

RECREATION

Recreation can be defined as any type of conscious enjoyment that occurs during leisure time. Recreation resources such as an athletic facility, an open meadow, or a fishing area can be classified as natural resources and/or man-made resources that are used for the conscious enjoyment of leisure time. For the purposes of this study, only outdoor recreational facilities such as parks and greenways and activities associated with natural resources such as hiking, and fishing will be discussed. The identification of these facilities and activities is important in watershed management because they provide a linkage between environmental quality and use of natural resources.

Characterization

Parks and Greenways

Recreation is only one type of land use competing for land in the allocation of scarce resources. As development pressures have intensified, Delawareans have become increasingly concerned about losses of forest and open space to development. Compared to our neighboring states, Delaware has less public parkland per citizen. As the state and the Piedmont Basin region continue to experience increased development and population growth, the acquisition of additional land for public outdoor recreation will be a top priority in the State Comprehensive Outdoor Recreation Plan (SCORP). As population density increases in the Piedmont Basin, linear areas of open space or greenways connecting parks with population centers will help support greater use and maximization of our limited recreational resources.

Parks, recreational facilities, and open space are an important part of the social, cultural, and physical fabric of the community. Collectively, they embody a significant environmental resource that enhances both the health of the environment and the citizens of the basin. Although land dedicated to public recreational use in state, county, and municipal parks in the Piedmont Basin totals 9,000 acres (see Map 31), demand for outdoor recreation and recreational facilities exceeds the capacity of a significant portion of the Piedmont Basin's recreation base/resources. The demographics of the population — its nature, density, and distribution — greatly influence the need and demand for recreation and open space. Demographics by sub-watershed vary substantially and determine the scope and intensity of recreational needs in those communities.

A statewide recreational needs survey was conducted by DNREC's Division of Parks and Recreation with the cooperation of the University of Delaware College of Urban Affairs in

spring 1995. The Piedmont Basin results again supported the fact that differences in demographics by sub-basin resulted in different perceived recreational needs. In older, more stable areas, such as the Brandywine and Red Clay sub-basins, there were no perceived additional recreational needs, with the exception of more paved walking, hiking, and biking trails. In newer, rapidly developing areas such as the White Clay and Christina sub-basins, the need for additional open space and recreational facilities of all categories ranked high.

Fish and Wildlife Recreation

Recreational opportunities such as hunting, fishing, and boating have traditionally been and continue to be limited in the Piedmont Basin due to suburban sprawl and high human population. Boating has also been restricted due to a limited number of public boat ramps. Although limited, those sporting activities available in the basin provide some of the most unique opportunities in the state. Arguably, the most unique of these opportunities, and one that receives tremendous participation, is the freshwater trout fishing available at six designated trout streams within the basin (see Map 32). The Division of Fish and Wildlife annually stocks more than 30,000 legal-sized trout along 19 miles of these streams, the only streams in Delaware that receive trout. The number of anglers purchasing Delaware's required state trout stamp annually exceeds 5,500, with the majority (48.9% or 2,718) of these anglers residing in the Piedmont Basin. One of these trout streams, White Clay Creek, has a fly-fishing-only section, providing anglers an unparalleled experience within the state.

Another unique fishing opportunity in the Piedmont Basin is Brandywine Creek, which provides the only sustainable smallmouth bass fishery within the state. This water body also occasionally yields unusual catches, such as muskellunge, and other species that are transients from nearby Pennsylvania. Other popular fishing areas within the basin include Christina River and Becks Pond, each of which have public boat-launching facilities — two on the Christina River and one at Becks Pond.

Unfortunately, the Piedmont Basin also has several water bodies that have fish consumption advisories due to the presence of contaminants found within edible portions of some fish. These water bodies of concern include Red Clay Creek (PCBs, dioxin, and chlorinated pesticides); the Christina River (PCBs); and portions of the Brandywine, White Clay, Little Mill, and Christina creeks (PCBs). However, none of the areas stocked for recreational fishing shows significantly elevated levels of contaminants, and no advisory is being issued for these areas.

Hunting opportunities within the basin occur primarily on private property, as no State Wildlife Areas exist in the region; however, both the White Clay Creek and Brandy-

wine Creek State Parks use recreational hunting as a mechanism to control excessive deer populations. Although there are limited hunting opportunities within the region, hunting is an important recreational activity among Piedmont Basin residents, as approximately 30% (5,992) of all state resident hunting licenses are sold within the region. The establishment of a special non-migratory Canada goose season has expanded waterfowl hunting opportunities in the area, but these activities have thus far been limited to several local golf courses and country clubs that experience problems with nuisance geese populations.

Outdoor recreational activities during the summer are very susceptible to problems associated with high mosquito populations. The Division of Fish and Wildlife's Mosquito Control Section conducts extensive surveillance and control of nuisance and disease-carrying mosquitoes. One form of routine surveillance in the Piedmont Basin consists of six light traps operated seasonally in four of the watersheds. These traps are used to monitor nightly increases of mosquito populations and to assess annual population levels. Annual populations are assessed based on the number of "nuisance-free nights" between June 1 and September 15 (107 days). A "nuisance-free night" is a dusk-to-dawn period when fewer than 25 female mosquitoes of a known nuisance or potentially disease-vectoring species are captured per light trap. The average annual number of "nuisance-free nights" within the basin — as determined by these six light-trap locations — is 90, or 83% of the surveyed period.

Mosquito-control practices within the Piedmont Basin are generally confined to the extensive marshes and forested wetlands of the Christina River watershed because the hilly topography of the other watersheds does not lend itself to large expanses of standing water usually required for extensive mosquito breeding. Large-scale larviciding via fixed winged aircraft is used to control extensive mosquito breeding over 1,755 acres of marsh at five wetland sites within two watersheds. On average, these marshes are treated 3.25 times per summer, with approximately 8,778 pounds of insecticide applied annually. Additional aerial applications of insecticide occur via helicopter during the early spring in scattered forested wetlands in the southwest corner of the Christina River Basin.

Trends

Parks and Greenways

As northern New Castle County moves from a generally suburban environment to an urban environment, and opportunities for new recreational lands and facilities become minimized, the demand for such lands and facilities increases. Smaller parcels of vacant land within communities are being recognized as possible recreational areas. Linking existing recreational areas to population cen-

ters by a network of greenways will allow greater access to a larger number of residents, increasing their recreational opportunities. Greenways can be defined as linear open space established along either a natural corridor such as a stream valley or ridge line, or a landscaped course for pedestrian or bicycle passage that links parks, nature preserves, cultural features, or historic sites with each other. Greenways provide recreational opportunities "close to home" — a need demonstrated in the State Comprehensive Outdoor Recreation Plan.

As mentioned earlier, there are approximately 8,000 acres of land dedicated to public recreation in the Piedmont Basin. The National Recreation and Park Association suggests that a park system, at a minimum, be composed of a core system of parklands with 6.25 to 10.25 acres per 1,000 population with *adjunct* parkland of regional open space of 15 to 20 acres per 1,000 people, or a total of 21.25 to 30.25 acres per 1,000 people for a well-rounded system of parks and recreation areas. Using those criteria, the population-to-parkland ratio for the basin is approximately 21.4, falling into the "acceptable" range within National Recreation and Park Association guidelines. Although within the acceptable range, the population-to-parkland ratio for the Piedmont Basin is on the lower end of the scale. With rapid growth projected to continue in portions of the basin, active open space acquisition will be necessary to maintain and improve our population-to-parkland ratio.

As with all other resources, recreational resources have a specific *carrying capacity*. In broad terms, carrying capacity is the amount of use a given resource can sustain before irreversible deterioration in the quality of the resource begins to occur. *Recreational carrying capacity* is defined as the number of recreational opportunities that a specific unit of a recreation resource can provide without the significant biological or physical deterioration of the resource or substantial impairment of the recreational experience. Currently, the carrying capacity of many of the Piedmont Basin's recreational resources is maximized or exceeded. This is due not only to population increase, but also to demographic trends in different communities within the region. For example, as the population in the upper portions of the Brandywine watershed ages, demand for playgrounds declines as the need for paved walking trails and senior-oriented forms of recreation increases.

Demonstrated impacts of overuse of recreational resources can be seen throughout the Piedmont Basin. Overused or unmaintained recreational facilities continue to be a constant problem. Vandalism of existing facilities also continues to be a serious concern which, unfortunately, prohibits many recreation providers from expanding or improving recreation programs and facilities. Overuse and inappropriate use of unpaved hiking and walking trails

lead to degradation of resources and result in erosion and destruction of habitat on adjacent lands.

Fish and Wildlife Recreation

Recreational Fishing. Development, industry, and poor agricultural practices in the Piedmont Basin and surrounding areas have had a negative effect on recreational fishing by causing a general degradation of aquatic habitats within the region. An increase in suburban development and “clean” farming practices within the watersheds have increased stormwater runoff and nonpoint source pollution. Increased stormwater runoff and its associated increase in sediment loading have caused a loss of fish habitat by extensive erosion of stream banks and the sedimentation of potential spawning areas. The increase in nonpoint source pollution entering these systems can decrease water quality within both streams and ponds. Individually, poor water quality or loss of suitable fish habitat can suppress game fish populations; however, when combined, their impacts can be dramatic.

Historic industrial and agricultural practices have contributed to the presence of contaminants within numerous water bodies. Many of these contaminants are long-lived and bioaccumulate within fish tissue, which in turn can pose a health risk to humans if consumed. This health risk has prompted the Division of Fish and Wildlife and the Division of Public Health to impose fish consumption advisories for several Piedmont Basin water bodies. Potential sources of these contaminants include the numerous Superfund and hazardous waste sites within the Christina River, Brandywine Creek, and Red Clay Creek valleys, as well as historic agricultural and mosquito-control practices within the watershed.

In an effort to reduce upland flooding and accommodate agricultural practices within wetland areas, early settlers installed an extensive series of dikes and water-control structures (tide gates) along the Delaware and Christina rivers. Many of these tide gates, located on tributaries to these rivers, have been maintained for centuries allowing only one-way exchange out of these formally tidal systems. Maintaining these structures continues to exclude many estuarine and anadromous fish species from tributaries where fishing opportunities exist. These tide gates further impact fishing opportunities by restricting access by game fish and important forage fish species to historic spawning and nursery areas.

Sales of trout stamps have shown that trout fishing in the Piedmont Basin has annually become increasingly more popular. In response, the Division of Fish and Wildlife has increased the number of trout stocked within the region. However, studies have shown that stocking higher numbers of trout does not necessarily result in higher catch rates and that a limiting factor in angler

success is public access to stocked areas. Public access is limited by the posting of private property along these designated streams and the lack of adequate angler parking. Future stocking levels will probably not increase until additional public access is available on those streams currently stocked, or until other streams within the region are determined suitable for stocking.

Public access is also a problem for boaters within the basin as the three public boat-launching facilities are currently inadequate to handle the ever-increasing boat traffic. Currently, there are approximately 8,400 registered boats within the Piedmont Basin. This increased boat pressure has been attributed to a number of factors including improvement in water quality and recreational fisheries in the upper Delaware River and its tributaries and rejuvenation of the Christina River waterfront in Wilmington. However, one of the most substantial increases in boat traffic on the Christina River has been caused by the advent of personal watercraft (“jet skis”). Additional safe and adequate public launching facilities to accommodate these highly popular watercraft, as well as small trailered boats, are needed to provide access to the Delaware and Christina rivers. A potential source of impact to recreational fishing and boating involves the proposed development of an additional water-supply reservoir within the Piedmont Basin. How and where this reservoir is created could have significant impacts on recreational fishing and boating.

Recreational Hunting. The primary impact to recreational hunting in the Piedmont Basin has been associated with increased urbanization and development in the region. Increased suburban sprawl in the basin has limited hunting opportunities because of moral and safety concerns, in many cases resulting in an increase in wildlife populations beyond a social carrying capacity. Excessive deer populations in portions of the Piedmont Basin have caused unacceptable browsing damage to crops and ornamental shrubs and increased deer/vehicular collisions, and have been associated within an increased risk of Lyme disease. Recreational hunting, where it can safely occur, is the recommended management tool to reduce deer populations to acceptable levels on both public and private properties in the basin.

Another species in which hunting is providing the primary tool for population management is resident Canada geese. It is estimated that there are 3,500 non-migrating geese residing within the Piedmont Basin. This population exceeds the species’ social carrying capacity by creating annoyances such as excessive noise, defecation on lawns, eutrophication of small ponds, and herbivory of lawns and ornamental plantings. These problems are especially evident at golf courses and corporate centers where hunting opportunities have been traditionally limited. The Division of Fish and Wildlife has a trap and transfer program that

annually removes approximately 350 geese from these nuisance areas and releases them on State Wildlife Areas; however, this solution frequently just relocates the problem, as many of these geese move off the State Areas and become a nuisance elsewhere. Recreational hunting combined with other damage prevention and control methods — for example, habitat modifications, fencing, and elimination of public feeding — are currently the best solutions. However, in order for this strategy to be successful, more public and private areas where hunting programs can safely occur need to be implemented within the basin.

Philosophical, medical, moral, and ethical objections to the use of pesticides have been increasing in the basin. These objections have to some extent slowed prompt response to mosquito-breeding problems or restricted some mosquito-control practices. These problems have been compounded by the migration of urban dwellers into new developments surrounded by mosquito-breeding habitat. Additionally, several areas within the basin that annually produce the most extensive breeding of pestiferous mosquitoes are formerly tidal wetlands that have been impounded and separated from the mosquito-control benefits associated with tidal exchange. These same marshes require the majority of the pesticides applied.

Positive Initiatives

Parks and Greenways

Although demands on our recreational resources will continue to grow and change in the Piedmont Basin, there are a number of positive initiatives under way. Through the Delaware Open Space Program, the Division of Parks and Recreation has actively been acquiring additional lands for resource protection and recreation. Over 1,300 acres of land have been added to Bellevue, Brandywine Creek, and White Clay Creek state parks since 1991, with an additional 371 acres protected through conservation easements. Additional lands are currently under negotiation by the division for future acquisitions.

The Delaware Greenway Program has made great strides in connecting existing open space with residential and commercial areas and historic and cultural sites. Currently there are several major greenway projects under way. The Northern Delaware Greenway will provide a multi-purpose trail and recreational facility that will link residential areas, parks, and cultural and historic resources. When completed, this greenway will extend from the Delaware River at Fox Point State Park to White Clay Creek State Park near the Maryland state line. The greenway will provide linkages with the City of Wilmington, Brandywine Creek State Park, Delcastle Recreation Area, and the Middle Run Natural Area. The Christina River Greenway is in the planning stages and will provide a river walk along the

Christina in the City of Wilmington and a multi-purpose trail along the middle and upper Christina, linking parks and open space northwest to Newark. The Pencader Greenway will link the rapidly growing Pencader area to the Christina River Greenway by providing pedestrian and bicycle access to community open space and county parks along tributaries and area roadways.

In Newark, a greenway trail is planned, which will link the downtown commercial area north to White Clay Creek State Park and west to the Mason-Dixon Trail System along Christina Creek. The Division of Parks and Recreation is also working with the East Coast Greenway Alliance, which is fostering the creation of an urban greenway network connecting all the major cities along the Atlantic coast, from Boston to Miami. A portion of this greenway network will cross the basin.

Although most greenway projects serve a recreation and transportation component, they also can act to protect and conserve the environment. All the above-mentioned greenway projects also include a land preservation component, especially along stream corridors. A major stream corridor greenway protection program has been undertaken in the Piedmont Basin by the Delaware Nature Society. Through the society's Stream Corridor Greenway Program, landowners in defined stream corridor greenways have been contacted regarding environmentally sensitive land management and means of permanent land protection. To date, more than 763 stream-side landowners have been contacted and have received information regarding proper stream-side management.

Funding for land acquisition and park and greenway development by local governments is supplemented by the Delaware Land and Water Conservation Trust Fund. Established in 1986 as a means for providing a permanent source of funding for local parks and greenways, the trust offers matching grants to communities for this purpose. Since 1986, more than \$5 million have been granted to communities in the basin for park and Greenway acquisition and development.

The Division of Parks and Recreation also assists communities by offering technical assistance. Information can be exchanged regarding recreation and park master planning, open-space acquisition and preservation techniques, greenway development, playground safety, fund-raising, facility management, and recreational programming.

In addition to state programs, New Castle County, the cities of Newark and Wilmington, and the town of Elsmere all support active parks and recreation programs. Both New Castle County and the City of Newark are actively acquiring additional recreational lands. The majority of the new lands purchased by local municipalities has been along streams, primarily the Christina and White Clay creeks. The City of

Wilmington has been proactive in improving trail opportunities through the Wilmington Walkways Program. Every incorporated community in the basin has some land dedicated to open space and parks.

Fish and Wildlife Recreation

In an effort to improve fishing opportunities in the Piedmont Basin, the Division of Fish and Wildlife has developed and is implementing aquatic habitat improvement plans for several public ponds and streams in the region. These include developing long-range fishery management plans, stocking water-quality-tolerant fish species, and creating stream and pond habitat improvement devices (stone deflectors, bank cover devices, and brush shelters). The division also has a program to improve aquatic habitat on private property by providing technical assistance to private pond owners. In 1995, seven pond consultations were conducted within the basin, providing assistance ranging from fish and water-quality sampling to recommending herbicide, mechanical weed control, or beneficial plantings.

The divisions of Fish and Wildlife and Soil and Water Conservation are implementing a wetland rehabilitation program on the tidal tributaries of the Christina and Delaware rivers. Regional objectives of this program, the Northern Delaware Wetlands Rehabilitation Program, include (1) restoring limited tidal exchange between the Delaware Estuary and formerly tidal tributaries and wetlands; (2) restoring spawning, nursery, and feeding sites to several species of anadromous, estuarine, and riverine fish species; and (3) improving a wide variety of recreational opportunities in wetland, estuary, and adjacent upland habitats. One method being used to accomplish these goals is replacement of traditional one-way tide gates with automated or mechanical water-control structures that allow two-way tidal flow.

Initiatives to improve recreational hunting opportunities within the Piedmont Basin are directly tied to reducing excessive wildlife populations to socially accepted carrying capacities. Controlled public hunts in two state parks have been a successful and economical mechanism to control excessive deer populations while also providing recreational opportunities. It is hoped that the success of these controlled hunts will promote additional hunting opportunities on other public and private properties within the basin where deer populations are exceeding social carrying capacities and can be safely harvested.

The control of nuisance resident-geese populations has also increased recreational hunting opportunities through the establishment of a special non-migratory Canada goose season. This recently established season was designed specifically to reduce nuisance geese populations within the region by utilizing recreational hunting as the management tool. To date, the season has had limited success because hunting access has been restricted to several local

golf courses and country clubs. It is hoped that, with time, this management tool will be employed in all areas where recreational hunting can be safely used to reduce nuisance geese populations.

Although the high human population levels in the Piedmont Basin limit fish and wildlife recreational opportunities, this population density does lend itself to environmental education opportunities. During the 1996 state fiscal year, 347 students received boating safety instruction and 200 scientists and teachers were exposed to aquatic resource education activities in the basin, such as Adopt-a-Wetland and Fish Banks programs. In addition, several special youth fishing and hunting events were conducted to expose urban and single-parent youths to these recreational activities. It is anticipated that in the future these educational opportunities will increase as additional emphasis is being placed on environmental education and several outdoor education facilities are being proposed within the region.

Mosquito control within the Piedmont Basin will probably always be necessary at some level to allow the public to enjoy safe outdoor recreational activities since avoidance and tolerance of existing mosquito populations do not appear to be acceptable alternatives. Mosquito control within the basin now involves an Integrated Pest Management approach that uses a variety of control measures to achieve its goals. These measures include water management, biological controls (fish, birds, bats, bacteria), insecticides, and insect growth regulators. This integrated approach provides better control by not relying solely on any one particular control measure, such as pesticides. The Mosquito Control Section is also constantly updating and researching the products they use, in many cases, switching to more expensive but more environmentally sound products.

As the public becomes more educated about pesticides and their uses, the Mosquito Control Section is spending increasingly more time on education and advance notification of spray events. This education is in the form of detailed brochures about the methods and products used, meeting with community civic associations, and presenting information at state fairs and universities. An extension of this education involves eventually updating all mosquito-breeding areas within the basin on an existing computerized data base in order to better monitor pesticide usage and improve mosquito surveillance.

Another objective of the Northern Delaware Wetland Rehabilitation Program is to control pestiferous mosquito populations through improved water management practices, thereby reducing the use of chemical insecticides. These improvements in water management, such as the reintroduction of tidal exchange, are currently being proposed for several large wetland areas that contain extensive mosquito-breeding habitat.