Chapter 1: Overview of Wildlife Conservation in Maryland

Loss of Species and Wildlife Diversity

Landscapes are dynamic, constantly shifting due to storms, floods, fires, and other natural sources of habitat change. Habitat changes have also been imposed for thousands of years by humans. There is evidence that Native Americans altered the habitat in Maryland by burning areas for hunting, and their likely strategy was to maintain openings in areas naturally predisposed to fire (Pyne 1982). Although landscape changes have always been part of the natural process, the colonization of Maryland in 1634 and subsequent new settlements by European immigrants impacted the ecological balance drastically due to the rapid increase of human-related activities and made it more difficult for species and systems to acclimate to such rapid changes. Changes to our native forests, grasslands, and wetlands came as a result of settlement and these changes affected wildlife populations. Forests were cleared to make way for crops and livestock. Trees were felled to build cabins, furniture, ships, and to provide fuel for heat and cooking. Competition from non-native European species began when colonists brought plants and animals from their homeland. Livestock grazed on native grasslands and marshes, and the gradual conversion of native habitats to accommodate the settlers came at the expense of wildlife populations.

European settlers heavily utilized many wildlife species for food and clothing. Wild turkey, passenger pigeon, and white-tailed deer were hunted extensively for subsistence[1]. Other species were considered vermin and killed to reduce livestock losses or to reduce crop damage. Beaver and other furbearing mammals were trapped for their valuable fur. Small game and songbirds were regular sources of food for the expanding human population in Maryland. Market hunting of waterfowl and other wildlife in the 1800s was a common event that supplied the growing cities with fresh meat. Fish, shellfish, and other aquatic species were harvested as well.

With the industrial revolution came pollution that further degraded Maryland's streams and waterways. The remaining forests were logged to produce lumber and charcoal. Coal was extracted to power the factories and railroads. Wetlands were ditched to enhance agricultural production. Canals were dug for commerce and transportation. Rivers were dammed for water supplies, flood control, and power plants. Channels were dredged through the estuaries to enhance shipping ports. Highways were cut through mountains, and road networks fragmented habitats.

The combination of loss and degradation of habitat, subsistence hunting, and vermin control resulted in highly diminished wildlife populations throughout the state by the early 1900s. Some species disappeared from Maryland, and a few of these even became extinct rangewide. Elk, bison, wolves, and cougars have disappeared from the state, while the

[1] All scientific names of animal and plant species used in this document can be found in Appendix 3.

passenger pigeon and Carolina parakeet are now extinct. Some species benefited from the changes to the Maryland landscape, though these were outnumbered by the declining species.

Many of these same alterations to our environment have continued through modern times, exacerbated by Maryland's ever-growing human population. As our human population burgeons and land use pressures intensify, it is increasingly important that we protect our vanishing native species and their habitats. There is clear consensus that the loss and degradation of habitats across the state from Maryland's development and growing economy (including unplanned growth in population and consumption) remains the primary overarching threat to species of greatest conservation need (GCN) as is true nationwide (Trauger et al. 2003).

Extinct and Extirpated Species

The U.S. Congress recognized man's impact on wildlife in its preamble to the Endangered Species Act: "The Congress finds and declares that various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation" (USFWS 1973).

Several species have become extinct in modern times in Maryland. The Carolina parakeet once ranged throughout the eastern United States as far north as the Great Lakes, but became extinct in the 1920s due to destruction of its forest habitat, killing by farmers who considered it a nuisance species, and hunting for its feathers (Cornell Lab of Ornithology 2003). The passenger pigeon is another modern extinction, suffering from severe overharvesting.

An estimated 135 species (111 plants and 24 animals) have been extirpated from Maryland (see Table 1.1). Six of the 24 animals are mammals. One of these species is the eastern cougar, which disappeared from Maryland in the 1800s (Paradiso 1969) and which is listed as an endangered species by the U.S. Fish and Wildlife Service (USFWS 1982a). The southern distribution of the lynx was historically south into western Maryland (Lee 1984). Gray wolves were once so common that they were hunted for a bounty in the late 1700's and early 1800's. The last wolves were purged from the state in the late 1800's. Although both species were apparently present throughout central and western Maryland, the last American bison was shot in 1775 in Garrett County (Paradiso 1969) and the last American elk vanished around 1850 (Lee 1984). The pine marten had a historic range primarily in western Maryland, as did the fisher, which had the opportunity to return to Maryland as a result of a release of 23 animals in West Virginia near the Maryland border in the winter of 1969 (Childs et al. 1989). The snowshoe hare historically was found in the mountains of Maryland, but the release of Canadian individuals has not restored the population and no hares have been seen in three decades (Webster et al. 1985).

The Swainson's thrush no longer breeds in Maryland's mountains and forested wetlands (Robbins and Blom 1996). The federally-endangered red-cockaded woodpecker is also extirpated as a breeding species (Robbins and Blom 1996, USFWS 2003b). The Bachman's sparrow is considered extirpated from Maryland's pine woodlands and grasslands as the northern extent of its range has apparently contracted (NatureServe 2005). Several butterfly

species are currently listed as endangered-extirpated in the state, likely due primarily to habitat loss (MD DNR 2003a). The Maryland darter, this state's only endemic vertebrate, may now be extinct. It was last reported in a single riffle of Deer Creek in Harford County in 1988 (MD DNR, unpubl. data).

Endangered and Threatened Species

DNR's Natural Heritage Program (NHP), currently part of the Wildlife and Heritage Service, is the state's leading program for wildlife diversity conservation. NHP identifies, ranks, and conserves rare and endangered species and natural communities throughout the state. It currently monitors the status of over 1,100 native plants and animals. More than 600 species and subspecies are listed in state regulation as endangered, threatened, in need of conservation, or endangered-extirpated in Maryland (COMAR 08.03.08 and 08.02.12). Most of the state-endangered species are plants (265), and 79 are animals. An additional 79 plants and 20 animals are recognized as threatened in the state. Only a small fraction of all species (38) are also ferderally-listed as endangered or threatened (Table 1.1).

Table 1.1 Summary of Federal and State Listed Species

Federal Listed Species

Category	Plants	Animals
Endangered	5	24
Threatened	4	5
Total	**9**	**29**

State Listed Species*

Category	Plants	Animals
Endangered	265	79
Threatened	79	20
In Need of Conservation	n/a	29
Endangered Extirpated	111	24
Total	**455**	**152**

* Summary of State Listed Species only includes species listed in COMAR 08.03.08. **Source: MD DNR website**

Of the eleven state-endangered mammals, six are federally-listed whales that are occasional visitors or that seasonally migrate through Maryland's marine waters. The federally-endangered Delmarva fox squirrel is endemic to the Eastern Shore region and reintroductions by DNR and others have expanded its population and distribution on the peninsula (Therres and Willey 2002).

Eighteen bird species are state-listed as threatened or endangered, including the federally-listed piping plover that nests on Assateague Island. Many of the state-listed birds are coastal species (e.g., Wilson's plover, least tern, royal tern, gull-billed tern, black skimmer), but others like the threatened Henslow's sparrow and endangered short-eared owl are grassland species in significant decline. The secretive Swainson's warbler is a woodland bird that regularly breeds only in the Pocomoke watershed on the Eastern Shore, while the northern goshawk only breeds in western Maryland's forests.

Five of the sixteen threatened and endangered reptiles and amphibians are federally-listed seaturtles, which forage in Maryland's estuaries during warmer summer months. The endangered northern coal skink is a mountain species about which little is known; the last known occurrence in Maryland was in 1976. The hellbender, a state-endangered amphibian,

is one of the country's largest amphibians and is threatened by degraded water quality in its fluvial habitat.

The DNR Fisheries Service and the Maryland Biological Stream Survey also monitors certain species that are state-listed as endangered or threatened. There are thirteen threatened and endangered fish in Maryland, of which the shortnose sturgeon and Maryland darter are also federally-listed. The bridle shiner, also endangered, is declining at an alarming rate in the state. The unlawful acquisition for the pet trade and the use of pesticides and herbicides adjacent to their habitats threaten the state-threatened blackbanded sunfish.

The most endangered animal taxa in Maryland, however, are among the invertebrates. More than 40 species are designated as threatened or endangered. Several of these species (e.g., Franz's cave isopod, Shenandoah cave amphipod, Hoffmaster's cave planarian) are highly specialized subterranean species found in springs, mines, and caves in the Maryland mountains. Freshwater mussels are of major concern, including the federally-endangered dwarf wedge mussel, which is found only in a limited number of streams and rivers from New Brunswick, Canada to North Carolina. Other endangered invertebrate species in Maryland include several tiger beetles (e.g., the federally-listed northeastern beach and puritan tiger beetles) and numerous butterflies and moths (e.g., bog copper, mottled duskywing, and great purple hairstreak).

Declining Species (and our opportunity to reverse that trend)

Twenty-nine animal species are listed as in need of conservation in Maryland (COMAR 08.03.08.09), as well as a number of commercial fish species (COMAR 08.02.12). These 29 species include 8 invertebrates, 3 fish, 3 reptiles and amphibians, 8 birds and 7 mammals. Although the state officially recognizes over 150 animal species in regulation, many other species are disappearing to the point that they may be added to the list within the next couple of decades. Nearly half of all freshwater mussels are imperiled globally and two-thirds are rare or imperiled nationally (Abell et al. 2000, Hoffman Black et al. 2001). Williams et al. (1993) found that only 23.6% of the freshwater mussel species in the U.S. and Canada are showing stable populations, with over 70% of the species in need of conservation. The majority (65%) of the nation's freshwater crayfish are rare or imperiled and 37% of freshwater fish are at risk of extinction (Abell et al. 2000). The mud sunfish population, for example, is experiencing declines due to habitat loss, which has led to its extirpation in New York and Pennsylvania and its designation as a regional species of concern (Northeast Endangered Species and Wildlife Diversity Technical Committee 1999).

Amphibians are exhibiting alarming rates of decline, with one in three species globally threatened (Stuart et al. 2004). Gibbons et al. (2000) states that reptiles are exhibiting dramatic declines similar to that of the amphibians, with habitat loss and degradation, environmental pollution, unsustainable use, disease, introduced invasive species and global climate change the leading causes for declining populations.

Numerous bird species are showing population declines nationally, regionally and locally. Nearly half of the shorebirds assessed in the U.S. Shorebird Conservation Plan showed

significant or apparent population declines (Brown et al. 2001). A recent assessment by the National Audubon Society found that 85% of grassland birds are declining (Butcher 2004). The short-eared owl population, for example, has declined by 69% nationally. The American bittern has been designated a regional species of concern due to its population decline, largely due to loss and degradation of its wetland habitat (Northeast Endangered Species and Wildlife Diversity Technical Committee 1999). Partners in Flight (PIF) has ranked 30 forest birds, 12 shrub/early successional birds, 10 grassland/agricultural birds, 7 wetland birds, and 1 urban/suburban bird (the chimney swift) as priority species for Maryland (Rosenberg 2004). In order to reverse declining population trends of these birds, PIF calls for Maryland to double its statewide populations of red-headed woodpecker, cerulean warbler, rusty blackbird, northern bobwhite, golden-winged warbler, field sparrow, short-eared owl, loggerhead shrike, grasshopper sparrow, Henslow's sparrow, and eastern meadowlark, and to make significant increases in the populations of several other species. Brinker et al. (2001) have documented declining populations of nesting water birds in Maryland.

The eastern small-footed myotis may be the least common cave bat in the Northeast and is vulnerable to extirpation by chance events to isolated colonies that concentrate the species in hibernacula. Its population is susceptible to habitat loss, human disturbance, and conversion of its roosting and foraging habitat. The New England cottontail is another mammal exhibiting population declines, leading to its designation as a regional species of concern as well as a species in need of conservation in Maryland (Northeast Endangered Species and Wildlife Diversity Technical Committee 1999). The range of the New England cottontail has declined by 75% since 1960, with maturation of its forest habitat a leading threat.

This Wildlife Diversity Conservation Plan (WDCP) represents an opportunity to reverse these declining population trends for numerous species in greatest need of conservation. Butcher (2004) identified State Wildlife Grant conservation plans as one of the means to address declining bird population trends, and the PIF has already recommended population goals specific to Maryland (Rosenberg 2004). By incorporating existing population assessments and conservation plans into the development of the Maryland WDCP, DNR and its conservation partners have the opportunity to implement conservation actions that will have positive effects on population levels.

Our Changing Landscape

Maryland's natural landscape has been significantly altered by the human population increase and associated human activities. At the time of European colonization, Maryland was 95% forest and 5% tidal wetland (Besley 1916, Powell and Kingsley 1980). By 1993 both the state's forests and wetlands had been reduced by half (Weber 2003). Human development currently drives land cover changes in Maryland: in the 30-year period prior to 2002, urban land use statewide nearly doubled (Table 1.2), and a 19% increase in developed land occurred between 1985 and 1990 (Regional Economics Studies Institute 1997 as cited in Weber 2003). Urban land use is predicted to increase by over 25% from 1997 levels by 2020 (Weber 2003). Forest cover is expected to decline by 9% during the same time period. This trend of development sprawl has led the state to establish an Office of Smart Growth and develop detailed plans (e.g., Priority Places Strategy) to guide land use planning

statewide, including resource conservation and restoration areas (http://www.smartgrowth.state.md.us/). Figure 2.4 identifies the land cover and land use of Maryland, including developed land, which is shown in red.

Table 1.2 Land Use Changes in Maryland, 1973-2002 (Source: MD Department of Planning 2005)

Land Use Category		1973	2002	Change
Low Density Residential	*Urban Development*	197,152	571,807	374,655
Medium Density Residential		188,411	300,559	112,148
High Density Residential		48,945	76,908	27,964
Commercial		74,231	97,992	23,761
Industrial		16,290	57,683	41,393
Institutional		62,076	99,972	37,896
Other Developed Land		67,425	93,467	26,042
Sum of above		*654,530*	*1,298,388*	*643,858*
Agriculture		2,521,993	2,118,368	-403,625
Forest		2,827,495	2,578,099	-249,396
Water		1,681,348	1,685,876	4,528
Wetlands		231,416	232,388	972
Barren Lands		9,763	13,427	3,664
Total		**7,926,545**	**7,926,545**	**0**

While the western part of the state continues to have the largest blocks of forest, habitats are now becoming fragmented as development moves into the area and converts the contiguous habitat into smaller patches like those in the eastern and southern portions of the state (Weber and Aviram 2002). An assessment of development patterns in the state from 1997 to 2000 determined that western Maryland suffered the highest losses (over 8,600 acres) of forests that were formerly large, contiguous forest blocks. Furthermore, an analysis of the risk of forest loss based on these development patterns found that the most likely counties to be further developed (to the detriment of these large forest blocks) are Cecil, Garrett, Howard, Montgomery, St. Mary's and Washington (Weber 2004). The areas least likely to be developed are the lower Eastern Shore and Allegany County in western Maryland.

Current Threats

A number of problems threaten Maryland's fish and wildlife resources and their habitats. Many of these threats are statewide, or even regional or global in scope. Other threats affect singular species or key habitats. The foundation for the process of identifying problems impacting those species and habitats identified as in greatest conservation need during the development of this Wildlife Diversity Conservation Plan (WDCP) was a compilation of numerous existing conservation programs, plans, and references, and represents a long established knowledge base and expertise. Appendix 1a lists the major state, regional and national resources used in this threats assessment. Some resources were focused on species or taxa, while others were focused on the ecosystem (ecoregion or vegetative community) levels.

Some threats like global warming, climate change, sea-level rise, habitat loss and fragmentation are global and national problems. Olson and Dinerstein (2002) cite threats to global biodiversity as human disturbance, habitat loss and fragmentation, and decline of water quality. Among the greatest threats affecting imperiled or federally-listed species are habitat degradation and loss, non-native species, pollution, over-exploitation, and disease (Wilcove et al. 2000). Freshwater habitats are threatened by non-native species, dams, pollution and habitat degradation (Master et al. 1998, Abell et al. 2000, Olson and Dinerstein 2002). Coastal and marine habitats are threatened nationally by pollution, coastal development, overfishing, climate change, habitat alteration, bycatch, invasive species, and aquaculture (Pew Oceans Commission 2003). Terrestrial habitats are globally threatened by habitat degradation, wildlife exploitation, and habitat conversion resulting from agriculture, incompatible silviculture or development (Olson and Dinerstein 2002).

In the northeastern United States and Maryland, regional and localized threats add to the national and international threats mentioned above. The commercial trade in reptiles and amphibians has been identified as a regional threat to herpetofauna. Development, human disturbance, catastrophic oil spills, and inadequate funding for surveys and management threaten the region's shorebirds (Clark and Niles 2000, Brown et al. 2001).

Table 1.3 lists recurring threats gleaned from existing national, state, and regional conservation plans. These overarching threats affect Maryland's fish and wildlife populations statewide and were compiled from numerous sources. For example, The Nature Conservancy's Threats Assessment and Viability Analysis (The Nature Conservancy 2000) for its Ecoregional target species were reviewed and integrated for Maryland's Ecoregions (Thorne et al. 2001, Barbour et al. 2003, Samson et al. 2003). A summary of threat assessments from Partners in Flight (PIF) Bird Conservation Plans for Maryland's Bird Conservation Regions (Rosenberg 2004) and other related regional/international plans applicable to Maryland was prepared for and integrated into the WDCP threats assessment. The Chesapeake 2000 Agreement addresses the threats that affect the Chesapeake Bay watershed and its habitats. The Coastal Bays' Comprehensive Conservation and Management Plan (CCMP) performed the same for the Coastal Bays watershed along the state's Atlantic coast (MD DNR 1999). Standardized protocols for aquatic biological monitoring and stressor assessment were used in the recent Maryland Biological Stream Survey to assess water quality and stressors in the state's non-tidal streams (Boward et al. 1999).

After the results of the WDCP threats assessment were compiled, additional input was solicited during workshops that were held with stakeholders and DNR staff. The resulting threats were associated with key habitats to facilitate analysis and conservation action development. Some threats were specific to one habitat or applied only to closely related key habitats (see Chapter 4), while others emerged from this process as an overarching problem applicable to most if not all habitats across Maryland (Table 1.3).

Table 1.3 Overarching Statewide Threats to Wildlife.

Statewide Threats
• Climate change, including global warming and sea-level rise • Human population increase and associated impacts • Pollution, including biological and chemical contaminants, pathogens, and diseases • Development, including residential and commercial, urban sprawl, road construction and salt application, impervious surfaces, impoundments, and conversion to other land uses, that results in erosion, sedimentation, nutrient enrichment, habitat loss and/or fragmentation, and isolation of local populations • Pesticide and/or herbicide use and contamination that directly or indirectly affects GCN species, such as non-target impacts of gypsy moth and mosquito control on GCN, or results in pollution or degradation of water quality • Lack of scientific understanding of appropriate habitat requirements and management needs for all GCN species • Incompatible forestry practices that result in habitat loss, fragmentation, degradation, or imbalanced vegetation structure and species composition • Invasive and/or non-native species that result in habitat loss or degradation • Excessive human use and/or disturbance, including off-road ATV use, boats, jet skis and ORVs • Incompatible agricultural practices that result in habitat loss, fragmentation, and degradation, including ditching and channelization, livestock overgrazing, inadequate riparian buffers, liming practices, and pond construction

DNR's Role in Wildlife and Habitat Conservation

Maryland has one of the nation's oldest natural resources conservation programs. Conservation of the state's fish and wildlife resources began with the establishment of the State Oyster Police in 1868, which expanded its role many times over the following century and is now known as the Natural Resources Police within DNR.

Conservation of Maryland's oysters began in 1830 in response to harvesting pressure. In 1874, a Commission of Fisheries was created to study and submit a report on the status of

Maryland's fisheries resources. The State Oyster Police Force was brought under the jurisdiction of the new Commission and renamed the State Fishery Force.

In 1890, formal conservation of Maryland's natural resources began when the first laws for uniformity in the protection of game birds and game animals were placed on the statute books by the General Assembly. Prior to 1890, an inconsistent assortment of county game and fish legislation made protection of natural resources difficult. Pressure on the legislature brought about the Act of 1896, which created the Office of the State Game Warden. In 1916, the Conservation Commission was created combining the State Fisheries Force and the Office of the State Game Warden. In 1918, the first statewide hunting license law was enacted. State officials anticipated that the licensing requirements would generate approximately $35,000 the first year, but it actually produced revenue of $61,770. Nine years later in 1927, the legislature enacted the resident and nonresident angler's license, which was required by all persons over the age of 14 desiring to fish the non-tidal waters of the state.

In 1922, a one-man commission called the State Conservation Department was created. Two years later the Governor appointed a second commissioner, who completed the first survey of the oyster bars of Maryland in 1907 and drew up the Potomac River Compact of 1912. The reorganization and change of direction in Maryland's conservation program incorporated the State Fishery Force into its overall activity and calling them the Maryland Patrol and Inspection Fleet.

Another title change occurred in 1935, when the Conservation Department became the Conservation Commission. In 1937 the patrol vessels of the State Fishery Force were armed with 30 caliber machine guns for the purpose of maintaining order on Maryland oyster grounds. The Conservation Commission was later divided to form the Game and Inland Fish Commission, and the Tidewater Fisheries Commission. The Board of Natural Resources was created in 1941 as an umbrella organization for all state conservation agencies. This Board consolidated the state's conservation programs within one organization, later to become known as the Department of Natural Resources (Vaughn 2003).

The first state legislation designed to protect endangered species was the Maryland Endangered Species Act of 1971 and the first full-time staff position devoted to nongame and endangered species was authorized by the Maryland General Assembly in 1973 (Taylor 1984). The Act was significantly strengthened in 1975 by the passage of the Nongame and Endangered Species Conservation Act (Annotated Code of Maryland, Natural Resources Article, Section 10-2A-01). One of the primary cornerstones of biodiversity conservation in Maryland, this law authorizes the state to establish a list of threatened and endangered species and to develop conservation programs for these species (Therres 1998). By 1979, DNR's Nongame and Endangered Species Program increased to 3 full-time staff (Taylor 1984).

1979 also brought the establishment of the Maryland Natural Heritage Program (NHP), one of the earliest programs developed in the international network of Natural Heritage Programs and Conservation Data Centers. In 1984 NHP published a symposium proceedings on the

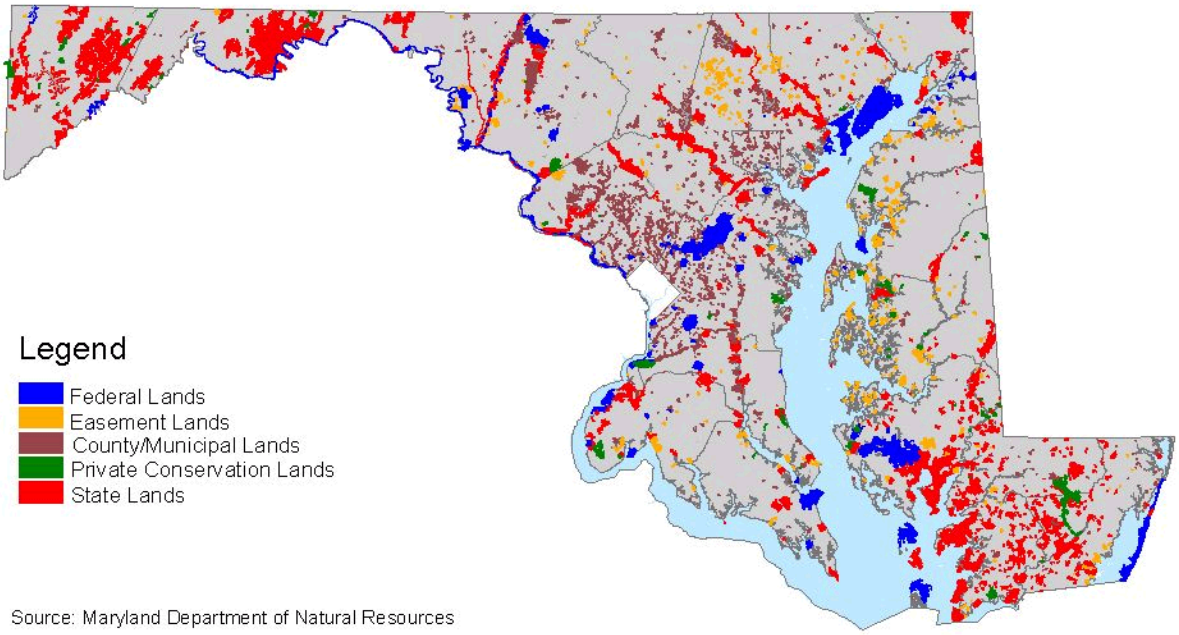
threatened and endangered plants and animals of Maryland; it was the first of its kind that focused on species in need of conservation (Norden et al. 1984). NHP assumed the lead role for coordinating endangered species conservation in Maryland in 1987, however throughout the 1980's and into the mid-1990's, DNR had two programs sharing responsibilities for nongame and endangered species conservation (Therres 1998).

In 1996 the two programs were combined within NHP, which is currently the Department's lead program responsible for the identification, ranking, protection and management of nongame, rare and endangered species and natural communities in Maryland. NHP seeks to sustain populations of rare plants and animals through the maintenance of healthy natural ecosystems. This is accomplished through field surveys, research into natural history requirements, restoration of degraded habitats, technical assistance and data distribution to conservation partners and landowners, and public education. The Program also works with other agencies within the Department and with private organizations to purchase properties and easements with habitats that support rare species and natural communities.

Today the Department oversees nearly 450,000 acres of land throughout the state, with DNR's State Forest and Park Service managing 93 sites for natural, historical, cultural and recreational resources (Figure 1.1). The Department's regional foresters provide technical assistance and incentive programs to urban communities and private landowners to manage forest habitats better. Through the Chesapeake Bay Program, DNR monitors and works to restore the Bay's water quality, habitats and ecological health. The Fisheries Service manages the state's fisheries and shellfish, including the use of fish hatcheries to stock many of the state's streams and lakes. The Wildlife and Heritage Service (WHS) within DNR manages the health and recreational enjoyment of the state's wildlife, including the conservation of rare plants and animals under the coordination of the Natural Heritage Program, and the management of game species. WHS oversees the management of 41 Wildlife Management Areas (WMAs), ranging in size from under 20 acres to over 29,000 acres. The WMA system encompasses nearly 105,000 acres, with WMAs located in 17 of Maryland's 23 counties. In additional to conservation of wildlife habitat via land ownership, DNR conserves land and wildlife habitat through a number of easement programs, such as the Conservation Reserve Enhancement Program (CREP), Rural Legacy Program, and Forest Legacy Program, and through working directly with landowners to provide technical guidance on managing fish and wildlife habitats.

In the late 1990's, DNR's Chesapeake and Coastal Watershed Services undertook an extensive data analysis project to evaluate the status of Maryland's remaining forests and wetlands utilizing a system of ecological factors to rank and prioritize their conservation value. The results of this analysis, called the Green Infrastructure Assessment, can be found online at: http://www.dnr.state.md.us/greenways/gi/gi.html. In 2001, Maryland established the GreenPrint Program to protect land within the identified Green Infrastructure network (Weber 2003). Weber (2003) found that only 27% of Maryland's Green Infrastructure, or network of large forested or wetland hubs and connecting corridors, are currently protected from development and conversion to other land uses.

Figure 1.1 Protected Lands and Government-owned Lands in Maryland (Source: MD DNR)



The Department has successfully restored rockfish (striped bass) to the state's waters, allowing anglers to harvest more than 2 million pounds of the species in 2004. Bald eagles, once listed as an endangered species, have successfully returned to breeding in most of Maryland's counties with 383 nesting pairs documented in 2004; an increasing number of bald eagles are overwintering in Maryland as well. DNR and its partners have successfully restored wild turkey to most of the state's suitable habitat over the last two decades. Following two centuries of overharvest and habitat loss, wildlife managers and sportsmen restored native white-tailed deer to all available deer habitat by the 1960s. Current wildlife management efforts to maintain the deer population include an annual harvest of over 100,000 individuals in the last few years, and hunting is being encouraged to balance the rapid increase in deer population (MD DNR 1998).

The multiple programs and services within DNR cooperate on conservation projects, sharing their areas of expertise to apply the best available information and resources to the state's conservation needs. Through the DNR web site (www.dnr.state.md.us) all of the programs and services within DNR contribute to on-going public education and involvement to promote citizen's awareness and participation in natural resource conservation.

DNR's Partners in Wildlife and Habitat Conservation

The DNR collaborates with numerous partners in natural resource conservation efforts (Appendix 4b). Nearly all of the species and habitats in greatest need of conservation in Maryland extend beyond the state's borders – making partnerships a necessity for successful natural resource conservation. Migratory species often move beyond international

boundaries during the different seasons, creating a need for multinational collaboration to achieve conservation goals. At the national level, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service are the lead agencies for the conservation of federal trust species found in Maryland and elsewhere. The USFWS, National Park Service (NPS), National Oceanic and Atmospheric Administration (NOAA), and the Bureau of Land Management (BLM) are also landowners in Maryland, managing key habitats on the ground to protect fish and wildlife resources. DNR regularly collaborates with these federal agencies and others (e.g., Department of Defense, U.S. Army Corps of Engineers) to implement restoration projects and manage habitats on their lands. The U.S. Army Corps of Engineers, for example, is instrumental in assisting the state to restore habitats like Poplar Island in Chesapeake Bay. The Environmental Protection Agency (EPA) and U.S. Geological Survey (USGS) are key partners with Maryland in improving the water quality and resources of Chesapeake Bay, as are the five other states and the local governments in the Bay's watershed. The USFWS, NOAA, U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) provide technical and financial assistance to the state, its partners and its citizens to manage, enhance and restore fish and wildlife resources and habitats.

At the regional level, DNR participates in the Atlantic Flyway Council, Atlantic States Marine Fisheries Commission (ASMFC), and the Mid-Atlantic Fisheries Management Council (MAFMC). The Atlantic Flyway Council consists of the Atlantic coast states and USFWS. They oversee waterfowl management within the flyway. The ASMFC is a 155 state compact that manages migratory species within state waters. The MAFMC includes states from North Carolina through New York and sets fisheries rules for twelve species of game fish. Each organization has developed several management plans. DNR is a member of the Northeastern Association of Fish and Wildlife Agencies and the Southeastern Association of Fish and Wildlife Agencies. DNR also participates in several informal regional coordination efforts.

At the state level, DNR collaborates with the MD Department of Environment (MDE) on water quality issues, wetland conservation, and Bay restoration projects. The MD Department of Transportation, State Highway Administration (SHA) and other state agencies work with DNR to protect fish and wildlife resources by avoiding, minimizing and mitigating for impacts during the construction of state projects. The Maryland Department of Agriculture (MDA) oversees the state's aquaculture programs, manages pest species and animal health, and collaborates with DNR and private landowners in nutrient management, land preservation, invasive species management, habitat restoration, and wildlife enhancement projects. DNR maintains an ongoing partnership with universities and academic experts. To mention just a few, DNR collaborates with University of Maryland Eastern Shore on the Gap Analysis Program (GAP) and with University of Maryland Center for Environmental Science, Appalachian Lab on various research projects.

At the local level, DNR collaborates with county and municipal agencies through various planning and zoning efforts, including the development of their Comprehensive Plans, as well as more detailed Land Preservation and Recreation Plans. Technical guidance is frequently provided to assist with the conservation of the state's fish and wildlife resources

and the key habitats they depend upon, such as through the establishment of Habitat Protection Areas within the Chesapeake Bay Critical Area Program.

The successful conservation of fish and wildlife resources in Maryland would not be possible without partnerships with non-governmental organizations (NGO), private industry and the public (Appendix 5e). Just to name a few, The Nature Conservancy, National Audubon Society, Audubon Naturalist Society, Maryland Ornithological Society, Maryland Natural History Society, Chesapeake Bay Foundation, Alliance for the Chesapeake Bay, Sierra Club, Trout Unlimited, Potomac River Fisheries Commission, and other NGO's are not only stakeholders in the protection of the state's natural resources, but also valuable partners in planning, funding and implementing conservation projects. Industry representatives such as timber and development interests assist the state in conserving fish and wildlife resources on private lands. But perhaps most important of all partners, the citizens of Maryland provide the state with opportunities to protect natural resources on private property and benefit from grass-roots efforts to monitor threats, assess ecosystem health, enhance key habitats and improve species populations.