day and Labor Day ranging from \$5 to \$7 during the week and weekend respectively. Restroom facilities were available at 8 of 37 sites. The facilities available were located at the following: 2 at Lafayette Township Park, 4 at Swartswood State Park and 1 at Foot Bridge Park in Blirstown, Branchville Borough Park and 1 at Crater Lake Delaware Water Gap National Recreation Area.

Site Activities

As table 3a illustrates, the majority of the access sites within this watershed group had fishing access. There were 28 boating sites located and 16 offered all forms of boating with the use of “Electric Motor Only”. The 5 sites that offered a trailer launch ramp were located at Swartswood Lake and Little Swartswood Lake within the State Park and at Delaware Lake and Columbia Lake within the Columbia Lake Wildlife Management Area. The remaining waterways had to be accessed via car-top launch. The sites accessed along the Paulins Kill are only suitable for man-powered watercraft such as canoes and kayaks. The electric motor only boating areas are located at the lakes within the Swartswood State Park and Columbia Lake Wildlife Management Area. There were 2 swimming access sites with guarded beaches located at Lafayette Township Park, Swartswood State Park while the third swimming access was located at Crater Lake in the Delaware Water Gap that does not have any lifeguard supervision but there was a life preserver ring onsite.

Table 3a. Inventory Sites Paulins Kill Watershed Group

Total Number of Sites	37
Swimming Access	3
Fishing Access	35
Boating Access	29

Site Quality and Condition

Table 3b illustrates the amount of trash observed at each site based on the number of pieces seen on the day of the assessment. The results are as follows:

Table 3b. Trash Category Paulins Kill Watershed Group

Trash Category	Number of Sites
No Trash Visible	9
Minimum – Less than 10 pieces	19
Moderate –between 10-50 pieces	6
Excessive- over 50 pieces	3

For the 37 sites assessed in the Paulins Kill Watershed Group the overall quality of the sites are fairly good in respect to the amount of trash visible. There were 28 sites with trash visible with the majority having a minimum amount and only 3 with an excessive amount. The trash observed was located on the banks or shorelines of the waterways. The sites where an excessive amount of trash was visible were found at the Columbia Lake Wildlife Management Area. The sites in this watershed group that are located in Swartswood State Park that do not provide any garbage receptacle are designated as “Carry In/Carry Out” facility. Areas that provided trashcans were found within Lafayette Township Park where minimum to moderate amount of trash was visible. The Foot Bridge Park in Blirstown had trashcans available for use and a minimum amount of trash was seen. While trashcans were available at the Columbia Lake Wildlife Management Area an excessive amount of trash was visible. Delaware Water Gap site that had a minimum amount of trash visible and a trashcan was available.

Site Use and Environmental Impact

The majority of the sites (29 out of 37) were determined “Not to be having a negative environmental impact on the area”. The remaining 8 sites were determined “To be having a negative environmental impact on the area.” Potential negative impacts included fecal coliform contamination during the summer months at the bathing beaches either from human or wildlife introduction as well as the severe erosion at some areas from angling or boating access to the waterway. The bank condition was evaluated by

determining the amount of erosion visible. Three areas along the Paulins Kill fell into the severe erosion category for both fishing and boating by having a vertical bank, with a significant drop off to the waterway. There was 1 fishing access only site along the Paulins Kill that fell into the severe erosion category.

Pequest Watershed Group

The Pequest Watershed Group incorporates townships from Sussex and Warren Counties. This watershed group drains an area of about 197 square miles. The access sites located include municipal parks, state parks and forest, wildlife management areas, trout stocked water areas and legal fishing access sites. The municipal parks located within the watershed group include Oxford-Furnace Lake and Lake Marguerite Wildlife Refuge; state parks include Kittatinny Valley State Park, Allamuchy Mountain State Park and Jenny Jump State Forest; the Wildlife Management Areas include Pequest Wildlife Management Area, Beaver Brook Wildlife Management Area and Whittingham Wildlife Management Area. Figures 10-12 show the 3 HUC-11 sub watersheds that incorporate this watershed group; streams in this area include the Upper Pequest River, the Lower Pequest River and the Beaver Brook.

The access sites within this watershed were marked either by township park signs, state park and forest signs, trout stocked water signs or wildlife management area white diamond signs. Of the 24 sites accessed for this watershed, 17 had clear directional signs indicating the presence of a publicly accessible area while the remaining 7 sites had no clear signs indicating a publicly accessible area but were known to the locals as an access area. There were 2 areas that offered some sort of accessibility for people with disabilities for fishing access. A floating dock can be found at the Kittatinny Valley State Park and a “Fishing Handicap Area” can be found at Pequest Trout Hatchery. This access area was constructed with the partnership of NJ Fish & Wildlife and Trout Unlimited. All areas assessed offered some sort of parking. Fees were not charged for the entrance into any of the facilities. Restroom facilities were available at 4 of 24 sites. Three located at Kittatinny Valley State Park and one at Oxford-Furnace Lake Municipal Park.

Site Activities

As table 4a illustrates; all the sites within this watershed group offered fishing access. Fourteen of the sites offered boating. Seven areas offered all forms of boating with the use of “Electric Motor Only”. There were 3 sites that offered a trailer launch ramp of some sort located at Lake Aeroflex and Gardner’s Pond in Kittatinny Valley State Park and Oxford-Furnace Lake. The remaining waterways had to be accessed by car-top launch. Car-top launch areas included Ghost Lake in Jenny Jump State Forest; Orchard Crest Pond at Whittingham Wildlife Management Area; Allamuchy Pond in Allamuchy State Park; Twin Lakes in Kittatinny Valley State Park and along the Pequest River and its tributary access sites. The sites assessed along the Pequest are only suitable for man-powered watercraft such as canoes and kayaks, whereas the “Electric Motor Only” boating areas were located at the lakes within Oxford-Furnace Lake Municipal Park; Allamuchy State Park, Kittatinny Valley State Park, Jenny Jump State Forest and Whittingham Wildlife Management Area.

Table 4a. Inventory Sites Pequest Watershed Group

Total Number of Sites	24
Swimming Access	1
Fishing Access	24
Boating Access	14

Site Quality and Condition

Table 4b illustrates the amount of trash observed at each site based on the number of pieces seen on the day of the assessment. The results are as follows:

Table 4b. Trash Category Pequest Watershed Group

Trash Category	Number of Sites
No Trash Visible	10
Minimum- less than 10 pieces	8
Moderate- between 10-50 pieces	4
Excessive- over 50 pieces	2

Of the 24 sites assessed in the Pequest Watershed Group the overall quality of the sites is fairly good in respect to the amount of trash visible. The 14 sites with visible trash included half having a minimum amount and the other half showing moderate to an excessive amount of trash. The majority of the trash seen in all categories was on the banks or shorelines of the waterways. The sites located in Kittatinny Valley State Park, Allamuchy Mountain State Park, Jenny Jump State Forest and Washington Township Wildlife Refuge did not provide any garbage receptacles these areas are designated as “Carry In/Carry Out” facilities. There were two areas that provided trashcans located at Oxford-Furnace Lake Municipal Park and the Pequest River site off Route 46. Ironically both of these sites were classified as having an excessive amount of trash visible even though trashcans were provided.

Site Use and Environmental Impact

The majority of the sites 20 of 24 were determined “Not be having a negative environmental impact on the area”, while the remainder were determined “To be having a negative environmental impact on the area.” With the potential negative impacts from fecal coliform contamination during the summer months at the bathing beach at Oxford-Furnace Lake Municipal Park either from human or wildlife introduction as well as the severe erosion of some areas from angling or boating access to the waterway. The areas assessed included the swimming beach. The bank condition was observed by determining the amount of erosion visible. Two areas along the Pequest River fell into the severe erosion category for fishing and boating by having a vertical bank, with a significant drop off to the waterway. The severe erosion found at some of the areas could pose an environmental threat from sediment pollution. There were 7 moderately eroded sites for fishing and boating due to their somewhat steep banks with vegetation. The moderately eroded sites included Twins Lakes, Gardner’s Pond, Ghost Lake, Oxford-Furnace Lake, Beaver Brook and Pequest River. Four fishing and boating sites had no visible erosion. Fishing only sites had: 2 sites in the severely eroded category found along the Pequest River; 6 sites with moderately eroded banks from fishing; and 3 with no visible erosion along Lake Marguerite in Hope Township, Muddy Brook in Swayzes Mill and along Pequest River in Pequest River Wildlife Management Area.

Pohatcong-Lopatcong Creek Watershed Group

The Pohatcong-Lopatcong Creek Watershed Group incorporates townships from central and southern Warren County. This watershed group drains an area of about 106 square miles. The access sites located in the sub watershed include municipal parks, Wildlife Management Areas, trout stocked water areas and recreation areas. The municipal parks located within this watershed group include Roaring Rock Park, Pohatcong Creek Natural Area and Lock & Chestnut Street Park; and Merrill Creek Reservoir (a privately owned area that has public access). Figures 13-15 show the 3 HUC-11 watersheds that incorporate this watershed group including Pophandusing & Buckhorn Creek, Lopatcong Creek and Pohatcong Creek.

All the access sites within this watershed had clear directional signs marked either by township park signs, state park signs, trout stocked water signs, Merrill Creek Reservoir signs or natural area signs. Only one area offered some sort of accessibility for people with disabilities. There is a handicap accessible ramp located at the Merrill Creek Reservoir Inlet/Outlet Tower site suitable for a fishing access. All areas assessed offered some sort of parking. Fees were not charged for the entrance into any of the facilities. Restroom facilities were available at 3 of 14 sites. Two can be found at the Merrill Creek Reservoir and one at the Pohatcong Creek Natural Area in Washington Township.

Site Activities

According to table 5a all the sites within this watershed group offered fishing access. There were 6 boating sites located. Merrill Creek Reservoir was the only area that offered all forms of boating with the

use of “Electric Motor Only” as well as offering a trailer ramp along with a dock. The remaining sites along the Pohatcong Creek have to be accessed by car-top launch. The sites assessed along the Pohatcong Creek were only suitable for man-powered watercraft such as canoes and kayaks.

Table 5a. Inventory Sites Pohatcong-Lopatcong Creek Watershed Group

Total Number of Sites	14
Swimming Access	0
Fishing Access	14
Boating Access	6

Site Quality and Condition

Table 5b illustrates the amount of trash observed at each site based on the number of pieces seen on the day of the assessment. The results are as follows:

Table 5b. Trash Category Pohatcong-Lopatcong Creek Watershed Group

Trash Category	Number of Sites
No Trash Visible	4
Minimum – Less than 10 pieces	4
Moderate –between 10-50 pieces	5
Excessive- over 50 pieces	1

For the 14 sites assessed for the Pohatcong-Lopatcong Creek Watershed Group the overall quality of the sites is moderate in respect to the amount of trash visible. Ten of the 14 sites had trash visible with the majority showing a moderate amount of trash and only 1 site with an excessive amount visible. The majority of the trash was seen on the banks or shorelines of the waterways. One site had trash in the stream. The site where the excessive amount of trash was visible was at the Roaring Rock Pond in Washington Township’s Roaring Rock Park where no trashcans were available. The sites located at Roaring Rock Park and the Pohatcong Creek Natural Area did not provide any garbage receptacle; they were designated as “Carry In/Carry Out” facilities. There were 4 areas in the group that provided trashcans, 3 of which were located at the Merrill Creek Reservoir where a minimum amount of trash was observed. The other site that provided trashcans was at the Lock Street Municipal Park in Pohatcong Township where a moderate amount of trash was found in the stream and on the banks even though there was a trashcan available for use.

Site Use and Environmental Impact

The majority of the sites, 10 of 14, were determined “Not to be having a negative environmental impact on the area”. The remaining 4 sites were determined “To be having a negative environmental impact on the area”. The sites determined to be having a negative impact were areas found along Pohatcong Creek off Carpentersville Road; Lopatcong Creek along C.R. 519 and Lock Street Municipal Park in Pohatcong Township; and Roaring Rock Pond in Roaring Rock Park. They were considered to be causing a negative environmental impact due to the severe erosion and trampled vegetation on the banks due to possible over-use of the areas. The bank condition was observed by determining the amount of erosion visible. One area along the Pohatcong Creek fell into the severe erosion category for fishing and boating by having a vertical bank with a significant drop off to the waterway. There were 4 sites in Pohatcong and one in Greenwich Township that were moderately eroded where fishing and boating are available resulting in steep banks, although showing erosion, were somewhat protected by vegetation. The Merrill Creek Reservoir boat ramp site had no visible erosion. One fishing access site along Lopatcong Creek exhibited severely eroded banks. Four fishing access sites indicated moderately eroded banks and 4 sites had no visible erosion.

Musconetcong Watershed

The Musconetcong Watershed includes townships from southern Warren, northern Hunterdon, southwestern Morris and southeastern Sussex Counties. This watershed and its tributaries drain an area of about 156 square miles. The access sites include municipal, county and state parks; wildlife

management areas; trout stocked water areas and recreation areas. The municipal parks located within the watershed include Hackettstown Community Park, Hampton Borough Park and Lake Hopatcong Eves Mountain Inlet Sanctuary; county parks in this watershed are located at Lake Hopatcong, Lee’s County Park, Mahlon Dickerson Reservation in Morris County and Point Mountain located in Hunterdon County; the recreation areas can be found at Lake Musconetcong, Lake Hopatcong, Mt Arlington Beach Access for residents only; state parks include Hopatcong State Park, Allamuchy Mountain State Park and Stephens State Park; the Musconetcong Wildlife Management Area. Figures 16 and 17 show the 2 HUC-11 watersheds that incorporate this watershed, the Upper Musconetcong and the Lower Musconetcong.

The access sites within this watershed were marked either by municipal park signs, county park signs, state park and forest signs, trout stocked water signs or wildlife management area white diamond signs. Of the 38 sites accessed for this watershed, 30 had clear directional signs indicating the presence of a publicly accessible area while the remaining 8 sites had no clear signs indicating a publicly accessible area but were known to the locals as an access area. An access ramp to the beach as well as a surf chair is available for the handicap at Lake Hopatcong in Hopatcong State Park. A fishing areas for people with disabilities are available at Stephens & Allamuchy State Park; West Brookwood in Byram Township; Hackettstown Community Park; and at Hampton Borough Park. All areas inventoried offered some sort of parking either in a lot or a pull-off area. Fees were charged at the entrance to Hopatcong State Park between Memorial Day and Labor Day ranging from \$5 to \$7 during the week and weekend respectively. Various fees are charged at Lee’s County Marina on Lake Hopatcong in Mount Arlington for boat launching from this location. Restroom facilities were available at 7 locations within this group. They were located at areas along the Musconetcong River including Hackettstown’s Community Park, Saxton Falls, Stephens & Allamuchy Mountain State Park, Lee’s County Marina, Hampton Borough Park, Hopatcong State Park and West Brookwood Riverside Park in Byram Township.

Site Activities

According to table 6a, 37 sites out of 38 sites within this watershed group offered fishing access. Thirty-four boating sites were assessed. At 10 of the boating sites all forms of boating were available with 5 areas having the environmental restriction of “Electric Motor Only”. Three sites offered boating with no environmental restrictions at all. Those sites were found at Cranberry Lake, Lake Hopatcong and Lake Musconetcong. Four sites offered a trailer launch ramp; 2 at Lake Hopatcong, 1 at Lake Musconetcong on the Netcong side and 1 at Cranberry Lake. The remaining boating sites could only be accessed by car-top launch. The car-top launch sites were located at various sites along the Musconetcong River, Jefferson Lake, Lake Hopatcong and the Stanhope Township side of Lake Musconetcong. The sites assessed along the Musconetcong River are only suitable for man-powered watercraft such as canoes and kayaks, whereas the “Electric Motor Only” boating areas were located at the lakes in Hopatcong, Stephens and Allamuchy Mountain State Park. The two access sites for swimming were located at Hopatcong State Park on Lake Hopatcong where there is a guarded beach between Memorial Day and Labor Day and at Lake Hopatcong, Mount Arlington Beach Access Area which is for “Mount Arlington Residents Only” with a lifeguard on duty from Memorial Day till Labor Day. The Musconetcong River was not accessed for having swimming access sites due to the lack of any designated swimming areas although people might swim in the river at their own risk. The river was not surveyed or inventoried as having any publicly accessible swimming beach recreational areas.

Table 6a. Inventory Sites Musconetcong Watershed

Total Number of Sites	38
Swimming Access	2
Fishing Access	37
Boating Access	34

Site Quality and Condition

Table 6b illustrates the amount of trash observed at each site based on the number of pieces seen on the day of the assessment. The results are as follows:

Table 6b. Trash Category Musconetcong Watershed

Trash Category	Number of Sites
No Trash Visible	5
Minimum – Less than 10 pieces	18
Moderate –between 10-50 pieces	10
Excessive- over 50 pieces	5

For the 38 sites accessed in the Musconetcong Watershed the overall quality of the sites is good in respect to the amount of trash visible. Out of a total of 38 sites, 33 had trash visible with the majority having less than 10 pieces seen. The minimum and moderate amount of trash visible was on the banks or shorelines of the waterways with the other half found directly in the streams. An excessive amount of trash was visible at Lake Musconetcong where it is designated as “Carry In / Carry Out” under the state park jurisdiction where trash bags are provided and where a trashcan is provided. Trashcans were not available at the other locations where an excessive amount of trash was visible. The sites located in Stephens, Allamuchy Mountain and Hopatcong State Park does not provide any garbage receptacle, they are designated as “Carry In/Carry Out” facilities. The remaining sites that provided trashcans where a minimum amount of trash was seen included Lake Hopatcong, Hackettstown Community Park, Hackettstown Union Cemetery, Hunterdon County Park at Point Mountain, and at the Musconetcong Wildlife Management Area in New Hampton. Hampton Borough Park provided trashcans but had a moderate amount of trash visible.

Site Use and Environmental Impact

The majority of the sites, 25 of 38, were determined “Not to be having a negative environmental impact on the area”. The remaining 8 sites were determined to “Be having a negative environmental impact on the area”. These areas were found at various locations along the Musconetcong River, Lake Hopatcong and Lake Musconetcong. They were considered to be causing a negative environmental impact due to several factors. These factors include a large open canopy with little riparian vegetation along the river, severely eroded banks void of vegetation, trampled banks with an excessive amount of trash visible as well as large numbers of geese on the banks of the lakes. At Lake Hopatcong the possible fecal coliform contamination especially during the summer months can pose a negative environmental impact, as well as the potential contamination of MTBE (Methyl tert-butyl Ether), a gasoline additive, from motorboats on the lake. The degree of bank erosion was determined visually. Seven fishing and boating areas fell into the severe erosion category because of the presence of a vertical bank with a significant drop off to the waterway. This severe erosion could negatively impact the environment with sediment pollution. Seventeen fishing and boating sites were only moderately eroded because the steep banks were somewhat vegetated. Ten fishing and boating sites had no visible erosion. There were only 2 sites for the fishing access along the Musconetcong River that had moderately eroded banks.

Survey Conclusions

The inventory of the Public Water-Based Recreational Resources in the Upper Delaware Watershed was completed between July and November 2001. A more complete inventory and assessment of recreational sites would have included an assessment of both public and private recreation sites. Because of funding constraints only public sites were considered. There was not enough time to locate and contact private landowners to get permission to conduct a comprehensive survey. This watershed region contains over 40 publicly owned and managed access areas with about 140 access sites including parks and wildlife management areas. The popularity of water-based recreation in the area is directly related to the abundance and quality of the state’s water resources and their proximity to urban and suburban areas. The majority of the access sites had some sort of signs indicating public access was available. Only 24 access sites did not have a sign clearly indicating an access area; these sites were mainly pull-off fishing access areas along the streams. Although the majority of sites had signs indicating access location, a good number were difficult to spot or the signs were not in highly visible areas.

As determined from the assessment, there are areas that indicate overuse resulting in streambank erosion and the high presence of trash. To keep the access areas clean and functional there needs to be a continual respect, care and ownership assumed by those who use these public areas. Better education and marketing explaining to the public their role in keeping the areas litter free and encouraging them to

follow trail paths so as to prevent erosion needs to be addressed. It is also vital that the public address and their voice concern to recreation area managers when problems or deficiencies are noticed so that maintenance can be performed correctly and efficiently. The fishing and boating access sites should have ongoing maintenance in order to avoid and correct erosion where present or by constructing access points that minimize or control erosion. All the designated swimming access sites provided adequate restroom facilities, however the location should be advertised as to decrease the chance of fecal/bacterial contamination. Eliminating the favorable habitat of open areas along the shoreline can decrease the contribution of fecal/bacteria contamination from geese. The establishment of vegetative barriers comprised of shrubs and grasses is an effective goose deterrent to geese populations.

There clearly is a lack of handicapped facilities available, 127 out of the 140 sites were not handicap accessible. The handicap accessible sites were mainly located at the state parks. Their needs to be additional state and/or private funding support in order to increase the accessibility of the regions water-based recreation sites to the handicap community. This is a great opportunity for outside partnerships to partner with state land managers help address this issue. There is a growing concern among recreational enthusiast that these sites continue to be adequately staffed and maintained now and in the future.

Adequate Sites Available

Overall some could consider the number of publicly accessible water-based recreation sites plentiful. Yet when compared to population based recognized planning standards for open space and recreation area needs, the Upper Delaware Watershed region needs more publicly accessible lands for local use. According to the “Balanced Land Use Guidelines of 1999”, Warren and Sussex counties have a deficit of almost 24,000 acres of land needed to meet the standard public recreation open space needs. The Balanced Land Use Guidelines are a means of estimating the amount of recreation land that should be set aside by the various levels of government in New Jersey to provide recreation opportunities for the existing and future residents of the state. The “need” figures are long term goals for public recreation land acquisition based on the extent of New Jersey’s developed, developable and undeveloped land resources and the need to accommodate other land uses. Using developed and developable land as the calculation basis for counties and municipalities takes into account that the demand for county and municipal recreation land is generated by development. By referring to Table 7 “Balanced Land Use Guidelines”, municipalities, county, state and federal levels of government can calculate their public recreation open space requirements.

Table 7: Balanced Land Use Guidelines

Municipal Level	3% of the developed & developable area of municipality
County Level	7% of the developed & developable area of the county
State Level	10% of the area of the state
Federal Level	4% of the area of the state
Developable Areas	Excludes acreage of slopes over 12%, wetlands, federal and state-owned open space

Paddlers voice a general concern over the lack of public access to the streams, rivers and lakes in the region. Restrictions exist and continue to be a problem, especially along river trails where more access points are needed for put-in, take-out, resting, portaging and parking. River access for canoeing must be obtained either at road crossings or publicly owned river access areas, which are used by fishermen, boaters and paddlers. Within the Upper Delaware Watershed region 103 boating access sites were inventoried out of 140 sites assessed.

New and improved trails, especially waterways, can stimulate the protection of open space and increase the recreational opportunities available to accommodate the demand from the local and regional user groups. To meet the recreational needs of the population, there must be a variety of trail uses within different regions of the state. Because of New Jersey’s changing population, economy and landscape since the 1980’s, the demand for recreation has expanded and will keep growing. Townships will have to become more involved in managing and maintaining these areas to help satisfy the ever present and growing need of the watershed.

Although lands for recreational pursuits are constantly being added to counties, state parks, forests and wildlife management areas, the growth in the region and the attraction of this area as a regional destination will continue to place a severe burden on the resources.

Relationships between Water Quality and Recreational Use

Recreation as an environmental issue can be viewed two separate ways: the impacts recreation use has on water quality and the impacts water quality has on recreation. There are many factors that affect the quality of water that is used for recreation. One way to assess this data would be to determine if the water bodies are meeting their “designated use” as determined by the New Jersey Department of Environmental Protection.

Surface Water Quality Standards

As part of the Surface Water Quality Standards all streams and lakes are to have designated uses assigned to them. “Designated use” meaning those surface water or ground water uses, both existing and potential, that have been established by the NJDEP for waters of the state. NJDEP has established existing and potential designated uses for the surface waters in the Upper Delaware Watershed. The State Surface Water Quality Standards establish criteria that are designated to protect both primary and secondary contact uses. According to the State Surface Water Quality Standards “primary contact recreation” means water related recreational activities that involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing and water skiing and “secondary contact recreation” means recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing (SWQS, 1998). All waters in New Jersey are designated for primary contact recreation (i.e. swimming) and secondary contact recreation (i.e. wading, boating). The state of New Jersey evaluates if the primary and secondary contact recreation uses are being met by focusing on fecal coliform sampling programs.

River and Streams Recreational Designated Use Attainment

Fecal coliform pollution causes non-attainment of recreational designated uses in rivers and streams. This data is not appropriate to evaluate the risks to human health from swimming in rivers and streams because monitoring stations are currently not located where swimming and secondary contact occurs. The source of fecal coliform pollution needs to be considered. Contact with human wastes presents a significantly higher risk of illness than contact with animal wastes. Specific sources of fecal coliform pollution have not yet been identified. However, compliance with permit limits for fecal coliform at wastewater treatment plants is high and incidence of treatment plant failures are low. Thus, most fecal coliform pollution in freshwater rivers and streams is suspected to be derived from animal wastes. Fecal coliform pollution is suspected to occur primarily from domestic pets, livestock and wild animal wastes which are transported to rivers and streams by municipal and industrial stormwater, overland runoff and by direct contact with water. Although Canada goose population data are not readily available, significant populations of these animals occur in and around many New Jersey waterways. In developed areas, domestic pet and bird wastes contribute to fecal coliform in stormwater. In agricultural areas, animal manure piles and access of livestock to streams can contribute to fecal coliform pollution. Table 8 illustrates eight stations that were monitored for fecal coliform attainment in WMA (01).

Table 8: Fecal Coliform Attainment Status in WMA (01) Rivers and Streams (1995-1997)

WMA	Station #	Station Name	Fecal Coliform Number	Fecal Coliform-geomean	Fecal Coliform # exceed 400 MPN/100ml	FC SWQS Attainment	Length (miles)
1	01440000	Big Flatbrook at Flatbrookville	9	17.0	0	Full	1.70
1	01443440	Paulins Kill at Balesville	14	279.4	5	No	1.72
1	01443500	Paulins Kill at Blairstown	14	96.6	4	Partial	0.97
1	01445500	Pequest at Pequest	14	335.3	4	No	1.26
1	01455200	Pohatcong Creek at New Village	14	700.8	10	No	5.67
1	01456200	Musconetcong River	14	124.9	2	Partial	2.24
1	01457000	Musconetcong River near Bloomsbury	14	296.7	6	No	11.34
1	01457400	Musconetcong River at Riegelsville	14	283.9	6	No	11.34

The table highlights the number of samples collected between 1995 and 1997, "Fecal Coliform Number". The table highlights the number of samples that exceeded the SWQS criteria and if the stretch attained full, partial or no attainment for Surface Water Quality Standards. As the table shows there was only 1 station, Big Flatbrook at Flatbrookville that meet full SWQS attainment, 2 that partially met SWQS attainment were the Paulins Kill and Musconetcong and the remaining 5 met no attainment.

Lake Aquatic Life Designated Uses

The aquatic life use support assessment for lakes was based upon warm water fishery assessments supplied by the Department's Bureau of Freshwater Fisheries (BFF). This assessment has been improved to provide a direct indicator of aquatic life designated uses. Previous aquatic life assessments for lakes were based on lake trophic status, an indirect indicator of aquatic life uses.

In previous New Jersey Water Quality Inventory Reports, eutrophic lakes were classified as "fully supporting aquatic life designated use, but threatened". However, aquatic plants, which grow in abundance in eutrophic lakes, provide food and habitat to the lake fish community. Many warm-water fish communities can thrive under moderate eutrophic conditions but may be impaired by severe eutrophication when dissolved oxygen levels are severely depressed and/or aquatic vegetation becomes excessively dense. Clean Lakes Program studies trophic status identified recreational and aesthetic impairments, not impairments to fisheries.

Assessments of lake fisheries are performed based upon a priority list provided in the Division of Fish and Wildlife's Warmwater Fisheries Management Plan, which serves as the primary guidance for warmwater fisheries management for the Department. Lake assessment frequencies vary depending upon the lake in question and its individual management needs.

Fish populations are sampled using methods such as electrofishing (spring or fall), shoreline seining (summer to assess fish reproduction), and/or gillnetting (fall). In addition, basic water chemistry parameters such as dissolved oxygen; pH and nutrients are recorded during the summer months when the water columns are most stratified. Fish population data are then assessed by experienced fishery biologists for the purpose of determining a lake's actual or potential recreational value as a fishery and recommendations are made to maintain or enhance the resource.

It is important to note that although the Bureau of Freshwater Fisheries is principally concerned with the recreational value of the fisheries they assess, the assessments they provide are based upon the diversity of a wide range of fish species and not just species of recreational value. This is because many sport fish are carnivorous and depend upon an abundant and diverse forage base to support their populations. Species stocked by the Bureau are also identified and addressed in the assessments.

For this 2000 New Jersey Water Quality Inventory Report, the Bureau of Freshwater Fisheries based upon fish inventories of selected lakes and reservoirs of over 100 acres in size with public access for recreational fishing supplied assessments. This resulted in 10 lakes and reservoirs totaling 9875 acres being assessed. Assessment data range from 1993 to 2000. Assessments conducted during or after 1995 are considered "monitored" for this report while those conducted prior to 1995 are considered "evaluated". NJDEP plans to expand the use of fisheries assessments in future Water Quality Inventory Reports. Table 9 describes the aquatic life use assessment method based on the Bureau of Freshwater Fisheries lake inventories.

Table 9: Lake Aquatic Life Designated Use Assessment Method

Aquatic Life Assessment	Fishery Description
Full Support	Fishery is well balanced, exhibiting good diversity. Consistent recruitment. No one species dominating the community. No observable factors limiting the fishery
Full Support but Threatened	Fully support fishery, however, anticipated changes in surrounding land use, lake water levels or in-lake water quality have the potential to cause future declines in fishery quality
Partial Support	Fishery present, however, fish diversity not at potential expected for the type of lake in question. Predator to prey populations are not in balance, inconsistent recruitment
No Support	Fishery exhibits poor diversity. Fishery dominated by a few tolerant species (carp, goldfish, mudminnows, killfish, etc) &/or general overall number of individuals is low. Poor recruitment and growth of individuals

Recruitment refers to the number of young fish, which survive to ultimately become large enough to reproduce and/or become harvestable. For example: reproduction of a number species of fish in a lake may be good but there may be insufficient habitat cover resulting in many of these fish being eaten by their larger counterparts before they grow to sufficient size to either reproduce or be sought after by anglers. In such a scenario, recruitment is regarded as poor.

The lake aquatic life designated use assessment results for 3 lakes within the Upper Delaware were: Lake Hopatcong (Morris County) resulted in threatened use assessment in 1995/1996. Lake Hopatcong was classified as fully supporting aquatic life uses but threatened due to accelerated eutrophication brought about by nonpoint source pollution from the communities immediately surrounding the lake, especially from septic systems. The Clean Lakes Program also classified Lake Hopatcong as eutrophic. Lake Aeroflex (Sussex County) assessed in 1995 and Merrill Creek Reservoir (Warren County) assessed in 2000 resulted in full support use assessment.

Lakes Recreational Designated Use: Sanitary Quality

The sanitary quality of water at the bathing beach is monitored by the entity responsible for operating the beach, including county and local health agencies and private entities. Some lakes included in this assessment are privately owned and operated, including camps, private schools or lake associations.

New Jersey Department of Health and Senior Services (NJDHSS) regulations govern the collection of these data and beach closures based on elevated levels of fecal coliform (FC). Under these guidelines, fecal coliform bacteria are monitored at least weekly during the bathing season (typically Memorial Day to Labor Day). If concentrations exceed 200 FC/100ml sample, the beach is sampled again the following day and is closed and remains closed until levels meet the standard. Sanitary surveys are performed to identify and address bacterial pollution sources. Levels of fecal coliform bacteria are used to indicate the presence of fecal pollution, which may be harmful to human health. NJDEP's Cooperative Coastal Monitoring Program from the NJDHSS compiled data for this assessment. This initial assessment relied on fecal coliform data provided by NJDHSS. Ideally, future assessments will rely on beach closure data as well.

The following assessment method was adapted from the USEPA Guidance for Preparation of Water Quality Inventory Reports (EPA, 1997)

Table 10: Lakes Recreational Designated Use Assessment Method

Use Support	Definition
Full Support	Less than 10% of samples exceed 200 FC/100 ml
Full but Threatened	Less than 10% of samples exceed 200 FC/100 ml but statistically significant trends indicate that greater than 10% of samples will exceed the standard by the next reporting cycle (currently 2 years)
Partial	Greater than 10% but less than 25% of samples exceed 200 FC/100 ml
None	More than 25% of samples exceed 200 FC/100 ml

Within New Jersey, 376 lake bathing beaches located on 310 lakes have been identified; some lakes have more than 1 beach. Recreational designated use attainment was assessed separately at each beach. Since data was collected within the last 5 years, this assessment is based on monitored results. There are 89 recreational lake beaches within the Upper Delaware Watershed that have been accessed for their water quality. The majority of the recreational lake beaches, 61 are designated as having full support, 10 have partial support, 5 show none, no support and 13 recreational lake beaches' data were not available. This data was not available either for lack of data or the beaches were closed in 1999. The full attainment status results for the recreational lakes beaches in the Upper Delaware are noted in a table in Appendix C: Recreational Lake Beach Water Quality in 1999.

Eutrophication

Much of the DEP's information regarding lake eutrophication comes from the Clean Lakes Program. Lake eutrophication is a widespread issue in New Jersey and is characterized by elevated levels of suspended sediment, nutrient and algal concentrations. Aquatic life may be stressed due to dissolved oxygen fluctuations and in extreme situations, fish kills may occur. Eutrophic conditions generally lower the aesthetic and recreational value of the lake. Although all lakes naturally progress to eutrophic conditions, then become wetlands (especially those created as stream impoundments), this process is being accelerated by excessive inputs of nutrients and suspended sediments from point and nonpoint sources. In addition, an important factor to consider in New Jersey lakes is that most of them are shallow stream impoundments constructed for a variety of purposes including flood and sediment control. These shallow impoundments are highly prone to eutrophication.

Table 11 shows the results of lakes assessed in the Upper Delaware Watershed. All the lakes are eutrophic either for macrophyte, algae or total phosphorous.

Table 11: Lake Trophic Status Assessment Results

County	Lake	Surface Area	Total Phosphorous (mg/l)	Chlorophyll a (mg/m ³)	Trophic Indicator	Trophic Status	Report Date
Morris	Hopatcong	2658	0.08	97.71	Macrophytes, Algae	Eutrophic	1989
Sussex	Cranberry	296	0.07	6.82	Macrophytes, Algae	Eutrophic	1989
Sussex	Marcia	19.2	0.03	8.29	Total Phosphorous (TP)	Eutrophic	1989
Sussex	Musconetcong	321	0.04	14	Macrophytes, Algae	Eutrophic	1989
Sussex	Sawmill	20	0.03	20.41	Macrophytes, Algae	Eutrophic	1989
Sussex	Steenykill	37	0.14	3.67	Macrophytes, TP	Eutrophic	1989
Sussex	Swartswood	505	0.06	33.8	Algae, Macrophytes	Eutrophic	1989
Warren	Columbia	30	0.07	16.54	Algae, Macrophytes	Eutrophic	1989
Warren	Ghost	7	0.06	3.51	Macrophytes, TP	Eutrophic	1989

The Clean Lakes Program was designed by USEPA to facilitate identification and remediation of impaired lakes. Lake associations, municipalities or other entities, identified public lakes with water quality issues; studies were conducted to characterize water quality and as funding was available, remediation projects were conducted. Data collection included a suite of indicators such as total phosphorous, Secchi disk transparency and chlorophyll a levels to determine the trophic state of lakes. Much of the impairments brought to DEP's attention through the Clean Lakes Program centered around algal growth impairing swimming and in some cases boating.

The Effect of Recreation on Water Quality

Some recreational factors that impact water quality include MTBE, Methyl tertiary butyl ether, from boat engines; erosion of stream banks and shorelines from wave action from boats and over use of fishing access points creating erosion that impacts fisheries; litter accumulation; and the affects of fecal coliform on water quality.

Boating and Water Quality

Boating is a very popular activity that can impact water quality. Poorly maintained engines can leak oil, grease and gasoline into the lake and threaten the health of the lake. One emerging concern is related to the pollution of our waterways by gasoline additives. The Clean Air Act Amendments (CAAA) of 1990 mandate seasonal or year-round use of oxygenated compounds in gasoline in specific areas of the United States. Methyl tertiary butyl ether (MTBE) has historically been the most widely used oxygenate in the United States to reduce smog-causing emissions. Oxygenates, when added to gasoline, are designed to add oxygen to the gasoline, thereby decreasing vehicular carbon monoxide emissions and ozone levels in the atmosphere. Oxygenated gasoline is used in watercraft on lakes across northern New Jersey.

MTBE is a suspected carcinogen (cancer causing) additive. Since MTBE is highly soluble in water it is drawn to water and is very slow to biodegrade. It is flammable, colorless and volatile. This fuel can be introduced into waters simply by operating a gasoline-powered watercraft. There are few lakes within this region that allow the use of gasoline-powered watercraft. As stated in the survey findings section of this report, the lakes that do allow this type of watercraft are Lake Hopatcong, Lake Musconetcong, Cranberry Lake and Lake Lackawanna. The other lakes in the watershed have environmental restrictions, which prohibit the use of gasoline-powered engines; most state park lakes are "Electric Motor Only" use so that there is a minimal environmental impact to the overall water quality of that lake. According to a study conducted by the U.S. Geological Survey in cooperation with the Sussex County Health Department two lakes in Byram Township, Lake Lackawanna and Cranberry Lake, have concentrations of MTBE that is of immediate concern. This study recommends a regional assessment of the occurrence of these compounds in the lakes that allow the use of gasoline-powered engines.

Erosion and Water Quality

Another impact recreation can have on water quality occurs from bank or shoreline erosion at access sites. Streambank erosion is a natural process that occurs over time, but it can also be induced or accelerated by human activities. The eroding bank or shoreline contributes sediment to the waterway. This sediment can decrease the water clarity, which reduces the sunlight available to algae and aquatic vegetation. Decreased water clarity decreases the photosynthetic rate; that in turn decreases the dissolved oxygen being added to the water, in turn decreasing the amount of aquatic vegetation. Sediment is detrimental to coldwater fisheries. The eggs of many trout species can easily be suffocated and/or killed.

The problem of streambank and shoreline erosion is a complex issue. Erosion can occur for a number of reasons. When sites are over used, vegetation is trampled and soil stability is lost. This erosion indicates heavy use of an area either by fisherman or boaters and can also be affected by boat ramps at lakes. Recreational users can over-use short-cut paths down to the waterway thus causing trampling of vegetation leading to the loss of vegetation exposing soil for erosion. Vegetation at the waters edge can reduce soil erosion by providing soil stability through the plants' root network. This problem can be alleviated if recreational users follow the designated trails and paths to the waterways that have been established as accesses. If there are no specific trails or paths established as accesses to the waterway, paths should be constructed and maintained as to prevent excess erosion from occurring. Also, wave action from boat wakes can cause erosion of stream banks, especially in lakes. Maintaining no wake areas close to shore can help reduce this type of erosion.

Litter is normally found where there is a concentration of people, such as at commercial or recreational areas. Litter creates visual pollution and it impacts the water quality and wildlife habitat of the area. The litter left by fisherman, boaters or swimmers is dangerous to the aquatic species that live within the waterways. Litter also impacts the terrestrial wildlife that depends on that waterway as their source for

water and food. The plastic litter is especially harmful to the aquatic wildlife, which can become entangled in fishing lines or ingest small pieces of debris mistaken for food. The monofilament nylon fishing line that most anglers' use does not decay as easily as the older silk line, once used, that decayed rather quickly. The newer line remains unchanged and a hazard for a long time. Entanglement in the line can sever wings and limbs; waterfowl can suffer from lacerated beaks and throats when the line is ingested causing the animal to starve to death.

Fecal coliform contaminations from humans and wildlife can impact both the recreational impact on water quality as well as the water quality impact on recreational use. Fecal coliform bacteria levels in water provide an indication of pollution from human or animal feces, which may contain organisms such as *E. coli* that are harmful to human health. The presence of fecal coliform in a lake can have a negative impact on the recreation use of the area, mainly resulting in swimming beach closures. The levels of fecal coliform bacteria are used to indicate the presence of fecal contamination, which may be harmful to human health. The majority of New Jersey's lakes, bays and oceans' bathing beaches has excellent water quality and are therefore considered "swimmable". Fecal coliform bacteria criteria were established in the state in order to protect human health and can be found within the New Jersey Water Quality Inventory Report (2000 New Jersey Water Quality Inventory Report, 5-2001). Water quality data on fecal coliform levels are collected at Ambient Stream Monitoring Network stations, which are typically not located where swimming or secondary contact recreation occurs. In addition, this assessment considers sanitary quality of rivers, but does not consider recreational beach amenities or access to the stream. Thus, these data are not appropriate for assessing risks to human health associated with swimming in rivers so they are not useful in assessing compliance with primary or secondary contact designated use.

Water quality impacts on recreation

In the previous section we explored how recreational uses can impact water quality. In this section we will explore how the quality of our lakes and streams impact the recreational uses of the region. The same surface water quality standards exist and are applied when looking at the quality of the water that is going to be used for a recreational use. The waters should be fishable and swimmable.

Some potential sources of environmental impacts on water quality include sediment from agriculture and construction, fertilizers and pesticides from agriculture and lawns, and bacteria from humans, wildlife domestic animals and farm animals as well as inputs from malfunctioning cesspools and septic systems. The following are examples of impacts having a negative effect on the recreation that can occur at various locations.

Water quality impacts the recreational sport of fishing in that it restricts the types of fish caught in some waterways as well as restricting the amount of fish that can be consumed by people. Many of the fish caught within the state's waters are generally healthful to eat. There have been some advisories for people to reduce consumption of certain types of fish caught due to toxic effects of mercury. These fish advisories apply to select species, more specifically those species that are at the top of the food chain. Mercury accumulates in fish tissue, so the fish at the top of the food chain are targeted because they eat smaller fish with mercury in their tissues. The mercury builds up in the larger fish tissue through a process called bioaccumulation. In the Upper Delaware Watershed the fish species these advisories apply to include largemouth bass and chain pickerel. The table 12 displays the lakes in the watershed that have such advisories placed on them. Additional information on fish advisories can be found on the NJDEP website at www.state.nj.us/dep/dsr/njmainfish.htm.

Table 12: Consumption Advisories for Largemouth Bass and Chain Pickerel for lakes within Upper Delaware Watershed. From New Jersey Freshwaters

Lake	County	Species	Advisory **	
			General Population	High-Risk Individual
Cranberry Lake	Sussex	Bass	Do not eat more than once a week	Do not eat more than once a month
		Pickerel	No restrictions	Do not eat more than once a month
Lake Hopatcong	Sussex/Morris	Bass	No Restrictions	Do not eat more than once a month
		Pickerel	No Restrictions	Do not eat more than once a month
Merrill Creek Reservoir	Warren	Bass	Do not eat more than once a week	Do not Eat
		Pickerel	Do not eat more than once a week	Do not eat more than once a month
Swartswood Lake	Sussex	Bass	Do not eat more than once a week	Do not eat more than once a month
		Pickerel	No restrictions	Do not eat more than once a week.

As of June 1997.

**One meal is defined as an eight-ounce serving.

*High-risk individuals are pregnant women, women planning pregnancy within one year, nursing mothers and children under five years old.

Humans use lakes and reservoirs for water storage, potable water supply, recreational boating, fishing and swimming. These same water bodies also provide a habitat for a large variety of aquatic and wildlife species. Aquatic life depends on balance in the water bodies' environment. An imbalance can occur either naturally or through human-induced events. The impact of fertilizers or pesticide from agricultural or residential application can cause eutrophication to occur in a waterway, especially in a lake or reservoir. As mentioned earlier, eutrophication is the premature aging of a water body from too many nutrients and too little oxygen. When human-induced cultural eutrophication occurs, nutrient, soil, or organic matter loads to the lake are dramatically increased. A lake's lifespan can be shortened drastically by activities such as forest clearing, road building, cultivation, residential development, and wastewater treatment discharges because these activities increase soil and nutrient loads that eventually move into the lake.

Human-induced eutrophication also occurs when nitrogen or phosphorus from fertilizers run off into lakes or ponds; this can cause a sudden and excessive growth of algae and aquatic plants. When these plants die and decay, they deplete the oxygen needed by the fish and other aquatic life. This process can promote the aging process of the lakes prematurely. Eutrophication is more noticeable in the lakes in New Jersey because many are shallow or man-made impoundments that are highly prone to accelerated inputs of nutrients and sediments. This excessive growth of algae and vegetation can impair the lakes' use for swimming, boating and/or fishing.

Lake Hopatcong is concerned about the threatened accelerated eutrophication brought about by the non-point source pollution that occurs from the surrounding community. There are many of different approaches that can be taken to restore or manage this water quality impact on these lakes. One approach is to reduce the lake fertility by controlling nutrient availability by restricting the use of commercial fertilizers containing phosphorous. Another approach is to treat the products of over-fertilization thus controlling plant production in the lake. Methods used to control plant biomass include

artificial circulation, water level draw down, weed harvesting, chemical treatments (herbicides and algaecides), biological controls, and shading and sediment covers for macrophyte control.

Summary and Conclusions

Clean water is essential, especially for outdoor recreational pursuits that include swimming, boating and fishing. These recreational activities translate to tourism dollars, which benefit the local economies and regions in which they are located. With all the state parks, forests, wildlife management areas, county parks, municipal parks and informal pull-off parking areas, the Upper Delaware Watershed offers many opportunities to commune with nature. Area residents of the five sub-watershed regions can enjoy the many pristine areas of water-based recreational opportunities. This report intends to serve as a baseline in characterizing publicly accessible water-based recreational opportunities that exist in the region. It may also be useful to the state park superintendents, park managers, wildlife management area supervisors, local recreation groups and others in order to determine new locations where water-based recreation can potentially exist. Keep in mind that newly established and well maintained access sites will not only benefit the local economy but will benefit the delicate relationship water-based recreation has on the aquatic environments.

A total of 140 water-based recreational access sites in the Upper Delaware Watershed were accessed. That includes 34 fishing sites, 2 swimming sites, 99 fishing and boating sites and 5 fishing, boating and swimming sites. The Upper Delaware offers lots of opportunities to access and use the water-based recreational sites. Some areas showed evidence of heavier use than others; some had problems with trash, erosion of stream banks and paths down to waterway and maintenance upkeep of the sites. The majority of the access sites were easy to locate and were obvious areas to the public that access to the waterway was allowed. Since there were only 3 access sites out of 140 total that offered access for the disabled community, land managers need to be sure to secure adequate funding in order to increase handicap accessibility to water-based recreation. The environmental problems impacting use of water-based recreation dealt with bacteria and fecal contamination issues; sediment, erosion and trash issues; a rising concern over MTBE contamination; and various environmental and non-point source pollution impacts on fisheries.

As evidenced in the Upper Delaware Watershed, park and recreation programs are intricate components of the regions high quality of life. In the future, evaluation of the effects of recreation on water quality could be approached through monitoring the effects of the visitor population and the impacts of population growth in the communities adjacent to recreation sites.

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Appendix A

**Methodology for Inventorying and Assessing Public Water-Based
Recreational Resources in the Upper Delaware Watershed**

Methodology for Inventorying and Assessing Public Water-Based Recreational Resources in the Upper Delaware Watershed

Grace Messinger

North Jersey Resource Conservation and Development Council

The Public Water-Based Recreation Inventory was created by the gathering of information that pertained to the publicly water-based recreation sites that exist within the Upper Delaware Watershed. The assessment survey is based on information that was collected through an inventory of the federal, state parks and forests, county, municipal and local parks, wildlife management areas, trout stocked waters, legal access sites and recreation areas. The sites assessed in this inventory were looked at for their public accessibility and for their opportunity to offer water-based recreation in the form of swimming, fishing and/or boating.

A survey form was created that would be used in conjunction with a Global Position System (GPS) that would collect the coordinates of the access sites. The main questions or categories in the form can be grouped into 5 sections.

1. Gives an understanding of where the area is located, and gives general characteristics of that site
2. Looks at a general overview of what is available at the access site and what type of recreation area are available
3. Expands on the 2nd section, the information becomes more specific to the access site, naming the specific water-body and expanding on the recreational opportunities that exist at that location
4. Looks at overall and more specific observations made in the field as to the "Health" or quality of the site, it looks at amount of trash visible, erosion of the banks of the waterway and gives room for general observations and comments about the environmental characteristics of the site.
5. Any additional information that might be important to this site and who one might contact for further information or resources about the site

This survey form was created in an access database so that it would be user friendly in the field as well as when inputting data into the system. When inputting information into the database check boxes and drop-down lists of things to chose from appear.

Data Collection Methodology

The information for the survey was collected through fieldwork. Met with park superintendents, wildlife management area supervisors and canoe clubs in order to survey the locations of their respective area. The majority of the sites were determined through this type of investigation, the remaining access sites were collected by driving through the watershed area surveying the pull-off areas, looking for any sort of public access that might exist along a waterway, locating municipal, county and town parks and researching sites that were recommended as access areas through various canoe books and references. A survey was completed for each access site, sometimes more than one existed at a location and a GPS coordinate was collected.

RECREATIONAL RESOURCES SURVEY FORM

General Information

Location Name: The general name of the access site: stream, river, lake, pond or Wildlife Management Area is filled in here. For example High Point State Park is a general location of an access area. If no general name or title exists for the area complete this section with the name of the waterway and the roadway intersections that it is near.

Date: Enter month, day and year the survey is being inventoried.

County: Drop-down lists of the 4 counties that are covered with the Upper Delaware Watershed Area appear. One can chose from *Hunterdon, Morris, Sussex, or Warren*

Township Name: The name of the township or borough where the access site is located

Name of Access Site: The specific name of the access site is completed here. For example Lake Marcia would be the Name of the Access Site found within the Location Name of High Point State Park. If no specific access name exists fill this section in with the waterway name.

GPS Coordinates (North): The northing reading from the Global Positioning System unit is recorded, otherwise known as the latitude. The points were collected in Geographic Coordinates, NAD 27 and converted to State Plane, NAD 83, New Jersey – 2900, U.S. Survey Feet

GPS Coordinates (East): The easting reading from the Global Positioning System unit is recorded, otherwise known as the longitude. The points were collected in Geographic Coordinates, NAD 27 and converted to State Plane, NAD 83, New Jersey – 2900, U.S. Survey Feet

Site Offerings:

Signs for access site: Put a check mark if there are any signs seen

Are Signs Visible? Put a check mark in the box if the signs are visible.

Type of Sign: This box is only completed if the first two boxes about signs are marked. Types of signs can be state park signs, Wildlife Management Area signs, Trout Stocked Water signs, recreational area sign, natural area signs, try to be generic in completing this section on the type of sign.

Parking: Check this box if an area for parking exists at the access site.

Number of Spaces: Only complete this box if there is a check mark in the “Parking?” box. Count the number of parking spaces that exist for the site.

Parking Fee? If there is a fee for parking at the access site, write in this box. This box will only let you write in a single dollar amount for the database.

Bathroom Facility: Check this box if a bathroom facility exists on site.

Picnic Area? Check this box if an area exists that is considered a picnic area.

Handicap Accessible? Check this box if the access site is handicap accessible. State park superintendents mentioned that the parks have been updated to aid and encourage the use and visits from the physically disabled, but they might not be considered fully “Handicap Accessible”

RECREATIONAL ASSESSMENT and INVENTORY OF PUBLIC ACCESS SITES

WITHIN THE UPPER DELAWARE WATERSHED OF NEW JERSEY

Location Name:	<input type="text"/>	Date	<input type="text"/>
County:	<input type="text"/>	Hunterdon Morris Sussex Warren	GPS Coordinates (North): <input type="text"/>
Township Name:	<input type="text"/>		GPS Coordinates (West): <input type="text"/>
Name of Access Site:	<input type="text"/>		
SITE OFFERINGS:			
Signs for access site?	<input type="checkbox"/>	Are signs visible?	<input type="checkbox"/>
Type of Sign:	<input type="text"/>		
Parking?	<input type="checkbox"/>	Number of Spaces	<input type="text"/>
Parking Fee ?	<input type="text"/>		
Bathroom Facility?	<input type="checkbox"/>		
Picnic Area?	<input type="checkbox"/>		
Handicap Accessible	<input type="checkbox"/>		

Type of Facility:

Access Ownership: A dropdown box appears when entering this data into the database. The following types of ownerships exist to choose from or one can be typed in: Federal Park, State Park, County Park, Municipal Park, Recreation Area, Wildlife Management Area, Legal Access Site, Trout Stocked Waters. For example the Access Ownership of High Point State Park is a State Park.

Fishing: Check this box if fishing is allowed and available.

Swimming: Check this box if swimming is allowed.

Some form of boating available: Check this box if some form of boating is allowed and available.

Type of Boating: A dropdown box appears with a list of the different types or categories of boating that could exist at the access site, if the type available is not in the list it can be entered in the box. Chose from the following: *Canoeing; Row Boat; Motor Boat; Jet Ski; Canoe, Row Boat and All forms of boating.*

Environmental Restrictions: Place a check mark in this box if an environmental restriction exists at the access site. For example some lakes only allow certain types of engines to be used at that location, "Electric Motors Only " would be an environmental restriction

Environmental Restrictions: Only complete this box if above an environmental restriction exists.

Dropdown box lists the environmental restrictions that can apply to an access site. Chose from the following: *No restrictions, Electric Motor Only, Man-powered (non-motorized), Mask Height Restrictions.*

TYPE OF FACILITY:

Access Ownership

Federal Park	Recreation Area
State Park	Wildlife Management Area
County Park	Legal Access Site
Municipal Park	Trout Stocked Waters

Fishing:

Some form of boating available:

Environmental Restrictions:

Swimming:

Type of boating:

Canoeing
Row Boat
Motor Boat
Jet Ski
Canoe, Row boat
All forms of boating

Environmental Restrictions

No restrictions
Electric Only
Man-power (non-motorized)
Mask Height Restrictions

Water Body

Water Body Name: Write the name of the specific waterway where the access site is located

Water Body type: A dropdown box of the various types of water bodies that exist: *River, Stream, Pond, and Lake.*

Use of Water Body: This is where a more specific explanation of the types of water-based activities that exist at the access site are identified and described.

Swimming

Designated Swimming: Check box for if there is a designated swimming area at the site, for example Lake Marcia has a designated swimming area

Beach Access: Check box if there is access to a beach

Changing Area: Check box if there are areas available for changing

Food Vendors: Check box for if there are food vendors available on site to supply food and drinks

Boating and/or Canoeing

Trailer Launch: Check box if there is a specific area where a trailer can be used in order to launch a a boat into the waterway

Car-top Launch: Check box if there is a place where one can launch a boat transported by car-top such as a canoe or kayak. Where a vehicle is not needed to back into the water for placement of the boat.

Dock Launch: Check box if there is a dock present that can be use to launch a boat

Bridge Access/Launch: Check box if one can launch a boat from a bridge or if this is the only access one might have to the waterway in order to launch a boat.

Describes "Put-in" Ease: Describe the effort or ability needed to launch a boat into the specific waterway. There is a maximum of # of letters that can be written in this area when entered into the database.

Fishing

Type of fishing available: Chose from the following general categories of fish types that could be caught in the waterway: *Cold Water, Warm Water, Warm and Cold Water*. For example if the stream is known for being able to catch trout, one can assume it is a cold water stream.

Fishing Restrictions: A dropdown box was created to choose from what types of fishing is allowed or available at the access site. Chose from the following: *Fly, Rod, Fly or Rod, Ice Fishing, No Restrictions*. For example there are areas along the Flat Brook that only allow the trout to be catch with the use of a fly, so fly would be the restriction on fishing at this section. This box was only completed for areas that specifically mentioned a fishing restriction for the area.

Bridge Access: Check box if the fishing is accessible from a bridge.

Shoreline Access: Check box if the fishing is accessible from the shoreline of the waterway.

Boat Access: Check box if the fishing is accessible from a boat within the waterway.

WATER BODY :

Water Body Name:

Water body type:

River

Stream

Pond

Lake

USE OF WATER BODY:

<p><u>Swimming:</u></p> <p>Designated Swimming: <input type="checkbox"/></p> <p>Beach Access: <input type="checkbox"/></p> <p>Changing Area: <input type="checkbox"/></p> <p>Food Vendors: <input type="checkbox"/></p>	<p><u>Boating and/or Canoeing:</u></p> <p>Car-top Launch: <input type="checkbox"/> Trailer Launch: <input type="checkbox"/></p> <p>Dock Launch: <input type="checkbox"/> Bridge Access Launch: <input type="checkbox"/></p> <p>Describe "Put-in" Ease: <input style="width: 200px; height: 80px;" type="text"/></p>	<p><u>Fishing:</u></p> <p>Type of fishing available: <input type="text"/></p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"><p>Cold Water</p><p>Warm Water</p><p>Warm and Cold Water</p></div> <p>Fishing Restrictions: <input type="text"/></p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"><p>Fly</p><p>Rod</p><p>Fly or Rod</p><p>IceFishing</p><p>NoRestrictions</p></div> <p>Bridge Access: <input type="checkbox"/></p> <p>Shoreline Access: <input type="checkbox"/></p> <p>Boat Access: <input type="checkbox"/></p>
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Quality of the Site

Visible Trash: Check box if there is any sort of trash or garbage visible at the access site.

Garbage Receptacle: From the dropdown box choose one of the following if they exist at an access site: *Yes-Garbage cans ARE available, NO- Garbage cans are NOT available, Carry In / Carry Out- most state parks*

Amount of Trash: A dropdown box was created to get an idea of the amount of trash that was visible at site. This box is only completed if there is visible trash. The amounts to choose from are the following: *Min.- less than 10 pieces visible, Mod. – 10 to 50 pieces visible, Excessive – more than 50 pieces are visible.*

Location of Trash: Only complete this box if trash is visible. Chose from the following as to where the trash is located: *In Stream, On-banks or shoreline, In-stream and on bank or shoreline.*

Use of Site/Physical Characteristics:

Over-use visible? Check box if there is evidence of over-use, for example does the vegetation look trampled, are there large amounts of trash visible that might lead you to think this site is being abused or over-used.

Comments on visible use: Comment and describe what the uses of this area might be by just taking a visual look at the overall condition of the site.

Use of Sites: Use of the area NOT causing environmental impact: Check box if the area looks not to be having a negative environmental impact to the waterway.

Use of Sites: Use of the area IS causing environmental impact: Check box if the area looks to be having an environmental impact to the waterway.

Area Maintained? Describe if the area looks to be maintained and who might be the one maintaining it.

QUALITY OF SITE:

Visible Trash:

Garbage receptacle:

Amount of trash:

Location of Trash:

Min- less than 10 pieces visible
Mod. - 10 to 50 pieces visible
Excessive - more than 50 pieces visible

In Stream
On banks or shoreline

Yes- Garbage cans ARE available
No- Garbage cans are NOT available
Carry in/ Carry Out- most state parks

Use of site/physical characteristics

Over-use visible?

Comments on visible use:

Use of sites: Use of area NOT causing environmental impact

Use of area IS causing environmental impact:

Area Maintained?

“HEALTH” of Bank:

Fishing Access Site: Condition of Bank (Look at Erosion): Complete if fishing access site exists. Chose from the following 3 categories that describe the health of the bank: *Severe- Vertical Banks, Moderate – Vegetative Cover, Not Eroding – No visible erosion.*

Boating Access Site: Condition of Bank (Look at Erosion): Complete if boating access site exists. Chose from the following 3 categories that describe the health of the bank: *Severe- Vertical Banks, Moderate – Vegetative Cover, Not Eroding – No visible erosion.*

Additional Information:

Resources Available about Specific Location: List any resources that might be available for the specific location.

Who to contact for further information: Write down a person or agency one might be able to contact in order to learn and receive more information about the specific access site.

"HEALTH" of Bank:

Fishing Access Site:

Condition of Bank (Look at Erosion):

Severe - Vertical Banks
Moderate - Vegetative Cover
Not Eroding - No visible erosion

Boating Access Site:

Condition of Bank (Look at Erosion):

Severe - Vertical Banks
Moderate - Vegetative Cover
Not Eroding - No visible erosion

ADDITIONAL INFORMATION:

Resources Available about Specific Location:

Who to contact for further information: