

Wisconsin’s Wildlife Action Plan (2005-2015)
Significant Ecological Features and Priority Conservation Actions

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Wisconsin, the setting (adapted from the Wisconsin Land Legacy Report):

The periodic advancement and retreat of continental glaciers shaped our landscape. Over the past 2.5 million years at least a dozen major advances occurred, scouring away vegetation, grinding down mountains, and leaving behind predominately rolling plains with exceptionally fertile and productive soils. Glacial meltwater carved powerful rivers that carved channels and deposited ton after ton of sand and gravel. The last glacier ending in Wisconsin and is a primary reason the state harbors many of the finest examples of glacial landforms in the world. A portion of Wisconsin known as the “Driftless Area” escaped the numerous glacial advances and contains ancient soils and landforms.

The distribution and abundance of plants and animals across the state continues to be determined by environmental factors (e.g. soil, moisture, temperature, and climate), topography, historical events and disturbance patterns both natural and human-induced. Historically, many species reached their range-limits in a narrow band that runs halfway across the state from northwest to southeast. Known as the tension zone, it separates the northern forest from the southern and eastern forest. Also, occurring in conjunction with the southern forest are incursions of western prairie and savanna species proving an ecologically complex and diverse meeting of three biomes in one state.

Wisconsin’s forests have seen dramatic changes since the last glacier melted. Early human populations had relatively slight impact on the forests. Conversely, the warming climate permitted a succession progressing from open tundra, taiga, closed spruce-fir forest, pine forest, northern hardwoods with hemlocks and oaks arriving most recently. Small places in the “Driftless Area” harbored conditions that permitted many of the north advance plants and animals to hold on for millennia. The opening of Wisconsin for European style agriculture and supplying lumber for a burgeoning population provided the conditions for massive utilization of our forests. Fortunately, a few areas escaped the original harvest and many of the forested acres have recovered enough to provide habitat for numerous wildlife species.

Wisconsin has a rich diversity of wetlands that play a critical role in our environmental quality and ecological health. Examples of wetlands include marshes, ephemeral wetlands, sedge meadows, bogs, beaver ponds, fens, wet shrub areas and forested wetlands. Wetlands are found throughout the state, although the largest concentrations are in northern, eastern and central Wisconsin. Over the years, Wisconsin has lost nearly one-half its wetlands. Since 1985, a shift in federal policy regarding wetland drainage and a subsequent state adopted wetland water quality standards; there has been a dramatic slowing of wetland loss. The nearly 5 million acres of remaining wetlands still suffer a number of impacts such as fragmentation, invasive species, impaired hydrologic function and sedimentation to name a few.

Wisconsin’s water resources play a vital role in the state’s economy, ecology, and the way of life. With over 44,000 miles of rivers and streams, over 15,000 lakes, 800 miles of Great Lakes coastline, and over 250 miles of Mississippi river frontage, Wisconsin lives up to its Ojibwe name of “gathering place of waters.” Our lakes and streams are without question, one of Wisconsin’s most distinguishing characteristics and ecologically valuable resources. Water quality in many of our rivers has been steadily improving as pollution from “point sources” has been substantially lowered since the 1970s. However, significant challenges remain, especially non-point pollution, in achieving our water quality goals.

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Wisconsin's Ecological Conservation Role

The state has a long history of natural resource conservation. Parks and Forests have over 100 years of conservation efforts resulting in permanent protection of some of our most treasured natural resources, such as Interstate Park, Peninsula State Park, Devils Lake State and the Northern Highland American Legion State Forest. Our fish and wildlife programs have been conserving and enhancing game and sport fish for more than 75 years, which also have had spin-off benefits for non-game species. Our State Natural Areas Program that provides ecological reference areas and protection of rare natural community and plant habitat is more than 50 years old. Endangered and threatened species legislation in the 1970s provided legal protection for rare species. Our waters and wetlands programs have extensive focus in the past 25 years.

These programs and their conservation activities have provided stability for many of Wisconsin's species. In concert with federal legislation and agency cooperation, many of our species have seen great enhanced populations over the years. For example, the Pittman-Robertson and Dingall-Johnson pieces of legislation provided funding sources to address the dire needs of waterfowl and sport fisheries more than sixty years ago. These funds focused on certain groups of species, but included benefits for many other species occupying the same or similar habitats. For instance, wetlands provided for duck production also enhanced populations of other marsh birds. Purchase of spawning wetlands for northern pike, also provides habitat and structure for forage fish and amphibians.

The Wildlife Action Plan strives to build on the back of past conservation, but understands that some species have had little previous emphasis. The federal legislation also encourages states to be effective in their activities. Addressing the gaps becomes a function of understanding the primary responsibility of any state for a species, natural community of ecological landscape.

The Department's ecology staff asked a few basic questions. Is a natural community, ecological feature, or species uniquely restricted to Wisconsin? If so, then, we have the unique role of assuring its future. Does Wisconsin have a significant proportion of a feature, natural community or species population in the state? If so, then Wisconsin has a dominant role in assuring its future. Does Wisconsin have special partnerships, funding sources, or existing programs that are especially effective in conserving natural communities and species habitat? If so, then Wisconsin should pursue those opportunities. For a natural community or species population, will Wisconsin be important as a refuge or provide a migration corridor in the light of climate change? If so, then Wisconsin may provide a needed role in assuring a future.

Significant Ecological Features for Wisconsin

The ecological features described here are those for which Wisconsin has an opportunity and responsibility in helping maintain regionally, continentally, and globally significant populations and/or natural communities. This information, along with maps identifying locations in Wisconsin where these features occur, was used to help set priorities for the State Wildlife Action Plan.

Globally Important Resources in Wisconsin

Great Lakes and their Shorelines.

The Great Lakes are the largest freshwater lakes in the world. Great Lakes shorelines support a diverse and distinct mosaic of natural communities and many regional endemic species. Lake Superior has important fisheries and bird habitat (e.g. lake trout and whitefish spawning and nesting piping plovers). Lakes Superior and Michigan and their shorelines are important migratory bird corridors and provide habitat for wintering waterfowl. The Apostle Islands have exceptional examples of old growth forests, beach and dune complexes, coastal wetlands, and bedrock features. There is a tremendous regional repository of rare biota and intact natural communities here. The freshwater estuaries on the southwest shore of Lake Superior are in relatively good condition (some are "pristine") and unique. Many other Great Lakes estuaries, especially to the east of Wisconsin on the "lower" lakes, are degraded due to poor water quality, development, and serious infestations of invasive species. Ridge and swale complexes are unique features of the Great Lakes shorelines, contain diverse assemblages of natural communities, and are especially prominent along Lake Michigan. The lakeplain prairie complex on southwestern Lake Michigan is the only non-forested ridge and swale system in the state and

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includes Chiwaukee Prairie. "SANDSCAPES" (these include sandspits, coastal barrier spits, cusped forelands, and tombolos) protect a diverse array of important natural communities and provide critical habitat for rare species (e.g., Piping Plover). Major concentrations of migratory birds occur on some of these sandscapes, especially the coastal barrier spits such as Long Island and Wisconsin Point. The Door Peninsula and Grand Traverse Islands have high concentrations of rare species associated with the calcareous soils and exposures of dolomite that characterize shoreline environments. Some "maritime" forests on the mainland and on offshore islands are of high quality.

Northern Highland Kettle Lakes and Pine Forest.

This sandy outwash plain has one of the highest densities of glacial kettle lakes in the world. It is a complex heterogeneous landscape of forested uplands, diverse wetlands, and many lake types. Some lake types, unmanipulated spring ponds, and undeveloped connecting streams, are now quite rare. Some rare lake types feature clear circumneutral water, hard bottoms, exceptionally low nutrient levels, and support rare invertebrates and fish species that are far better represented in this Landscape than anywhere else in the state. Some lakes and low gradient streams support wild rice beds, which are important both ecologically and culturally.

The pine-dominated dry-mesic forests that occur here are different than the matrix of hemlock-hardwood forest that historically vegetated most of northern Wisconsin and surrounds the Landscape. This is the best place in Wisconsin to practice large-scale white pine/red pine forest management, with opportunities to represent all age classes and patch sizes, including those which are currently scarce or absent. Natural red pine forest is at the center of its continental range here, (which is limited to the northern Lake States, Ontario, and the Appalachian Mountains). Wildlife species associated with coniferous forests are especially well-represented here.

Pine-Oak Barrens.

Pine barrens found in Wisconsin are globally significant due to their distinctive ecological characteristics, restricted range, and rangewide rarity. Their species composition differs from the New Jersey pine barrens (which are pitch pine-dominated and well east of the range of many of the prairie species that are so important in the Upper Midwestern barrens). Elsewhere in the upper Midwest, pine barrens are degraded or the remnants small, offering limited opportunities for restoration or management. Wisconsin pine barrens support a high number of rare species, including some that are globally rare (such as the federally endangered Karner blue butterfly and the Kirtland's Warbler), and many on the state list of Species of Greatest Conservation Need. Pine barrens in Wisconsin are dynamic and highly variable fire-driven ecosystems, and can be managed for a continuum of natural structurally distinct community types from semi-open brush prairie, to savannas with scattered trees, to closed canopy dry forest.

Bur Oak Openings.

The Great Plains has savanna communities all along its eastern edge, but those farther south and west are much different than those in Wisconsin. The Nature Conservancy called the savanna found in southern Wisconsin the "northern bur oak opening". This savanna type occurs from central Illinois in a thin strip into Minnesota. The type has a limited range, and Wisconsin is the center of the feature and has the best opportunity for restoration, especially at larger scales. The Southern Unit of the Kettle Moraine State Forest, portions of the Central Sand Hills and Central Sand Plains, and some places in the Western Coulees and Ridges Ecological Landscape, are areas where significant management opportunities exist for this globally rare community. Some of today's scrub oak barrens, or brush prairie communities, were historically Pine Barrens that lost their coniferous component and have been partially restored through mechanical and chemical reduction of woody cover and frequent prescribed burning. "Scrub" oak savannas with short, brushy structure, composed primarily of black and northern pin oaks, could be restored in the Central Sand Plains, Northwest Sands, and Northeast Sands Ecological Landscapes.

Niagara Escarpment.

The Niagara Escarpment is a bedrock feature composed mostly of Silurian dolomite (strictly speaking, it's the steep, exposed side of a gently sloping bedrock ridge or "cuesta") that stretches from Lake Champlain in the northeastern United States westward across the Great Lakes to Wisconsin. Here the Escarpment is exposed from the islands off of the northern tip of the Door Peninsula southwest for over 150 miles into southeastern Wisconsin where it disappears beneath glacial deposits. The Escarpment supports many rare species, most

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notably a group of globally rare snails, the oldest trees known in Wisconsin, karst topography, and contains important hibernacula for bats. It has value for migratory birds and bats by providing updrafts and generally north-south 'leading line'. Rare or otherwise important natural communities and habitats associated with the Escarpment include dripping cliffs, dry cliffs, talus slopes, unusual conifer forests that contain the state's oldest trees, and, at one site on the Door Peninsula, the globally-rare alvar community.

Continentially Important Resources in Wisconsin

Driftless Area Features.

The Driftless area occurs in southeast Minnesota, northeast Iowa, and northwest Illinois, however approximately 75% of the Driftless Area is in Wisconsin. Unlike most of Wisconsin and the Upper Midwest, the topography here formed over millions of years without glaciation, and is characterized by deep erosional valleys, exposed bedrock-controlled ridges, steep forested side slopes with strong aspect differences that support high species and community diversity, and landscape heterogeneity. The rugged topography led to greater abundance and persistence of remnant community types that have been destroyed or more greatly diminished elsewhere. Forest cover is relatively extensive compared to other parts of southern Wisconsin. Natural community types and habitats that are especially well-represented here are oak forests, mesic maple-basswood forests, floodplain forests, hemlock and pine "relicts", algal talus slopes, dry (goat) prairie, caves (and abandoned mines) with bat and herptile hibernacula, cliffs and associated rare plants and snails, and spring-fed cold-water streams. The lower reaches of several of Wisconsin's largest rivers occur here including the Wisconsin, Black, and Chippewa Rivers which all flow into the Mississippi River. These river systems are associated with broad floodplains, containing extensive floodplain forests, marshes, and oxbow lakes. Where these are associated with large blocks of upland forest, the diversity of forest dependent wildlife is especially high and many rare species are present. The largest stand of southern bottomland hardwoods in the upper Midwest is located along the Lower Chippewa River.

Large Blocks – Old Deciduous-Coniferous Forest (climate change resistant forest systems)

Large contiguous blocks of this forest type are embedded in a relatively unbroken forested matrix. These deciduous-coniferous forests have some of the most diverse assemblages of breeding birds on the continent. This strip of habitat stretches from Algonquin Park in Ontario to central Minnesota but does not extend very far north or south. Wisconsin is in the heart of this high diversity bird area. These forests are centers of abundance for many species, and are believed to be a source area for broadly distributed species. Distribution maps of many warbler species follow the same boundary and are associated with this forest. Locations in Wisconsin where these forests are extensive and offer good opportunities for large-block management are the Winegar Moraine and Penokee Range.

The Baraboo Hills occur on an outcrop of a unique quartzite formation, and also represent a part of the largest remaining block of dry-mesic and mesic forest in southern Wisconsin. The area has a high diversity of species and is considered one of the state's most important breeding sites for area-sensitive birds, especially those associated strongly with "southern" hardwood forests and Driftless Area conifer "relicts". The best of the conifer stands are imbedded within a matrix of extensive hardwood forest, and are often associated with deep gorges cut through the bedrock by intact and ecologically important headwaters streams. The Baraboo Hills support a wealth of rare species and natural communities, and have been a major focus of conservation efforts for many decades. The unique geological features have attracted worldwide attention.

Boreal Transition Forest.

This forest type is only seen in parts of the coastal strip of Michigan and Wisconsin along the Lake Superior clay plain. It is not found in Minnesota. It is an edaphic feature associated with the local climate and has very different properties from the boreal forests in Canada. Wisconsin historically had white pine and white cedar abundantly represented in this community type, but virtually no primary forest is left. It was heavily converted and much of the area is still managed for aspen. The Lake Superior Clay Plain forest differs from boreal transition forests in Door County. In Door County, the overstory is similar, but the substrate consists of shallow soils over dolomite bedrock, and the ground flora includes Great Lakes shoreline specialists and calciphiles. In the Lake Superior Clay Plain the substrate is mostly deep lacustrine clay soils. Clay soils also have a high calcium status but are relatively impermeable to moisture infiltration, resulting in more wetland-like conditions. The Lake Superior forest

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has some boreal species not found on Door Peninsula. This area is important to boreal birds in Wisconsin. Climate change modeling suggests that areas next to the Great Lakes may retain the current climate the longest and might be places to concentrate efforts for protecting examples of temperate community types. The "snowbelt" along the Great Lakes may be the best place to manage for hemlock and other species requiring cool climates and constant, relatively high moisture levels.

Kettle Moraine Features.

This is a large glacial interlobate moraine starting east of Lake Winnebago and running southwest for almost 90 miles into southern Wisconsin. It features rugged topography and contains many glacial features such as kames, drumlins and eskers. The vegetation is a complex mosaic of savanna, prairie, sedge meadow, marsh, calcareous fen, and southern forest communities. Presently it is a large forested block in the midst of agricultural lands. Michigan has some similar topography but the interlobate moraine in Wisconsin was less suitable for conversion to agriculture than other regions and many of the natural features that have persisted here have all but disappeared elsewhere. Interlobate moraines with this combination of natural features at this scale are very rare, and possibly restricted to just a few locations in the Upper Midwest.

Large River Corridors.

Wisconsin has a large number of lakes, rivers, and streams. Large rivers such as the Upper Mississippi, Wisconsin, Chippewa, Black, St. Croix, Brule, Wolf and Namekagon, Rivers are significant. An abundance of smaller coldwater streams emanating from glacial moraines and sedimentary bedrock in the unglaciated Driftless Area also occur here. The lower Wolf River is considered to be one of the few remaining rivers with a high degree of natural meandering which is needed by some aquatic species. The Winnebago pool lakes have a very significant population of the lake sturgeon. These waters contain significant populations of fish and rare invertebrates such as mussels and dragonflies, and the larger waterbodies also serve as major migratory bird stopover areas.

Upper Midwest Regionally Important Resources in Wisconsin

Glacial Lake Wisconsin.

This area in central Wisconsin is in and around the bed of extinct Glacial Lake Wisconsin and is a biodiversity hotspot. The feature occurs in the Tension Zone and supports a unique mixture of southern and northern species. Many SGCN, especially habitat and area-sensitive species, thrive in the area. Wet-mesic white pine-red maple forests are found here, which support many sensitive species, and have few if any extant occurrences elsewhere in the Upper Midwest (those in Michigan were cut and have not been restored). Large expanses of dry forest and barrens occur here and the potential for barrens restoration is high. This is one of the two best places in the state and continent to manage for Midwestern barrens vegetation and its associated species. The state's largest area of contiguous wetland occurred here - 'The Great Swamp of Central Wisconsin' - and there are large expanses of wetlands remaining, though many have been altered hydrologically by ditches and dikes. Sandstone buttes, mesas, cliffs, pinnacles, and gorges occur here; some with rare species. These features do not occur in other parts of the Upper Midwest.

Large Blocks of Predominately Older Northern Forest.

The Blue Hills have quartzite bedrock and are similar in some ways to the Baraboo Hills. The area supports large blocks of relatively unfragmented forests. The high-gradient, softwater streams drain intact, forested watersheds, have significant diversity values, and look similar to mountain streams. The area contains unique geological features especially the Felsenmeers ("sea of rocks"), which consist of extensive slopes of open, shattered quartzite talus with unusual lichen communities and dramatic cold air drainages which are responsible for the presence of several notably disjunct northern species.

The Menominee Reservation has vast relatively unbroken hemlock-hardwood forests, scattered lakes, and ecologically important streams within forested watersheds. Large white cedar swamps are common in the eastern portion, where marl lakes supporting calciphilic plants occur. Prominent exposures of granitic bedrock occur along the Wolf River. Most of the forest is older than average for the state and supports significant populations of forest interior species that have become scarce in forests elsewhere.

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Other northeast Wisconsin Forest have rock outcrops, rivers, and extensive forests, some with bedrock close to the surface including cliffs, talus slopes, and glade communities. It needs more study as to its regional importance.

Large Sedge Meadows, Fens and Prairies.

Although most of the tallgrass prairie has been lost, Wisconsin has some significant prairie remnants. Avoca Prairie is the largest contiguous prairie east of the Mississippi River. Scuppernong Prairie and Military Ridge have significant numbers of remnants and have very good potential for restoration. Chiwaukee Prairie is the largest wet-mesic prairie in the state. These remnants have high prairie species diversity. Among the largest concentrations of bluff ("goat") prairies in the Upper Midwest occur in Wisconsin's portion of the Driftless Area. Many of these are associated with significant stands of oak forest and restorable oak savanna. The bracken grasslands occurring at Spread Eagle are part of this category.

Wisconsin has a large number of wetlands covered under the heading sedge meadow, especially floodplain forests, marshes, and peatlands (however, Minnesota and Michigan also have many peatlands; Michigan has patterned peatlands that are more diverse) and to a lesser degree, fens, and prairie wetland types. Wetland loss in neighboring states has been greater than Wisconsin's on a percentage basis. Cedar swamps are common in some parts of the state and harbor many rare plants.

Caves and Abandoned mines.

Wisconsin has several caves and abandoned mines that have become hibernacula for large populations of bats. Neda Mine is considered to contain the largest number of hibernating bats in the Midwest. Even though many parts of the mine were inaccessible for censusing, the population was estimated to include at least 300,000 little brown bats (*Myotis lucifugus*), and hundreds of northern long-eared bats (*Myotis septentrionalis*), eastern pipistrelles (*Pipistrellus subflavus*) and big brown bats (*Eptesicus fuscus*) (Altenbach, unpublished data, 1995). Other abandoned mines known to harbor large numbers of hibernating bats occur along the Mississippi River and in the Penokee Range of far northern Wisconsin. Driftless Area caves also support bat hibernacula.

Medium-sized Rivers and Streams.

These waters contain significant populations of fish and rare invertebrates such as mussels and dragonflies, but have fewer species than the larger waterbodies. River systems such as the Wolf, Jump, Bark and Namekagon fall into this category. They also serve as major migratory bird stopover areas and often times harbor significant streamside natural communities.

The combined relevance of the fore mentioned ecological role goes well beyond our borders. Global, continental and upper Midwest features of importance, for which Wisconsin has a major role to play in the continued existence of a natural communities or species, indicates they should be our foremost conservation priorities. If we don't do it here, then conservation probably will not get done elsewhere and species will suffer the consequences of our actions (or inaction).

State Important Resources in Wisconsin

Even though other natural communities and species ranges may be better addressed elsewhere, we cannot assume they will. We also, have a responsibility to keep natural communities and species native to the state for future generations. Natural community assessments describing the importance in maintaining community types, assess their current condition in the state, and identify opportunities for managing the community type form the basis for additional high priority areas within the confines of the state. These highly rated natural communities and species are also considered priorities in the state.

Extensive Grassland Communities.

Native communities (prairies, sand barrens, and fens) and non-native grasslands such as pastures, hay fields, etc. make up the grassland communities. Wisconsin has some of the best opportunities in the Midwest to preserve and restore tallgrass prairie, and provide habitat for Henslow's Sparrow.

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Working Northern Forest Communities.

The 37 counties north of the Tension Zone have about 70% of the state's forested area. The area was drastically disturbed during the Cutover Period (1870 – 1930) and by subsequent fires. Currently maple-basswood and aspen-birch are the two most common forest types. Wisconsin is now one of the nation's top two forestry production states, and forestry is the largest employer in 27 northern forest counties. These large expanses of forest provide habitat for some of our most beloved species such as Ruffed Grouse, Scarlet Tanager, Black Bear, and White-tailed Deer. These species thrive precisely because we have abundant habitat for them. Most places need not be identified for changes in focus, because they are accomplishing many conservation goals with existing direction, but other areas harbor large blocks of mature forest, forested wetland, conifer uplands, or beech-hardwood forest where tweaks in management direct could enhance the viability for several SGCN.

Floodplain Forest Communities.

A mix of hardwoods and wetlands characterize floodplain forest. Smaller patches along mid sized streams harbor some species not found in the forests along the major river ways. Fragmentation by agriculture, water impoundment, and development has reduced connectivity. Patch size is shrinking, and invasive species are an increasingly serious problem. With these combined factors, a few smaller floodplain forest systems merit priority to focus on resolving the threats and enhancing the potential the species will still be with us in the future.

High Quality Wetland Communities.

Many different kinds of wetland communities have water-saturated soils or other substrates as their common characteristic. Ecological functions and food web relationships are different in wetlands than uplands. In Wisconsin 46% of the original wetlands were lost between 1780 and 1980. Wetlands are used by 43% of all federal listed threatened and endangered species and 32% of the state threatened/endangered species. Large patches of intact ash swamps or even disturbed, ditched and diked wetlands, such as Crex Meadows and Horicon Marsh provide habitat for and often times the largest populations of SGCNs in the state.

Diverse Aquatic Communities.

The amount and high quality of Wisconsin's water resources is rare on a global scale. It ranges from small ephemeral ponds to the largest freshwater lake by surface area in the world, and includes a plentiful supply of groundwater. Runoff pollution, urbanization and development, recreation, fish stocking and harvest, and exotic species invasions are significant threats. Large river systems harbor a vast majority of the aquatic diversity, but several reaches of mid-sized streams provide habitat for specialized species.

Bedrock Communities

These small areas of the landscape often times harbor rarely found or unique species occurrence due to the specialized habitat and harsh growing conditions. Bedrock communities can take the form of relatively flat glades communities, buttes and mesas, or steep-walled gorge communities.

Priority Conservation Actions Tied to Conservation Opportunity Areas

Focus habitat work in on the natural communities that Wisconsin has an especially significant role in perpetuating the ecological features, natural communities, and species habitat. For Wisconsin, the ecological features listed above harbor pine-oak barrens, bur oak openings, warm water rivers, Great Lakes shoreline and estuarine communities, large sedge meadows, dry prairies, large blocks of older southern oak forest and woodland, large blocks of older northern forests, floodplains – including forests and backwaters, and cliffs/karst features of the Niagara Escarpment. Specific conservation actions include:

Global

Great Lakes and their Shorelines

Including dune, beach, forested ridge and swale, boreal forest (restoration sites), shore fens, and estuaries.

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- Protect and restore harbor and river mouth shoreline and wetland habitats.
- Preserve and maintain large expanses of sedge meadow, coastal fen and forested wetlands along the coast and manage in the context of a mosaic of community types.
- Monitor community level vegetation changes within coastal fen in light of climate change and lowering lake levels.
- Protect intact examples of forested ridge and swale sites, monitor for invasive exotic species and implement an eradication plan.
- Increase representation of near-shore boreal forest by encouraging retention of white spruce, white pine, white cedar, and balsam fir, especially in older age classes, by adaptive management and selective planting.

Northern Highland Kettle Lakes and Pine Forest

Including hemlock-hardwoods and forested wetland types in north central and pine forest in Northern Highland.

- Develop tax incentives to preserve old-growth forest.
- Manage forest adjacent to old-growth stands and ephemeral ponds to complement the ecological values of the primary feature.
- Work towards a balanced mosaic of age-classes; older age-classes are currently underrepresented.
- Increase representation of red and white pine forests, especially older age classes.
- Use adaptive management techniques to develop pine dominated forest structure and composition.
- Develop techniques for using prescribed fire to reduce other woody competition when establishing and maintaining red and white pine forests.
- Develop educational tools and demonstration areas to articulate the benefits of utilizing prescribed burning for ecological management.
- Develop reliable natural regeneration techniques for red pine and mixed red and white pine forests.

Pine-Oak Barrens

- Create financial incentives to develop jack pine – northern pin oak forests.
- Create financial incentives to address differential market values between plantation forestry and natural regeneration dry forests, for retention of old-growth patches, or prescribed burning in and around core managed areas.
- Develop educational tools and demonstration/training areas that promote prescribed fire and other barrens management practices.
- Manage the full range of barrens succession stages and diverse habitats in a landscape context. A comprehensive landscape plan requires identification and management of early succession cores. The “barrens” also needs to have places managed in a shifting mosaic utilizing timber harvest with many clearcuts, some older than rotation age stands, some thinning of stands for savanna structure and a few protected groves. Many stands should be thinned to a safe amount of residual standing timber, and then burned for stand regeneration while leaving charred legacies. A few selected shallow, publicly owned lakes should have plans for open shorelines on the west and south sides.
- Identify additional sites containing high quality or restorable barrens.
- Develop a practical “toolkit” for maintaining structural and compositional characteristics of barrens ecosystems.
- Integrate planning efforts across federal, state, county, local and industrial ownership boundaries.

Bur Oak Openings

- Focus management and restoration efforts in the southern Kettle Moraine conservation opportunity area to emphasize oak openings, oak woodland and low prairie communities with smaller patches of dry prairie, open marshy wetlands, and patches of older closed canopy forest.
- Focus management and restoration efforts in the sandstone-influenced conservation opportunity areas to emphasize oak barrens, oak woodland and sand prairie communities with smaller patches pine relicts, dry prairie, open shrubby barrens, closed canopy oak forest, and rock outcrops.

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- Create financial incentives similar to either the Farmland Preservation Program or Managed Forest Law to protect and manage high quality examples of dry prairie, oak opening, oak woodland or retention of old-growth patches including hemlock and pine relicts, on private land.
- Create financial incentives similar to the Wisconsin Forest Landowner Grant Program (WFLGP) to address the differences in market values between oak savanna restoration and oak forest management or prescribed burning in and around prairie and savanna managed areas.
- Develop educational tools and demonstration/training areas that promote prescribed fire and other prairie and savanna management practices.
- Identify additional sites containing high quality or restorable oak barrens, oak savannas and woodlands.
- Develop a practical "toolkit" for maintaining structural and compositional characteristics of oak savanna ecosystems.

Niagara Escarpment.

- In the Niagara Escarpment Conservation Opportunity Area, encourage public and private landowners to maintain natural forest cover, protect surface areas that drain into natural fissures, minimize pesticide infiltration, and do not physically block sinkholes.
- Preserve habitat and protect from conversion to other land uses, those unique areas on the Niagara Escarpment currently occupied by SGCN species.
- On Wisconsin's only large alvar, minimize impacts from quarrying, road construction, and housing development by acquisition of fee title, development rights, transfer of development rights, and zoning.
- Manage alvars by thinning densely vegetated areas and removing aggressive exotic shrubs.

Continental

Driftless Area Features

- Focus management and restoration efforts in the loess-influenced forest Conservation Opportunity Areas to emphasize a matrix of older oak-central hardwood forest with smaller patches of oak woodland, oak opening, regenerating younger forest, native prairies and relict forests.
- Focus management and restoration efforts in the sandstone-influenced Conservation Opportunity Areas to emphasize dry oak savanna, oak woodland and sand prairie communities with smaller embedded patches containing regenerating oak forest, pine relicts, dry prairie, open shrubby barrens, closed canopy oak forest, and rock outcrops.
- Create financial incentives similar to either the Farmland Preservation Program or Managed Forest Law to protect and manage up to 20,000 acres of high quality examples of goat prairie, oak opening, oak woodland or retention of old-growth patches including hemlock and pine relicts, on private land.
- Create financial incentives similar to the Wisconsin Forest Landowner Grant Program (WFLGP) to address the differential market values between oak savanna restoration and oak forest management, reforestation of old fields to reduce fragmentation, or prescribed burning in and around prairie and savanna managed areas.
- Restore oak openings and woodlands and expand and enhance goat prairie and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
- Develop incentives for the start-up cost of converting from row-crop agricultural systems to a rotational grazing or biofuels production systems, which will keep permanent cover on the land, provide grassland habitat and significantly reduce soil loss into streams.
- Develop educational tools and demonstration/training areas that promote prescribed fire and other prairie and savanna management practices.
- Identify additional sites containing high quality or restorable oak barrens, oak savannas and woodlands.
- Zoning of blufflands needs to recognize the critical importance of maintaining goat prairies, oak savanna restoration opportunities, connecting habitat corridors, migratory bird stopover sites, and forested habitat is essential for long-term maintenance of viable SGCN populations.

Wisconsin's Wildlife Action Plan (2005-2015)
Significant Ecological Features and Priority Conservation Actions

STATEWIDE PRIORITIES

- Partnering with prairie/savanna/forest restoration groups to manage and protect habitats is vital to effectively keep SGCNs on the landscape.
- Conduct large-scale planning efforts with agencies, state government and partners regarding the upper Mississippi River and its adjacent bluffslands.

Large Blocks – Old Deciduous-Coniferous Forest (climate change resistant forest systems)

Baraboo Hills and Boreal Forest Transition

- Develop tax incentives to preserve old-growth forest.
- Manage forest adjacent to old-growth stands and ephemeral ponds the complement to the ecological values of the primary feature.
- Work towards a balanced mosaic of age-classes; older age-classes are currently underrepresented.
- Encourage regeneration or reestablishment of eastern hemlock, Canada yew, yellow birch, white cedar, and other conifer, where appropriate through adaptive management techniques.
- Increase representation of red and white pine forests, especially older age classes.
- Conduct an inventory and map the locations of ephemeral ponds.
- Conduct additional survey work in northern wet forest for boreal birds, invertebrates and other taxa.
- In areas free of exotic earthworms, minimize the likelihood of invasion by earthworms by preventing transportation of worms in soil, potted plants, mulch and compost.

Kettle Moraines Features

Concentrations of calcareous fens, prairies, oak woodlands, oak/central hardwood forest, forested wetlands, and glacial features.

- Focus management and restoration efforts in the middle and north Kettle Moraine areas forest conservation opportunity areas to emphasize a matrix of older oak-central hardwood forest with smaller patches of oak woodland, oak savanna, native prairies and relict forests.
- Develop a practical “toolkit” for maintaining structural and compositional characteristics of dry oak forest and oak savanna ecosystems.
- Develop cost share incentives for landowners to burn, eradicate invasive exotic species, and restore oak openings and forests, prairies, fens and sedge meadows.
- Preserve and manage all wet-mesic prairie sites, restore degraded sites (emphasizing restoration of hydrology), and manage the sites in a matrix of surrogate grasslands and other shrub and savanna habitats for area sensitive species.
- Promote private land management of small sites where possible by offering incentives to private landowners for preservation or restoration of prairies.
- Monitor wet-mesic prairies to determine whether prescribed burning and other management activities are maintaining invertebrate diversity.
- Preserve and manage all wet-mesic prairie, calcareous fen and tamarack fen sites; restore degraded sites (emphasizing restoration of hydrology), and manage the sites in a matrix of sedge meadow, surrogate grasslands and other shrub and savanna habitats for area sensitive species.

Large River Corridors, including floodplain forests and backwater areas

- Protect the ecological river corridor gradients from lowlands to uplands, along with protection of the floodplain corridor. This will enlarge the amount of habitat available, allow for the movement of species upslope and downslope as environmental conditions change over time, provide suitable habitat for species that require large areas, provide migratory bird stopover habitat, or are dependent upon a mosaic of interconnected habitats, including a full range of seral stages for their long-term survival.
- Conduct large-scale planning efforts with agencies, state's and partners regarding the upper Mississippi River, its large river tributaries and the adjacent bluffslands.
- Manage the sand and gravel-influenced floodplains of the Lower Chippewa and Lower Black Rivers for floodplain savanna conditions to help the recovery of Eastern Massasauga Rattlesnake.

Wisconsin's Wildlife Action Plan (2005-2015)
Significant Ecological Features and Priority Conservation Actions

STATEWIDE PRIORITIES

- Manage appropriate native sand prairie and sand prairie restoration sites for nesting Ornate Box and Blanding's Turtles.
- Monitor long-term population status and trends for Eastern Massasauga Rattlesnake.
- Continue head starting program for Ornate Box Turtles.
- Conduct research on the interspecies competition between increasing "channel" shiners and the greatly decreasing Pallid Shiner.
- Protection and restoration of natural lake and stream habitat, including establishment of refuge areas and appropriate management of aquatic plants, are needed for conservation of the Pugnose Shiner, which requires clear waters and littoral zone vegetation.
- Protect and restore appropriate habitat in the lower Wolf River, Mississippi and Lower Wisconsin Rivers for Shoal Chub.

Upper Midwest

Glacial Lake Wisconsin.

- Maintain large blocks of open bog/muskeg habitat and other surrounding wetlands and manage as co-occurring peatland communities by maintaining hydrology and eradicating invasive plant species.
- Maintain large blocks of open sedge meadow and manage as complex in conjunction with associated wetlands such as open bog, poor fen, emergent marsh, shrub-carr, alder thicket and northern wet forest by maintaining hydrology, tree cutting and harvest, prescribed fire and eradicating invasive plant species.
- Maintain lowland shrub communities, especially alder thickets and shrub-carr, and manage the working forest surrounding the shrub communities to benefit Golden-winged Warblers by leaving scattered off site aspen, ash and tamarack in the shrub areas and manage the uplands in a shifting mosaic to provide continuous habitat.
- Survey large peatlands for presence of boreal birds, Lepidoptera and other boreal taxa.
- Restore oak barrens on sites that will increase effective landscape for area sensitive species, such sand areas between large wetlands.
- Manage oaks in the context of oak forest, oak woodland, oak savanna in a gradient from forest to open wetlands.
- Maintain or restore mixed pine-oak forests to represent the range of variability expressed by this type, in a range of patch sizes and age classes.
- Identify and restore oak/conifer barrens and shrub habitats through fire and timber management.

Large Blocks of Predominately Older Northern Forest – Blue Hills and Northeast Wisconsin Forests

- Develop tax incentives to preserve old-growth forest.
- Manage forest adjacent to old-growth stands and ephemeral ponds the complement to the ecological values of the primary feature.
- Work towards a balanced mosaic of age-classes; older age-classes are currently underrepresented.
- Encourage regeneration or reestablishment of eastern hemlock, Canada yew, yellow birch, white cedar, and other conifer, where appropriate through adaptive management techniques.
- Increase representation of white pine forests, especially older age classes.
- Develop reliable natural regeneration techniques for mixed white pine-hardwood forests.
- Conduct an inventory and map the locations of ephemeral ponds.
- Conduct additional survey work in northern wet forest for boreal birds, invertebrates and other taxa.
- In areas free of exotic earthworms, minimize the likelihood of invasion by earthworms by preventing transportation of worms in soil, potted plants, mulch and compost.

Large Sedge Meadows, Fens, and Prairies

- Maintain large blocks of habitat; manage complexes of sedge meadow in conjunction with associated wetlands such as open bog, poor fen, emergent marsh, shrub-carr, alder thicket and northern wet forest where possible.

Wisconsin's Wildlife Action Plan (2005-2015)
Significant Ecological Features and Priority Conservation Actions

STATEWIDE PRIORITIES

- Maintain large blocks of open bog/muskeg habitat and other surrounding wetlands and manage as co-occurring peatland communities.
- Where possible, manage for complexes of wet prairie, calcareous fen, shrub-carr and tamarack swamp in the south.
- Utilize prescribed fire or fluctuating water levels to keep an open aspect and prevent woody species invasion.
- In high quality remnants avoid soil disturbance such as pothole creation, or level ditching.
- Focus research on the development of management techniques for maintenance of calcareous fens.

Caves and Abandoned Mines

- Develop statewide bat conservation plan.

Medium-sized Rivers and Streams.

- Protect the ecological river corridor gradients from lowlands to uplands, along with protection of the floodplain corridor. This will enlarge the amount of habitat available, allow for the movement of species upslope and downslope as environmental conditions change over time, provide suitable habitat for species that require large areas, provide migratory bird stopover habitat, or are dependent upon a mosaic of interconnected habitats, including a full range of seral stages for their long-term survival.
- Protection and restoration of natural lake and stream habitat, including establishment of refuge areas and appropriate management of aquatic plants, are needed for conservation of the Pugnose Shiner, which requires clear waters and littoral zone vegetation.

Statewide broad-based priority conservation actions for SGCN

Develop Improve Partnerships and incentives

- Encourage establishment and management of surrogate grassland habitat on private land through tax incentives, such as the Minnesota Prairie Bank Program.

Education

- Develop education materials to inform local zoning and planning partners regarding the positive effects for including wildlife habitat in their planning decisions.

Enforcement/Regulation/Legislation

- Evaluate amending the State Endangered Species Act to include protection of habitat for listed species.

Habitat/Landscape Protection and Management

- Develop a statewide ephemeral (vernal) pond management plan that encompasses maintenance of water quality, habitat disturbance, and biological legacy retention in and around the ponds.
- Protect bat hibernacula and maternity roosts from disturbance.
- Assemble a team to develop an ecological corridor map and habitat network reserve plan to address species and natural community movement opportunities in the face of a changing climate.
- Before the end of fiscal year 2009, assemble a team of wildlife biologists, foresters, researchers, and bird experts to develop a map of priority areas for management of early seral stage forest. The team would focus on the places where the Department could expend limited dollars for applying management to forests where timber sales are problematic. The sites chosen would have the greatest benefit for the greatest number of shrubland species, especially SGCN.
- Develop management objectives for public road-stream crossings that strives to have no stream constriction in priority Conservation Opportunity Areas.

Wisconsin's Wildlife Action Plan (2005-2015)
Significant Ecological Features and Priority Conservation Actions

STATEWIDE PRIORITIES

- Maintain a network of stopover sites that provide quality refueling and resting habitat for the full diversity of migratory bird SGCN, particularly in highly altered landscapes along the Great Lakes and Mississippi River flyways.
- Focus wintering habitat for neotropical migrant partnerships on those nations harboring significant habitat for those species with high breeding populations in Wisconsin that are most at risk. In Wisconsin, Cerulean, Canada, Connecticut and Golden-winged Warblers are most closely associated with the criteria. For Wisconsin to be most effective, we should work with migratory bird conservation organizations in Costa Rica, Panama, Venezuela, Columbia and Ecuador.

Invasive Species

- Support research to find biological control agents for especially pernicious invasive exotic species. Especially important is the need to controlling glossy buckthorn, common buckthorn, garlic mustard, zebra and quagga mussels.
- Promulgate rules to prevent new invasive species from entering the state.
- Promulgate rules to prohibit the transport, possession, transfer or introduction of a listed restricted invasive species and establish control requirements for restricted species.
- Follow Best Management practices developed for reducing the spread of invasive species.
- Give priority for monitoring and control of prohibited and early detection species.
- Focus limited funding for control of restricted species in conservation opportunity areas.

Individual Species Management

- Experiment with management regimes that regenerate oaks while maintaining core areas of older forests for Cerulean Warbler.

Inventory

- Conduct a comprehensive inventory and mapping of ephemeral ponds.
- Conduct inventory efforts on the species and communities of "Information Needs", identified in the 2008 Implementation process.

Monitoring

- Develop a monitoring protocol to assess the taxa groups most reflective of maintaining biological diversity in ephemeral ponds and the preferred return interval for ephemeral ponds.

Planning – Landuse and Management

- Inform local zoning and planning partners regarding the positive effects for including wildlife habitat in their planning decisions.

Research

- Collect more information on taxonomy and population trends of shortjaw cisco in Lake Superior as a basis for development a management for the species.
- Research Franklin's Ground Squirrel distribution, habitat use, population size, and mortality factors as a basis for developing an effective management strategy.
- Collect information on the distribution, abundance, and population trends of the Prairie Vole to develop effective conservation efforts.
- Collect distribution and abundance information to better quantify macro- and micro-habitat needs of the Woodland Jumping Mouse.
- Evaluate the biological and sociological impacts of repatriation as a conservation strategy for Eastern Massasauga Rattlesnake.

Wisconsin's Wildlife Action Plan (2005-2015)
Significant Ecological Features and Priority Conservation Actions

STATEWIDE PRIORITIES

- Conduct a landscape importance evaluation for the Northeast Wisconsin forests.
- Conduct comprehensive status survey for Phlox moth.
- Conduct comprehensive status survey for Poweshiek skipper.
- Evaluate the status of Swamp Metalmark and assess potential reintroduction sites.
- Conduct comprehensive status surveys for aquatic mussel species, and targeted population monitoring and life history research on the mussel species that require additional information for successful conservation.
- Conduct systematic atlas and inventory efforts on select species, species assemblages within the invertebrate groups Hemiptera and Odonata.
- Conduct research efforts on the species and communities of "Information Needs", identified in the 2008 Implementation process.

Build on Existing Investments

The following investments are active priorities of the governor and the Department that address many aspects of the Wildlife Action Plan. These investments provide the framework for conserving many of our state's natural communities and their species.

Identified Department of Natural Resources Priorities Relating to SGCN

These bulleted actions capture existing Department high priority conservation actions with programs in place actively working on the actions that have significant effects on SGCN. Modifications in a program's goal, increased funding for on the ground activities, or focusing actions in conservation opportunity areas can enhance these existing program's effectiveness regarding SGCN.

- Utilize the data from the Wildlife Action Plan, Ecological Landscapes Handbook, statewide conservation priorities, and identified conservation opportunity areas to assist the Deer Management Program in evaluating the establishment of deer management unit goals
- Continue to work on the Farm Bill and associated agricultural set-aside programs. Utilize the Wildlife Action Plan as key information for focusing permanent grassland and savanna protection, setting priorities and enhanced payments for critical parcels in conservation opportunity areas.
- Implement and strengthen several Watershed Program initiatives to effectively enhance water quality and aquatic habitat for numerous SGCN, such as
 - Utilize data from the Wildlife Action Plan to assist the Runoff Management program in both urban and rural settings including nutrient management, incentives for controls, and buffer strips to address the foremost/high rated streams and lakes to most effectively address SGCN.
 - Ground water supply program that identifies recharge areas can use the data to help determine effects on priority natural communities, such as calcareous fens and efficacy of issuing permits for high cap wells near those priority areas.
 - Great Lakes – several programs with special focus on brownfields, contaminated sediment clean up, aquatic invasive species, wetland and estuary protection and restoration, can use the WAP data to help keep SGCN in the Great Lakes.
 - Dams and Floodplain Programs can utilize the data and conservation actions from the Wildlife Action plan to help make decision regarding the best locations for dam removal, constructing fish passages, and where to target floodplain zoning ordinance reviews and workshops.
 - Plan, implement and evaluate the Mississippi River Habitat Enhancement and Rehabilitation Program projects and drawdown projects including Pool 8 Islands and Harper's Slough.
 - Aquatic invasive species program that includes education, monitoring and enforcement should use Wildlife Action Plan conservation actions and conservation opportunity areas as a part of the decision tree for dispersing financial assistance grants.
 - Shorelands and shallows assessment tool needs to include Wildlife Actions Plan data for SGCN.
 - Implement "Reversing the Loss" wetland strategy.

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Significant Ecological Features and Priority Conservation Actions

STATEWIDE PRIORITIES

- The Wetlands Team can use the Conservation Opportunity Area map and the conservation actions from WAP in their rapid assessment methodology, ADID wetlands considerations, and Wetland restoration plans.
- Incorporate WAP into the wetland website.
- Wetland toolkit is created and widely distributed.
- Explore ways to include rare wetland types and SGCN habitat into the Department Water Regulation programs.
- Implement actions from the Statewide Forest Plan and the Governor's Council on Forestry issues that positively affect SGCN. Implementation actions will be most effective if applied in conservation opportunity areas. Examples include 1.) Encourage the maintenance of native tree species that are becoming uncommon, 2.) Encourage the maintenance of oak, especially old oak forests 3.) Protect rare ecosystems and species habitats, 4.) Work to minimize the effects of invasive species, 5.) Conserve, protect and manage old-growth forests, 6.) Minimize forest fragmentation, 7.) Best Management Plan for Water Quality, 8.) Apply silvicultural techniques to increase carbon storage, and 9.) Increase the use of prescribed fire as a forest management practice.
- Reduce mercury emissions by working with chemical companies and electric utilities to use mercury free technologies.
- Support zoning and Smart Growth efforts that maintain forest cover in forested areas and grassland cover in grassland areas.
- Continue current system of tribal and state rice bed restoration and harvest regulations.
- Support initiatives to reduce greenhouse gas emissions and focus habitat work in areas where connecting corridors will accommodate species movement or places that contain features that will mitigate the impacts of increased temperatures.
- Complete a statewide assessment of ecological corridors deemed to be critical in the face of a changing climate.
- Implement the Whooping Crane Management Plan.
- Implement Karner Blue Butterfly Habitat Conservation Plan.
- Implement Great Lakes and Mississippi River Joint Ventures.
- Implement Butler's Garter Snake Management Plan.
- Implement Gray Wolf Management Plan
- Implement Piping Plover Recovery Plan.
- Implement Hine's Emerald Dragonfly Recovery Plan.
- Implement the Lake Sturgeon Management Plan.
- Implement Greater Prairie Chicken Management Plan.
- Implement Joint Venture All Bird Plan.
- Implement Wisconsin Bird Conservation Initiative (WBCI) All Bird Plan.
- Implement Department E/T Recovery Plans.
- VHS control and management program.
- Inventory for all Department properties for invasive species.
- Develop a statewide bat conservation plan.
- Implement Lower Fox Basin and Upper Green Bay Integrated Management Plans
- Incorporate Wildlife Action Plan data, conservation actions and Conservation Opportunity Area information in Property Master Plan decision-making.
- Inventory and monitoring programs administered by Ecosystem Inventory and Monitoring section and Natural Heritage Inventory collect, house, and interpret information on SGCN that can be used for master planning, habitat management and ET species regulations. Seek stable funding to assure this basic information is available to make sound decisions and help keep these species off the ET list.
- Ecological Reference Areas and protection of unique habitats administered by the State Natural Areas Program provides a baseline for our resource management as an indicator for how well we are doing. These reference areas are often times embedded in more actively managed lands. Managed lands and their

Wisconsin's Wildlife Action Plan (2005-2015)
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STATEWIDE PRIORITIES

accompanying references areas are both needed to accomplish the goals of the Wildlife Action Plan. Seek stable funding to assure this basic management and ecological monitoring keep species off the ET list.

New and increased emphasis conservation priorities from the Governor and Secretary's offices in addition to those listed above will enhance or improve existing programs examples include:

- Legislation modeled after Michigan's ballast water law, which will create uniformity among Great Lakes basin states.
- Ratification of the Great Lakes compact to keep water in the Great Lakes.
- Authority for aquatic invasive boat launch inspections and education
- Create a Forest Legacy Program that will act as a way to further protect forestlands and allow the state more options for purchasing land and easements to maintain large blocks of working forest lands.
- Faster processing of grants to farmers to affect amount of polluted runoff