





# Introduction/SGCN Conservation at Multiple Scales

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Vermont's list of Species of Greatest Conservation Need (SGCN) comprises 144 vertebrate species (including chestnut sided-warbler, lake sturgeon, and spotted salamanders) as well as 192 invertebrate species (including tawny emperor butterflies, cobblestone tiger beetles, and giant floater mussels). Developing individual conservation plans for each SGCN would have been exhausting and impractical. Moreover, attempts to implement the more than 300 plans would be impossible due to insufficient resources and the high overall cost, resulting from the inefficiency of implementing many uncoordinated plans (not to mention problems reminiscent of the Keystone Cops stemming from the hundreds of biologists in the field bumping into each other).

Fortunately an easier, cheaper, and more efficient approach to addressing the needs of our Species of Greatest Conservation Need exists. That method consists of designing and implementing conservation efforts at multiple scales. For example, wildlife managers have been creating edge habitat for decades (Smith 1980) where, for example, an early successional stage of forest borders later successional forest. They do this because research shows that this improves conditions for deer, rabbit, turkey, ruffed grouse and several other species. In this example management actions were targeted at the habitat level.

Similarly, research in the 1960's and 1970's indicated that pesticides such as DDT so weakened the eggs of loon, osprey, peregrine falcons and many other birds of prey that eggs were collapsing under the weight of expectant parents. Not only did this add to nationwide population crashes, it also impeded restoration efforts because the pesticides remained in the birds for years. Action taken at the state and federal level—the regulation of pesticides—eventually helped these species and loon, osprey, peregrine falcon were finally removed from the Vermont's endangered species list in April of 2005.

Following this approach, we began at the species level by assessing SGCN individually. Then SGCN were organized by taxonomic group and by habitat usage with habitats grouped by vegetation type. This resulted in conservation strategies at five levels (table 4-1). Some species will always require specific conservation attention, such as those that are very rare, those that are declining across their range, those that aggregate for breeding, and those that require large home ranges. Their needs are addressed at the Species Level. Other species' needs can be met by the long-term conservation of high quality habitats and communities used by these species (the Community Level). Still other species will require conservation at the scale of wildlife travel corridors and large forest blocks (the Landscape Level).

**Table 4-1 Organization of Conservation Information in this Report**

| Level                                  | Organization   | Location in this document |
|--|--|---------------------------|
| 1) Species                             | 144 individual species summaries & 16 invertebrates group summaries          | Appendix A                |
| 2) Taxon                               | 5 group summaries (bird, fish, invertebrate, mammal and reptile & amphibian) | Chapter 4                 |
| 3) Community & Cultural Habitat Groups | 120 communities & cultural habitats grouped into 18 summaries                | Appendix B                |
| 4) Landscapes                          | 6 landscape summaries (4 forest, riparian & fluvial)                         | Chapter 4                 |
| 5) State & Region                      | State-level conservation strategies and action themes                        | Chapter 1                 |

## Selection of Classification Systems

Though great strides have been made in developing vegetation classification systems that function at the site, landscape, region and national scales (Barnes 1979, Allen and Starr 1982, Forman and Godron 1986, Cleland et. al 1997, Grossman et. al 1998) they are incomplete. In particular, no system satisfactorily integrates aquatic and terrestrial communities and cultural habitats<sup>1</sup> used by wildlife. The efforts of every

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<sup>1</sup> Cultural habitats are communities and sites that are either created and/or maintained by human activities or are modified by human influence to such a degree that the physical condition is substantially different from what existed prior to human influence (adapted from Reschke 1990)

state, however, in development of their Action Plan greatly improve our prospects and plans are underway for coordination and information sharing once states' Action Plan reports are approved (IAFWA 2005).

In lieu of a unified habitat classification system, Vermont's Action Plan technical teams utilized the best features of five peer-reviewed vegetation classification systems that can be crosswalked with those used in other states to support broader scale conservation efforts—regionally, nationally, and internationally. Forest Cover Types (Eyre 1980) and U.S. Forest Service Forest Inventory & Analysis Types (USDA 2003) were used for early successional stage forests. Natural Communities (Thompson and Sorenson 2000) were the basis most terrestrial vegetation. "A Classification of the Aquatic Communities of Vermont" by Langdon et. al. (1998) was adapted for aquatic community designations and cultural habitats<sup>1</sup> were adapted from Reschke (1990). Landscape scale communities were adapted from Poiani et.al. (2000).

One hundred 120 aquatic and natural community types, cultural habitats and land cover types, capturing most of the habitat required by SGCN were selected from the five systems (table 4-2). Each was assigned to one of 22 categories. Because Lake Champlain and the Connecticut River harbor most of the fish diversity in Vermont, these two waterbodies were broken out from the taxonomy to provide for a more targeted assessment. Technical teams then developed assessment summaries for each that includes descriptions and general locations; current conditions; desired conditions based on the needs of associated SGCN; priority problems; conservation strategies to address problems (along with the identification of potential conservation partners and funding sources); and a listing of relevant plans and planning processes pertinent to a habitat type. (Appendix B)

In addition, three landscapes were selected (forest, riparian, and fluvial/stream) to address connectivity needs of many SGCN as well as the needs of wide-ranging SGCN. Assessment summaries were also completed for each landscape (see this chapter).

## **Successional Stages, Species of Greatest Conservation Need and the Action Plan**

Plant succession produces cumulative change in the types of plant species occupying a given area through time. It is complicated by factors such as disturbance (large and small), local conditions, seed banks and soil legacies (Oliver 1981). A highly simplified timeline begins when land is cleared. Pioneer species typically return first followed by other species generally better adapted to the new and changing conditions created by the previous suite of species. Given sufficient time and appropriate conditions the area moves roughly through early, middle, and late successional stages—often referred to as mature or old growth. A disturbance, if sufficiently large, can re-set the clock anytime and succession begins again. The best known examples are forest succession but it occurs in virtually all vegetated areas. For example, lichen communities on granite mountaintops experience successional changes (Wessels 2002).

Succession can significantly impact habitat for Species of Greatest Conservation Need and other wildlife as in the edge habitat example noted earlier. Generally as succession moves from early to late stages some wildlife will lose out (e.g., spruce grouse, woodcock, cottontail rabbit) and others will benefit (e.g., marten, northern goshawk). Others still prefer a mix of successional stages in appropriate configurations (e.g., black bear, lynx).

Over the past two centuries the mix of successional stages available to Vermont's wildlife has changed dramatically in both distribution and abundance. Though precise estimates (current and historic) are unavailable, prior to 1800 a significant percentage of Vermont's forests were in late-successional stages (>150-300 years and older). One-hundred years later early-successional stages (1-15 years) dominated the state and today mid-successional forests (60-100 years) are most abundant. Wildlife populations have responded in turn. Vermont's SGCN list contains relatively few species requiring mid-successional forests and more that thrive in early and late-successional representations.

Because the loss of late-successional forests in the eastern US occurred prior to the advent of modern wildlife biology and the current scarcity of later-successional stages (particularly northern hardwood forest types) our understanding how wildlife utilized these stages is not as advanced as our knowledge of wildlife in early successional stages. Historic records and research in late-successional areas elsewhere indicate that the distribution and abundance of some wildlife species was much greater when late-successional forests were in greater abundance—even if these species can survive without them. Given the lack of this condition on the landscape it is advisable to increase its availability to wildlife.

The habitat, community and landscape summaries that follow here and in Appendix B address habitat the needs of Species of Greatest Conservation Need that use that vegetation type in one or more successional stages. Conservation strategies address the particular successional stage needs well those species that prefer a mosaic of successional stages.

**Table 4-2: Landscape, Community, Habitat & Cover Type Categories**

\* Categories marked with an asterisk "\*" are considered major categories for the purposes of organizing this report (24 in all). Conservation summaries were developed addressing characteristics and location, current and desired condition, SGCN using this habitat category, priority problems impacting this category, conservation strategies to address the problems and a list of other plans and planning entities with significant interest in this area.

**Landscapes** (adapted from Poiani et.al. 2000)

|   |   |  |
|---|---|--|
| <p><b>*Landscape Forests</b><br/>         Large blocks of contiguous forest<br/>         Statewide and regional wildlife corridors and linkages<br/>         *Spruce-Fir Northern Hardwoods<br/>         *Northern Hardwood Forests<br/>         *Oak-Pine-Northern Hardwoods<br/>         (These three Northern Hardwood natural communities comprise the bulk of Vermont's landscape forests)</p> | <p><b>*Landscape Level Aquatic &amp; Shorelines</b> (includes riparian areas)</p> | <p><b>*Fluvial (Riverine)</b> (adapted from Langdon et.al. 1998)<br/>         Brook trout<br/>         Brook trout-slimy sculpin<br/>         Blacknose dace-slimy sculpin<br/>         Blacknose dace-bluntnose minnow<br/>         Blacknose dace creek chub<br/>         Tessellated darter-fallfish<br/>         Blacknose dace-slimy sculpin<br/>         White sucker-tessellated darter</p> |
|---|---|--|

**Aquatic Communities** (adapted from Langdon et.al. 1998)

|  |  |
|--|--|
| <p><b>*Lower Connecticut River</b> (Atlantic salmon-American shad community)</p>   | <p><b>*Lacustrine</b> (lakes and ponds)<br/>         Dystrophic lakes<br/>         Meso-eutrophic lakes<br/>         Oligotrophic lakes<br/>         High elevation acidic lakes</p> |
| <p><b>*Lower Lake Champlain Tributaries</b> (Redhorse-lake sturgeon community)</p> | <p><b>*Lake Champlain</b></p>  |

**Cultural Habitats**

(adapted from Reschle 1990)

- \*Building & structures
- \*Mine & gravel pits
- \*Grassland & hedgerows
  - Grasslands
  - Hedgerow
  - Old field/shrub
  - Orchard

**Successional Stages & Forest Cover Types**

(Eyre 1980, US Dept of Agriculture 2003)

**Stages:** Seedling/Sapling Sapling/Pole Timber, Pole Timber

**Cover types**

- Boreal Conifers
  - Balsam fir
  - Black spruce
  - White spruce
- Boreal Hardwoods
  - Aspen
  - Pin cherry
  - Paper birch
- Spruce-Fir
  - Red spruce
  - Red spruce-balsam fir
  - Paper birch-red spruce-balsam fir
- Pine and Hemlock
  - Eastern white pine

**Note:** *Habitat descriptions in the Individual Species Summaries (A1-A5) note specific stage & cover type needs for SGCN Landscape Forest Summaries (next section) incorporate stage and cover type as part of landscapes & natural communities*

**Table 4-2 continued: Terrestrial Natural Communities** (Thompson & Sorenson 2000)

**Open or Shrub Wetlands**

- \*Open Peatlands
  - Alpine peatland
  - Dwarf shrub bog
  - Black spruce woodland bog
  - Pitch pine woodland bog
  - Poor fen
  - Rich fen
  - Intermediate fen
- \*Marshes & Sedge Meadows
  - Deep bulrush marsh
  - Deep broadleaf marsh
  - Shallow emergent marsh
  - Sedge meadow
  - Cattail marsh
  - Wild rice marsh
- \*Wet Shores
  - Calcareous riverside seep
  - River cobble shore
  - Lakeshore grassland
  - Riverside sand or gravel shore
  - Outwash plain pondshore
  - River mud shore
  - Rivershore grassland
- \*Shrub Swamps
  - Buttonbush basin swamp
  - Alder swamp
  - Alluvial shrub swamp
  - Sweet gale shoreline swamp
  - Buttonbush swamp

**Forested Wetlands**

- \*Floodplain Forests
  - Silver maple-ostrich fern riverine floodplain forest
  - Lakeside floodplain forest
  - Silver maple-sensitive fern riverine floodplain forest
  - Sugar maple-ostrich fern riverine floodplain forest
- \*Hardwood Swamps
  - Red maple-black ash swamp
  - Red maple-northern white cedar swamp
  - Calcareous red maple-tamarack swamp
  - Red or silver maple-green ash swamp
  - Red maple-black gum swamp
  - Red maple-white pine-huckleberry swamp
- \*Softwood Swamps
  - Northern white cedar swamp
  - Spruce-fir-tamarack swamp
  - Black spruce swamp
  - Hemlock swamp
- \*Seeps & Vernal Pools
  - Vernal pool
  - Seep

**Open Upland Communities**

- \*Upland shores
  - Riverside outcrop
  - Lake sand beach
  - Lake shale or cobble beach
  - Erosional river bluff
  - Sand dune
- \*Outcrops & Upland Meadows
  - Alpine meadow
  - Boreal outcrop
  - Serpentine outcrop
  - Temperate acidic outcrop
  - Temperate calcareous outcrop
- \*Cliffs & Talus
  - Boreal acidic cliff
  - Boreal calcareous cliff
  - Temperate acidic cliff
  - Temperate calcareous cliff
  - Open talus

**Upland Forests & Woodlands**

- \*Spruce-Fir Northern Hardwood Forest (included with landscape forest summary)
  - Subalpine krummholz
  - Montane spruce-fir forest
  - Lowland spruce-fir forest
  - Montane yellow birch-red spruce forest
  - Boreal talus woodland
  - Cold-air talus woodland
  - Red spruce-northern hardwood forest
- \*Northern Hardwood Forest (included with landscape forest summary)
  - Northern hardwood forest
  - Rich northern hardwood forest
  - White pine-northern hardwood forest
  - Mesic red oak-northern hardwood forest
  - Hemlock forest
  - Hemlock-northern hardwood forest
  - Northern hardwood talus woodland
- \*Oak-Pine-Northern Hardwood Forest (included with landscape forest summary)
  - Limestone bluff cedar-pine forest
  - Mesic maple-ash-hickory-oak forest
  - Valley clayplain forest
  - White pine-red oak-black oak forest
  - Dry oak forest
  - Pine-oak-heath sandplain forest
  - Dry oak-hickory-hophornbeam forest
  - Red cedar woodland
  - Red pine forest or woodland
  - Pitch pine-oak-heath rocky summit
  - Dry oak woodland
  - Transition hardwood talus woodland

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# Floodplain Forest Summary

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## Characteristics and Location

Floodplain forests are usually dominated by silver maple or occasionally sugar maple, with abundant ostrich fern or sensitive fern. They are closely associated with river and lake floodplains and have exposed mineral soils of alluvial origin.

Natural communities of the Floodplain Forest include: Silver Maple-Ostrich Fern Riverine Floodplain Forest, Silver Maple-Sensitive Fern Riverine Floodplain Forest, Sugar Maple-Ostrich Fern Riverine Floodplain Forest and Lakeside Floodplain Forest.

### Natural Communities of the Floodplain Forest:

**Silver Maple-Ostrich Fern Riverine Floodplain Forest:** This forest is found in the floodplains of moderate-gradient rivers. Silver maple and ostrich ferns are the dominant species and the soils are typically well drained sandy alluvium. Boxelder may be abundant in young forests.

**Silver Maple-Sensitive Fern Riverine Floodplain Forest:** These forests occur in the floodplains of large, low-gradient rivers. Silver maple is the dominant tree, but green ash and swamp white oak may be present. Sensitive fern and false nettle are characteristic. Soils are moist, typically mottled, silty alluvium.

**Sugar Maple-Ostrich Fern Riverine Floodplain Forest:** This uncommon floodplain forest type occurs along small to moderate sized high gradient rivers in areas of calcium-rich bedrock. Sugar maple, white ash, basswood, boxelder, and ostrich fern are common. There can be a diverse herbaceous layer. Soils are well drained sandy alluvium. Many examples of this community are uplands.

**Lakeside Floodplain Forest:** These forests occur primarily within the flooding zone of Lake Champlain. Silver maple and green ash are the dominant trees. Herbs include sensitive fern, false nettle, marsh fern, white grass, and Tuckerman's sedge. Surface organic layers are present in the moist silty soils and there are mottles near the surface.

## Floodplain Forest Condition

**Historical Perspective:** Although there is little specific information on distribution and composition of floodplain forests prior to European settlement in the region (Siccama 1971), it is expected that they covered large areas and were likely continuous bands of forest extending unbroken for miles along all of our major rivers. Forests of towering silver maple and American elm likely covered many of the active floodplains, with more diverse forests of sugar maple, red oak, and other species on higher terraces of former floodplains. (Sorenson et al. 1998). Although their total numbers were relatively small, evidence suggests that the Abenaki people that lived in Vermont concentrated their villages and agriculture on and adjacent to the floodplains of the Connecticut River, other major rivers, and Lake Champlain (Klyza and Trombulak 1999).

**Current Condition:** High quality floodplain forests are now uncommon in Vermont because the vast majority of the floodplain forest in Vermont and the region has been converted to agricultural use. Floodplains have been prized as agricultural lands because of their high soil fertility associated with annual flooding and deposition and because of the absence of stones. As a result of their high value as agricultural lands, floodplain forests are now limited to fragments of their original size. The small percentage of riverine floodplains remaining in a forested condition is illustrated for Franklin County by a comparison made between the area of alluvial soils identified by the Natural Resources Conservation Service (USDA 1979) and the area of floodplain forests identified in a Vermont Fish and Wildlife Department floodplain forest inventory project (Sorenson et al. 1998). Although approximate, this comparison indicates that as little as 11% of the floodplains in Franklin County remain in a forested condition.

Significant changes to the flooding regimes of floodplain forests results from dam operation and the construction of roads, bridges, and culverts along rivers and in floodplains. Furthermore, the disturbed nature of many of the floodplain sites makes them vulnerable to invasive exotic plant species, such as goutweed (*Aegopodium podagraria*), garlic mustard (*Alliaria petiolata*), dame's-rocket (*Hesperis matronalis*), honeysuckle (*Lonicera* spp.), and Japanese knotweed (*Polygonum cuspidatum*) (Sorenson et al. 1998).

**Desired Condition (SGCN Needs):** Floodplain forest is essential to those SGCN that require habitat mosaics of aquatic and riparian areas and upland forest. Several of the species associated with floodplain forests require a riparian mosaic that depends upon functioning floodplain wetlands (e.g., pied-billed grebe, Odonata, American black duck); many of which are most abundant in the floodplains of larger river systems. Other species such as the water shrew and spotted salamander use floodplain forest directly adjacent to the stream or river. Lastly, there are some species that require large (10-1000ha) contiguous blocks of forested habitat along stream and rivers—these range from the bald eagle to the mink to the wood turtle. In all, floodplain forest provides habitat for a total of 49 wildlife SGCN and 28 plant SGCN. Desired conditions include functional floodplain forests in healthy examples (mature, unfragmented) distributed across their range. High water quality is also an essential element of floodplain forest quality. Focus should be give to the largest examples.

## Species of Greatest Conservation Need in Floodplain Forests

### High Priority

American Black Duck (*Anas rubripes*)  
 Bald Eagle (*Haliaeetus leucocephalus*)  
 Canada Warbler (*Wilsonia canadensis*)  
 Fowler's Toad (*Bufo fowleri*)  
 Wood Turtle (*Clemmys insculpata*)  
 Bog/fen Odonata Group  
 Freshwater Snails  
 Hardwood Forest Butterflies  
 Lakes/ponds Odonata Group  
 Seep/rivulet Odonata Group  
 Vernal Pool Odonata Group  
 Eastern Pipistrelle (*Pipistrellus subflavus*)  
 Water Shrew (*Sorex palustris*)

### Medium Priority

Blue-winged teal (*Anas discors*)  
 Great Blue Heron (*Ardea herodias*)  
 Long-eared Owl (*Asio otus*)  
 Red-shouldered Hawk (*Buteo lineatus*)  
 Veery (*Catharus fuscescens*)  
 Chimney Swift (*Chaetura pelagica*)  
 Cerulean Warbler (*Dendroica cerulea*)  
 Black-crowned Night-heron (*Nycticorax nycticorax*)  
 Osprey (*Pandion haliaetus*)  
 Pied-billed Grebe (*Podilymbus podiceps*)  
 Spotted Salamander (*Ambystoma maculatum*)  
 Brown Snake (*Storeria dekayi*)  
 Mink (*Mustella vison*)  
 Cinereus or Masked Shrew (*Sorex cinereus*)

**SGCN Notes:** Plant SGCN not listed here include 28 species. The SGCN invertebrate groups listed here contain numerous species Wolf and Black bear utilize floodplain forests but are addressed at the Landscape level. See that section for details. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| <b>Problem/Info Need/Categories</b> | <b>Problem/Info Need Detail</b>   | <b>Rank</b> |
|-------------------------------------|---|-------------|
| Habitat Conversion                  | Agriculture and development   | High        |
| Habitat Fragmentation               | Wider ranging birds, mammals, and reptiles require unfragmented habitat mosaics of 10-1000 ha or more | High        |
| Inadequate Disturbance Regime       | Dams, drainage ditching, filling, and runoff that affect flooding, erosion, and deposition            | High        |
| Habitat Degradation                 | Altering forest conditions along streams and rivers   | High        |
| Distribution of successional stages | Loss of mid-story forest cover due to lack of disturbance or active management. (Veery)               | Medium      |
| Invasive Exotic Species             | Loosestrife and common reed   | High        |
| Trampling or direct impacts         | Human activity proximate to nesting birds   | High        |
| Inventory                           | Determine the location, distribution and condition of floodplain forests throughout their range.      | Medium      |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| <b>Strategy</b>   | <b>Performance Measure</b>   | <b>Potential Partners</b> | <b>Potential Funding Sources</b> |
|---|--|---------------------------|----------------------------------|
| Locate floodplain forests and assess management practices for these forests.  | Number of sites located and assessed   | ANR, FSA, UVM, VA         | SWG                              |
| Identify areas within the state with the largest matrix of floodplain forest for inclusion in conservation opportunity area.    | Number of opportunity areas identified   | ANR, UVM, NRCS            | WRP, SWG                         |
| Consider protection of opportunity areas via acquisition of conservation easements, management leases and fee title acquisition | Number of sites conserved  | ANR, VHCB, TNC, NRCS      | VHCB, WRP, TNC                   |
| Manage exotic species on state owned sites and provide technical assistance to other landowners regarding control of exotics    | Number of sites with control activities and/or invasive monitoring   | ANR, NEPCoP, TNC, NRCS    | WHIP, LIP, SWG                   |
| Technical assistance to private landowners, NGOs and government agencies to maintain and enhance floodplain forests for SGCN    | Number of acres of floodplain forest managed for SGCN maintained, enhanced or restored. Number landowners incorporating SGCN into their land management. | NRCS, TNC, VFWD, FSA      | WHIP, WRP, CREP, CRP, LIP, SWG   |

| Strategy  | Performance Measure  | Potential Partners              | Potential Funding Sources |
|---|--|---------------------------------|---------------------------|
| Technical assistance to towns and regional planning organizations to maintain and enhance floodplain forests for SGCN. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004) | Number of acres of floodplain forest managed for SGCN maintained, enhanced or restored. Number landowners incorporating SGCN into their land management, Number of towns including SGCN in their planning. | NRCS, TNC, VFWD                 | LIP, SWG, WRP, CREP       |
| Financial incentives for private landowners to maintain and enhance floodplain forests for SGCN   | Number of acres conserved/restored   | VFWD, NRCS                      | LIP, WHIP, WRP            |
| Conservation easements on higher quality sites with greatest number of SGCN or T&E listed SGCN  | Number of acres conserved for SGCN   | ANR, VLT, TNC                   | VHCB, VLT, LIP            |
| Manage or remove dams to restore more natural flooding regimes  | Number sites with adequate flooding regimes  | ANR, CT River Watershed Council | ACOE                      |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the lead column

| Plan or planning entity        | Goal/Scope of plan          | Lead                   |
|--------------------------------|-----------------------------|------------------------|
| Floodplain Forests of Vermont  | Natural Community Inventory | ANR                    |
| Draft VT Bat Conservation Plan | Bat conservation            | ANR                    |
| Bald eagle recovery plan       | Bald eagle recovery         | NWF, ANR               |
| Partners in Flight             | Bird conservation plan      | ANR, VT Audubon, USFWS |
| North American Waterfowl Plan  | Waterfowl populations       | USFWS, ANR, DU         |

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# Hardwood Swamp Summary

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## Characteristics and Location

Hardwood dominated swamps are the most common swamp type in the state. They are especially common in the warmer regions of the state on flatter topography and so reach their largest size and greatest abundance in the Champlain Valley and are least frequent in the Northeast Highlands. While two of the seven types are widely distributed, two others are restricted to a few biophysical regions, and the remaining three occur primarily in only a single biophysical region.

Hardwood swamps provide a number of functions, including flood storage, water quality protection, and fish, wildlife, and endangered species habitat. Because of their more open, deciduous canopy, hardwood swamps have more significant understory development than do softwood dominated swamps. This feature, along with their characteristic hummock and hollow topography, creates a landscape mosaic that provides an abundance of microhabitats.

The hardwood swamp formation includes the seven following natural community types:

**Red Maple-Black Ash Seepage Swamp:** This is the most common hardwood swamp type in the state. It occurs in all biophysical regions as either small or large patches. Although they occur in various settings, this natural community type is closely associated with groundwater seepage and does not typically experience surface flooding of long duration. While red maple is typically the dominant tree, black ash is very characteristic of this community. There are also other tree species present and well developed shrub and herbaceous layers.

**Red Maple-Sphagnum Acidic Basin Swamp:** This is another common swamp type that is widely distributed throughout the state. Typically it occurs in poorly drained basins with deep organic soils. Groundwater seepage is absent and the permanently saturated soils tend to be quite acidic. Since they occur in basins, most of these basin swamps are small and typically have no inlet or outlet streams. Red maple is the dominant tree, often with a co-dominance of yellow birch and various softwoods. The shrub layer is well developed, but the herb layer is less diverse, often with dominance by cinnamon fern. Moss cover typically approaches 100%.

**Red Maple-Northern White Cedar Swamp:** This uncommon community type exists as large patches mostly in the western part of the state. This community is limited to areas of calcareous bedrock and is often associated with floodplains, especially in the Champlain Valley. Although it can also occur in isolated basins, it can form huge wetland complexes where it is associated with larger rivers. Red maple, white cedar, and black ash typically dominate the canopy. Both the shrub and herbaceous layer tend to be sparse depending upon the degree of shading and the abundance of water-filled hollows.

**Calcareous Red Maple-Tamarack Swamp:** This is a rare community type that is restricted to areas of calcareous groundwater seepage. It is mostly restricted to the Vermont Valley with only a few examples in other biophysical regions. It typically occupies small isolated basins, but may also occur as part of a large wetland complex. Red maple and tamarack

dominate the canopy that can range from nearly closed to very open. In the latter situation, especially, a diversity of shrubs, herbaceous, and bryophyte species flourish.

**Red or Silver Maple-Green Ash Swamp:** This uncommon natural community type is largely restricted to the Champlain and Vermont Valleys. It occurs as large patches mostly associated with Lake Champlain. This swamp type typically undergoes extensive spring flooding that often results in saturated soils throughout the growing season. Although silver maple typically dominates, red maple and green ash may be very abundant. Both the shrub and herbaceous layer are well developed.

**Red Maple-Black Gum Swamp:** This rare community type occurs as small patches. It is mostly restricted to the southeastern part of the state with a few outliers in other regions. It occurs in small basins that are isolated from surface waters and that contain deep, saturated organic soils. Red maple and black gum co-dominate, but hemlock, yellow birch, and red spruce are also common.

**Red Maple-White Pine-Huckleberry Swamp:** This is a very rare natural community type that is restricted to the Champlain Valley. All known examples occur near the center of much larger wetland complexes. The canopy is dominated by red maple and white pine, but the most striking feature is the dense cover of huckleberry below. Typically, cinnamon fern dominates the herbaceous layer.

### **Hardwood Swamps Condition**

**Current Condition:** Although still relatively common in the state, hardwood swamps were formerly even more abundant. The primary activities resulting in loss of hardwood swamps were commercial and residential road development and road construction. Presently, agricultural conversion results in the greatest loss of swamps. Although protected by the Vermont Wetland Rules, many smaller examples are not mapped and therefore not protected under the regulations. Since many of these swamp types are most abundant in the lower, warmer regions of the state, they are subject to hydrologic impairment and incremental loss along the edges as the area around them is developed.

The primary problems to SGCN include agricultural conversion, invasion by exotics, altered hydrology, development and unrestricted logging.

**Desired Condition:** Forested wetlands provide habitat for a number of SGCN in the state. Hardwood dominated examples are especially diverse since they tend to be at lower elevations and in warmer areas of the state than coniferous swamps. A total of 36 SGCN animals and 43 plant SGCN rely on one or more of these natural communities to provide habitat. Several of the species associated with hardwood swamps also require a habitat mosaic that depends on functioning swamps. Desired conditions include functional hardwood swamps in healthy examples (mature, unfragmented) across the distribution of their range. High water quality is also essential to habitat quality. Focus should be given to the largest examples.

## Species of Greatest Conservation Need in Hardwood Swamps

### High Priority

American Black Duck (*Anas rubripes*)  
 Canada Warbler (*Wilsonia canadensis*)  
 Fowler's Toad (*Bufo fowleri*)  
 Spotted Turtle (*Clemmys guttata*)  
 Wood Turtle (*Clemmys insculpta*)  
 Eastern Rat Snake (*Elaphe obsoleta*)  
 Bog/fen/swamp/marshy pond Odonata group  
 Eastern Pipistrelle (*Pipistrellus subflavus*)  
 Pygmy Shrew (*Sorex hoyi*)

### Medium Priority

Blue-winged Teal (*Anas discors*)  
 Great Blue Heron (*Ardea herodias*)  
 Long-eared Owl (*Asio otus*)  
 Red-shouldered Hawk (*Buteo lineatus*)  
 Veery (*Catharus fuscescens*)  
 Chimney Swift (*Chaetura pelagica*)  
 Rusty Blackbird (*Euphagus carolinus*)  
 Black-crowned Night-heron (*Nycticorax nycticorax*)  
 Osprey (*Pandion haliaetus*)  
 Pied-billed Grebe (*Podilymbus podiceps*)  
 Blue-spotted Salamander (*Ambystoma laterale*)  
 Spotted Salamander (*Ambystoma maculatum*)  
 Four-toed Salamander (*Hemidactylium scutatum*)  
 Brown Snake (*Storeria dekayi*)  
 Cinereus or Masked Shrew (*Sorex cinereus*)  
 Black Bear (*Ursus americanus*)

**SGCN Notes:** Plant SGCN not listed here 43. The SGCN invertebrate group listed here contains numerous species. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| Problem/Info Need/Category | Problem/Info Need Detail  | Rank   |
|----------------------------|---|--------|
| Habitat Conversion         | Agriculture, road building, development   | High   |
| Hydrologic alteration      | Sedimentation, development in watershed, road building, dams  | High   |
| Invasion by Exotic Species | Non-native species can spread and degrade the habitat for wildlife and eliminate some plant species | Medium |
| Habitat Degradation        | Selective removal of cedar or black gum, logging on non-frozen ground, heavy cutting                | High   |
| Habitat Fragmentation      | Roads, agriculture, and development break swamps into smaller patches                               | High   |
| Inventory                  | Statewide inventory has been completed, but not all sites have been evaluated                       | Low    |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Strategy   | Performance Measure  | Potential Partners   | Potential Funding Sources |
|--|--|----------------------|---------------------------|
| Provide information to State Wetlands Office & EPA   | Number of sites added to database  | DEC, EPA             | SWG, EPA                  |
| Locate hardwood swamps and assess their management practices.  | Number of sites located and assessed   | ANR, FSA, UVM, VA    | SWG                       |
| Identify areas within the state with the largest matrix of hardwood swamps for inclusion in conservation opportunity areas.  | Number of opportunity areas identified   | ANR, UVM             | SWG                       |
| Consider protection of large hardwood swamps via acquisition of conservation easements, management leases and fee title acquisition  | Number of sites conserved  | ANR, VHCB, TNC       | VHCB, TNC                 |
| Manage exotic species on state owned sites and provide technical assistance to other landowners regarding control of exotics   | Number of sites with control activities and/or invasive monitoring. Number sites where invasive species are eliminated or controlled                                 | NEPCoP, TNC, NRCS    | LIP, SWG                  |
| Provide technical assistance to private landowners, NGOs and government organizations to plan and manage for SGCN in hardwood swamps.  | Number of acres maintained, enhanced or restored. Number landowners incorporating SGCN into their land management.   | NRCS, TNC, VFWD, FSA | LIP, SWG, CREP, WHIP, CRP |
| Provide technical assistance to towns and regional planning organizations to plan and manage for SGCN in hardwood swamps. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004) | Number of acres maintained, enhanced or restored. Number landowners incorporating SGCN into their land management, Number of towns including SGCN in their planning. | NRCS, TNC, VFWD      | LIP, SWG, CREP            |
| Financial incentives for private landowners  | Number of acres conserved/restored   | VFWD, NRCS           | LIP, WHIP, WRP            |
| Conservation easements on higher quality sites with greatest number of SGCN or T&E listed SGCN   | Number of acres conserved for SGCN   | ANR, VLT, TNC        | VHCB, VLT, LIP            |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Plan or planning entity   | Goal/Scope of plan                               | Lead |
|---|--|------|
| New England Plant Conservation Program – various Conservation Plans | Recovery of various plant species in New England | ANR  |
| North American Waterfowl Plan                                       | Waterfowl conservation and management            | ANR  |
| Black Bear Plan   | Bear conservation and management in Vermont      | ANR  |

## References

- Austin, J.M. C. Alexander, E. Marshall, F. Hammond, J. Shippee, E. Thompson. VT League of Cities and Towns. 2004. Conserving Vermont's Natural Heritage. A Guide to Community-Based Planning for the Conservation of Vermont's Fish, Wildlife and Biological Diversity. Vermont Fish & Wildlife Department and Agency of Natural Resources. Waterbury, VT. [www.vtfishandwildlife.com/library.cfm?libbase\\_=Reports\\_and\\_Documents](http://www.vtfishandwildlife.com/library.cfm?libbase_=Reports_and_Documents)
- Sorenson, E. R., R. Popp, M. Lew-Smith, B. Engstrom, M. Lapin, and M. Ferguson. 2004. Hardwood Swamps of Vermont: Distribution, Ecology, Classification, and Some Sites of Ecological Significance. NNHP, VT. Fish and Wildlife Department. 332 pp.
- Sorenson, E.R., B. Engstrom, M. Lapin, R. Popp and S. Parren. 1998. Northern White Cedar swamps and Red Maple-Northern White Cedar Swamps of Vermont: Some Sites of Ecological Significance. NNHP, VT. Fish and Wildlife Department. 261 pp.
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# Softwood Swamps Summary

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## Characteristics and Location

Most softwood swamps in Vermont are situated at higher elevations in the cooler regions of the state. The one exception are hemlock swamps which behave more like hardwood swamps and are located in the lower, warmer portions of the state. Because of the dense shading in softwood swamps, the understory shrub and herbaceous layers are generally quite sparse. Conversely due to these same moist shady conditions, bryophyte cover tends to be quite abundant. All of the natural communities in this formation occur as small patches on the landscape with the exception of spruce-fir tamarack swamps which occur as large patch communities.

### There are four types of natural community included within the softwood swamp group

**Northern White Cedar Swamp:** This is an uncommon natural community type that is associated with calcareous bedrock and groundwater seepage that makes the dissolved minerals available to the plants. Although it occurs in most of the state's biophysical regions, this community is more abundant in the northern half of the state since white cedar declines to the south. In addition to white cedar, balsam fir may be abundant, but the dense shading results in a sparse shrub and herb layers. Only bryophytes attain abundance in these swamps.

**Spruce-Fir-Tamarack Swamp:** This uncommon natural community is totally absent from the warmer parts of the state. They typically occupy basins that are isolated from surface water movement and have deep organic soils. The canopy is dominated by red or black spruce, fir, and tamarack in varying abundance. Generally more tamarack is indicative of more mineral rich conditions while more black spruce is indicative of deeper peat and less enriched conditions. Despite the deep shade, a number of tall shrubs persist here, especially mountain holly and wild raisin. Herbs are sparse whereas bryophytes proliferate in the cool, moist conditions.

**Black Spruce Swamp:** As the peaty soils become deeper and increasingly acidic and saturated, black spruce begins to replace the less tolerant red spruce. This community is restricted to only the coldest locations where they occupy basins that have gradually accumulated peat over the millennia. Black spruce dominates the canopy which is generally rather low and sparse. These swamps have low shrub and herbaceous diversity due more to the cold, wet, acidic conditions than shading. In openings, low shrubs characteristic of bogs may be common, but bryophytes are ubiquitous throughout the community.

**Hemlock Swamp:** This uncommon swamp is absent from the Northeast Highland and Northern Piedmont biophysical Regions. They typically occupy basins that receive some mineral enrichment either through groundwater seepage or surface water. Generally the hemlock is associated with varying amounts of yellow birch, red maple and black ash. The dense canopy allows for few shrubs or herbs to survive; instead the ground is covered by ferns and bryophytes.

## Softwood Swamps Conditions

**Current Conditions:** Softwoods swamps have been less impacted than either hardwood swamps or floodplain forest communities due to their location in the colder regions of the state

and their generally saturated peat soils. As with the other two wetland types, softwood swamps also receive some protection from the Vermont Wetland Regulations. Nonetheless, they are still limited by habitat degradation and alteration, hydrologic impairment, and sedimentation from development on the fringes and in the watershed, road construction, and unrestricted logging. Exotic species, and herbivory, especially by moose, are also a concern. A potentially major problem for hemlock swamps is the presence in nearby Massachusetts of the hemlock wooly adelgid, an introduced insect that could devastate the Vermont's hemlocks.

**Desired Conditions:** The four natural communities in softwood swamp formation provide habitat for 26 SGCN animals. This includes a large number of birds, but also some turtles and salamanders. A total of 33 plant SGCN occur in softwood swamps; not surprisingly, the majority of which are bryophytes which thrive in the cool, moist, shady conditions. Only spruce-fir-tamarack swamps occur as large patches; however this community and northern white cedar swamps are often included within much larger wetland complexes. Three of the four community types exist as small patches, they are more easily protected; however protection would need to extend beyond the wetland boundary to include at least a portion of the watershed and should include connectivity to softwood swamps. In such situations protection would need to apply to the entire complex. Desired conditions include functional softwood swamps in healthy examples (mature, unfragmented) across the distribution of their range High water quality is also essential to habitat quality.

### **Species of Greatest Conservation Need in Softwood Swamps**

#### **High Priority**

American Black Duck (*Anas rubripes*)  
Spruce Grouse (*Falcapennis canadensis*)  
Canada Warbler (*Wilsonia canadensis*)  
Spotted Turtle (*Clemmys guttata*)  
Wood Turtle (*Clemmys insculpta*)  
Bog/fen/swamp/marshy pond Odonata  
American Marten (*Martes americana*)  
Rock Vole (*Microtus chrotorrhinus*)  
Northern bog lemming (*Synaptomys borealis*)  
Southern Bog Lemming (*Synaptomys cooperi*)

#### **Medium Priority**

Great Blue Heron (*Ardea herodias*)  
Long-eared Owl (*Asio otus*)  
Red-shouldered Hawk (*Buteo lineatus*)  
Chimney Swift (*Chaetura pelagica*)  
Rusty Blackbird (*Euphagus carolinus*)  
Black-crowned Night-heron (*Nycticorax nycticorax*)  
Osprey (*Pandion haliaetus*)  
Gray Jay (*Perisoreus canadensis*)  
Black-backed Woodpecker (*Picoides arcticus*)  
Pied-billed Grebe (*Podilymbus podiceps*)  
Blue-spotted Salamander (*Ambystoma laterale*)  
Spotted Salamander (*Ambystoma maculatum*)  
Four-toed Salamander (*Hemidactylum scutatum*)  
Cinereus or Masked Shrew (*Sorex cinereus*)  
Smoky Shrew (*Sorex fumeus*)  
Black Bear (*Ursus americanus*)

**SGCN Notes:** Plant SGCN not listed here 33. The SGCN invertebrate group listed here contains numerous species. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| Problem/Info Need/Category | Problem/Info Need Detail   | Rank   |
|----------------------------|--|--------|
| Habitat Conversion         | Development, road construction   | High   |
| Habitat Fragmentation      | Roads and development fragment the habitat into smaller patches or from larger habitat mosaics for the wider-ranging species (e.g., wood turtle, American marten)        | High   |
| Hydrologic Alteration      | Sedimentation, development in watershed, road building, dams   | Medium |
| Invasion by Exotic Species | Non-native species (e.g., woolly adelgid) can spread and degrade the habitat for wildlife and eliminate some plant species   | Medium |
| Habitat Degradation        | Selective removal of cedar, logging on non-frozen ground, heavy cutting, lack of mature and overmature stands  | High   |
| Herbivory                  | Moose can eliminate regeneration in some community types   | Medium |
| Inventory                  | Distribution, location and condition of these communities are not known. The ongoing statewide inventory needs to be completed to identify and protect the best examples | High   |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Strategy   | Performance Measure  | Potential Partners     | Potential Funding Sources      |
|--|--|------------------------|--------------------------------|
| Provide information to State Wetlands Office & EPA   | Number of sites added to database  | DEC, EPA               | SWG, EPA                       |
| Locate softwood swamps and assess their management practices.  | Number of sites located and assessed   | ANR, FSA, UVM, VA      | SWG                            |
| Identify areas within the state with the largest matrix of softwood swamps for inclusion in conservation opportunity areas.  | Number of opportunity areas identified   | ANR, UVM               | SWG                            |
| Consider protection of large softwood swamps via acquisition of conservation easements, management leases and fee title acquisition  | Number of sites conserved  | ANR, VHCB, TNC         | VHCB, TNC                      |
| Manage exotic species on state owned sites and provide technical assistance to other landowners regarding control of exotics   | Number of sites with control activities and/or invasive monitoring. Number sites where invasive species are eliminated or controlled | ANR, NEPCoP, TNC, NRCS | LIP, SWG                       |
| Technical assistance and/or financial incentives to private landowners, NGOs and government organizations to maintain and enhance softwood swamps for SGCN,  | Number landowners incorporating SGCN into their land management, Number of acres conserved/restored                                  | NRCS, TNC, VFWD, FSA   | LIP, SWG, WHIP, CREP, CRP, WRP |
| Technical assistance and/or financial incentives to towns and regional planning organizations to maintain and enhance softwood swamps for SGCN. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004) | Number of towns considering SGCN in their planning for softwood swamps. Number of acres conserved/restored                           | NRCS, TNC, VFWD        | LIP, SWG, WRP, WHIP, CRP, CREP |
| Conservation easements on higher quality sites with greatest number of SGCN or T&E listed SGCN   | Number of acres conserved for SGCN   | ANR, VLT, TNC, NRCS    | VHCB, VLT, LIP, WRP            |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Plan or planning entity   | Goal/Scope of plan                               | Lead |
|---|--|------|
| New England Plant Conservation Program – various Conservation Plans | Recovery of various plant species in New England | ANR  |
| Black bear plan   | Bear population conservation and management      | ANR  |
| American Marten Recovery Plan                                       | Recovery of American Marten in Vermont           | ANR  |
| North American Waterfowl Plan                                       | Waterfowl conservation and management            | ANR  |

## References

Austin, J.M. C. Alexander, E. Marshall, F. Hammond, J. Shippee, E. Thompson. VT League of Cities and Towns. 2004. Conserving Vermont's Natural Heritage. A Guide to Community-Based Planning for the Conservation of Vermont's Fish, Wildlife and Biological Diversity. Vermont Fish & Wildlife Department and Agency of Natural Resources. Waterbury, VT. [www.vtfishandwildlife.com/library.cfm?libbase\\_=Reports\\_and\\_Documents](http://www.vtfishandwildlife.com/library.cfm?libbase_=Reports_and_Documents)

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## Vernal Pools & Seeps Summary

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Vernal pools are small, open-water wetlands that are filled by rain and snowmelt in spring or fall and are typically dry during the summer months. Such a pool is usually contained within a small forested basin, has no permanent inlet or outlet, and does not support predaceous fish. Forested swamps may also contain vernal pools in small depressions. During particular wet growing seasons, temporary pools may persist without drying completely. Years of filling and drying result in a unique type of set of conditions that supports a variety of wildlife specialized to take advantage of these conditions. Vernal pools are often rich in unique insects, molluscs, and other invertebrates, as well as amphibians. When conditions are favorable, vernal pools are often used by mole salamanders and wood frogs for breeding.

Seeps occur on slopes or at the bases of slopes in upland forests. Groundwater discharge is evident at the seep margin. Scattered trees may be present but canopy closure is usually from the adjacent forest. Certain species are adapted to the living in these conditions, including some invertebrate and plant SGCN.

### Vernal Pools & Seeps Condition

**Current Condition:** Vernal pools and the wildlife that use them face many problems, including direct loss of pools, degradation of pool quality, and alteration of the surrounding upland habitat. Hikers, their pets, and recreational vehicles that enter vernal pool risk destroying amphibian eggs and larvae and invertebrate SGCN. In addition, recreational vehicles that enter vernal pools can destroy the soil structure that is so important to maintaining these pools and the species that depend on them. Alterations within the forested basin that surrounds a pool can have significant impacts on the pool's hydrology and its species. Reduction in the volume of water that fills the pool means that drying will occur sooner. Loss of the adjacent canopy trees increases the solar energy reaching the pool, causing water temperature to rise more rapidly and drying the pool earlier in the warm season than usual. Premature drying has a negative impact on the invertebrates and young amphibians that require a minimum length of time (up to 4 months or more) to complete critical life stages. Removal of too many mature trees and downed logs in the surrounding upland habitat can impair the forest floor used by pool-breeding salamanders and frogs. Ditches and vehicle ruts in the surrounding forest often intercept spring migrating adults, luring them to lay eggs in spots that can dry well before the young can leave the water. Road construction or increased road traffic that bisects the upland amphibian habitat surrounding a vernal pool often results in the death of many of these animals as they make their annual migrations between the terrestrial and aquatic environments. The recent arrival, and public fervor over, West Nile Virus may result in vernal pools being targeted for mosquito control. This may include biological controls, chemical pesticides, and possibly draining.

Seeps face problems similar to those of vernal pools. Activities that alter the hydrology of a seep to even a minor degree can eliminate the characteristics required by some wildlife species. The ecological significance of seeps (and vernal pools) is often not recognized during development planning, with the result being direct loss of these features.

**Desired Condition (SGCN Needs):** Functional vernal pools are those examples that are intact, well-buffered and interconnected to ensure productivity and movement of species associated with vernal pools. Spotted salamanders, blue-spotted salamanders, Jefferson salamanders, and wood frogs all use vernal pools for breeding. They spend almost their entire lives in the surrounding upland forests, moving up to 300 meters or more from the pool. The adults return for a brief period in the spring to leave their eggs. Water depth must be great enough to cover the egg masses (generally 30cm or more) and provide continuous aquatic habitat until the young leave the pool (3-4 months, depending on the species and location). The terrestrial adults and juveniles can be found under cover material (logs, rocks, stumps) and in animal burrows in moist forest soils that have adequate leaf litter. Spotted turtles are seasonal users, foraging in vernal pools in the early spring. They require large wetland complexes and move between wetlands through the warm season. There are several insects, snails, fingernail clams, fairy shrimp, and other invertebrates that use vernal pools for their entire life cycle. During the dry months, these animals or their eggs remain on or under the soil surface, awaiting the return of water to the pool depression. Many other SGCN use vernal pools seasonally but do not require them.

Seeps are home to a few specialized SGCN as well as many more common species. The gray petaltail is a rare dragonfly that lays its eggs in forested seeps, where the nymphs remain and feed until reaching adulthood. Eastern Jacob's ladder is a threatened plant that is closely associated with seeps in Vermont.

## Species of Greatest Conservation Need in Seeps and Vernal Pools

### High Priority

Whip-poor-will (*Caprimulgus vociferus*)  
 American Woodcock (*Scolopax minor*)  
 Jefferson Salamander (*Ambystoma jeffersonianum*)  
 Fowler's Toad (*Bufo fowleri*)  
 Spotted Turtle (*Clemmys guttata*)  
 Wood Turtle (*Clemmys insculpta*)  
 Bog/fen/swamp/marshy pond Odonata Group  
 Freshwater Snails Group  
 Seep/rivulet Odonata Group  
 Vernal pool Odonata Group

### Medium Priority

Great Blue Heron (*Ardea herodias*)  
 Long-eared Owl (*Asio otus*)  
 Ruffed Grouse (*Bonasa umbellus*)  
 Red-shouldered Hawk (*Buteo lineatus*)  
 Prairie Warbler (*Dendroica discolor*)  
 Osprey (*Pandion haliaetus*)  
 Pied-billed Grebe (*Podilymbus podiceps*)  
 Blue-spotted Salamander (*Ambystoma laterale*)  
 Spotted Salamander (*Ambystoma maculatum*)  
 Four-toed Salamander (*Hemidactylium scutatum*)  
 Brown Snake (*Storeria dekayi*)  
 Eastern Ribbon Snake (*Thamnophis sauritus*)  
 Cinereus or Masked Shrew (*Sorex cinereus*)  
 Smoky Shrew (*Sorex fumeus*)  
 Black Bear (*Ursus americanus*)

**SGCN Notes:** Six plant SGCN are found in seeps and vernal pools. The SGCN invertebrate groups listed here contain numerous species. See individual species assessment summaries in Appendix A for specific information about Species of Greatest Conservation Need listed here.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| Problem/Info Need/Category     | Problem/Info Need Detail   | Rank   |
|--------------------------------|--|--------|
| 1. Habitat Alteration          | Thermal and hydrologic alterations that reduce the quality or usability of pools and seeps; modification of surrounding upland habitat needed to maintain dependent wildlife; creation of ditches and ruts that lure amphibians to unsuitable breeding habitat | High   |
| 2. Habitat Conversion          | Direct loss of pool and seep habitat due to hydrologic manipulation, filling, draining, etc; loss of associated upland habitat due to development or conversion  | Medium |
| 3. Impact of roads and trails  | Roads located too close to vernal pools kill amphibians as they attempt to migrate between the pools and upland habitat; loss of animals increases with traffic volume   | Medium |
| 4. Trampling or direct impacts | Destruction of and damage to amphibian eggs and invertebrate SGCN due to people and their pets entering vernal pools   | medium |
| 5. Incompatible recreation     | Damage to habitat and loss of SGCN due to recreational vehicles entering vernal pools  | High   |
| 6. Impacts of Roads and Trails | Trails leading to sensitive vernal pools bring recreational hikers and their pets  | low    |
| 7. Pollution                   | Stormwater directed into pools carries sediments and contaminants that have a negative impact on this habitat and its aquatic populations  | Medium |
| 8. Disease                     | West Nile Virus control: Vernal pools may be annual targets of mosquito control, including the use of chemical and biological pesticides.  | Medium |
| 9. Inventory                   | Inventory needed for many SGCN, particularly those for which distributional and abundance information is greatly lacking   | High   |
| 10. Monitoring                 | Monitor SGCN population trends to determine whether populations are able to persist; evaluate long-term effects of development near these habitats   | High   |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Strategy   | Performance Measure  | Potential Partners          | Potential Funding Sources |
|--|--|-----------------------------|---------------------------|
| Monitor known SGCN populations and evaluate effects of development   | Number of known SGCN sites monitored                             | ANR, EPA                    | SWG, EPA                  |
| Conduct statewide inventory of vernal pools and seeps important to SGCN  | Number of completed inventories                                  | ANR, EPA                    | SWG, EPA                  |
| Identify areas within the state with the largest examples of seep and vernal pools for inclusion in conservation opportunity area.   | Number of opportunity areas identified                           | ANR, VHCB, TNC              | SWG                       |
| Identify areas within the state with the largest matrix of floodplain forest for inclusion in conservation opportunity area.   | Number of acres of habitat protected and/or restored             | ANR, VINS, Landowners       | LIP, SWG, EPA             |
| Promote conservation easements where appropriate   | Number of acres of habitat protected and/or restored             | ANR                         | LIP                       |
| Manage access at sensitive sites   | Number of selected sites with managed/restricted access in place | ANR, USFWS, Green Mt. Club  |                           |
| Educate foresters, landowners, developers, and municipalities about the value of vernal pools and seeps and encourage behavior that conserves wildlife dependent on these features and the necessary surrounding habitat | Number of parties contacted                                      | ANR, VFF, VINS, RPCs, towns | LIP, SWG, EPA             |
| When appropriate, re-vegetate area surrounding pool or seep and restore hydrology  | Number of sites restored; number of acres restored               | ANR                         | LIP, EPA                  |

| Strategy   | Performance Measure  | Potential Partners          | Potential Funding Sources |
|--|--|-----------------------------|---------------------------|
| Develop and distribute forestry guidelines for the protection and management of vernal pools and seeps   | Number of forest management activities meeting vernal pool guidelines  | ANR, USFWS, SAF, VWA, NRCS, | USFWS, USFS, SWG, WHIP    |
| Technical assistance to towns and regional planning organizations to maintain and enhance vernal pools for SGCN. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004)  | Number of towns considering vernal pools and seeps in their planning.  | VFWD                        | SWG                       |
| Develop recreational management plans for state lands where vulnerable, sensitive vernal pools and seeps occur   | Number of recreational management plans adopted for state lands identified as having vulnerable vernal pools and seeps | ANR, VOGA, VASA,            |                           |
| Work with VTrans and Federal Highway Administration to encourage protection of vernal pool, seep, and associated upland habitat when designing future roads; encourage the use of well-designed animal passage structures or other methods to allow safe passage for animals across existing roads | Number of cooperative projects that have avoided potential wildlife conflicts or restored safe passage                 | VFWD, VTrans, FHWA          |                           |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Plan or planning entity               | Goal/Scope of plan                              | Lead |
|---------------------------------------|---|------|
| State Outdoor Recreation Plan (SCORP) | A comprehensive recreation plan for state lands | FPR  |
|                                       |   |      |
|                                       |   |      |

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# Open Peatlands Summary

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## Characteristics and location

Open peatlands are wetlands that accumulate peat, a type of soil which consists of partially decomposed organic matter. These wetlands are permanently saturated with a stable water table at or near the soil surface, creating a nearly anaerobic soil environment. Seasonal flooding is generally lacking in these wetlands and mosses and liverworts are abundant. With the exceptions of Black Spruce Woodland Bogs and Pitch Pine Woodland Bogs, trees are generally absent or sparse due to the very low availability of dissolved oxygen and minerals in the soil. Bogs are a type of peatland with slightly raised surfaces that receive most of their water from precipitation, have acidic waters poor in minerals and nutrients, and are dominated by sphagnum mosses, heath shrubs, and in some areas black spruce. Fens, on the other hand, have slightly acidic to slightly basic mineral-rich waters from groundwater discharge and seepage, may be flat or gently sloping, and are dominated by sedges, grasses, and non-sphagnum mosses. Water in fens generally has higher oxygen concentrations than in bogs resulting in greater peat decomposition. There is a continuum, however, in the variations between bogs and fens.

Seven different natural community types are included in this group, all of which are considered rare:

**Dwarf Shrub Bog:** These are open, acid wetlands with few trees and are dominated by heath shrubs and sphagnum moss. Size ranges from one to 600 acres in isolated kettlehole basins and as inclusions in larger wetland complexes. They occur throughout Vermont but are more common in the cooler regions.

**Black Spruce Woodland Bog:** Stunted black spruce trees cover 25 to 60 percent of the ground over heath shrubs and sphagnum moss. Found in cold climate areas. These bogs are generally less than 50 acres in size in Vermont and are found in the cooler regions of Vermont, including the Southern Green Mountains.

**Pitch Pine Woodland Bog:** Pitch pine covers 25 to 60 percent of the ground over heath shrubs and sphagnum moss. This community is known only from Maquam Bog at the mouth of the Missisquoi River. Small patches of this community are scattered across this larger wetland matrix.

**Alpine Peatland:** This community has characteristics of both bog and poor fen, but is distinguished by its high elevation and the presence of particular plants. It is found only on the highest peaks of the Green Mountains, particularly Mount Mansfield. By their nature, these communities are limited in size to very small patches.

**Poor Fen:** These are open, acid peatlands dominated by sphagnum moss, sedges, and heath shrubs. There is some mineral enrichment of surface waters. Poor fens are scattered in all biophysical regions of Vermont.

**Intermediate Fen:** These open, slightly acid to neutral fens are dominated by tall sedges, non-sphagnum mosses, and a sparse to moderate cover of shrubs. Most examples are only several acres in size, with all known sites being less than 50 acres. These fens are found only in areas with calcium-rich bedrock, which may occur in all regions outside of the Green Mountains.

**Rich Fen:** These fens are similar to Intermediate Fen but typically have shallower sedge peat and more mineral-enriched surface waters. Sedges and non-sphagnum mosses dominate, and shrubs are present. All documented examples are 6 acres or less in size. Rich Fens are restricted to areas with calcium-rich bedrock in the Piedmont, Vermont Valley, and limited areas of the Taconic Mountains.

## Open Peatlands Condition

**Current Condition:** Open peatlands occur in a variety of situations across the Vermont landscape, from small, hydrologically-isolated basins to components of large wetland matrices. The primary problems to SGCN in open peatlands include recreation, exotic species, hydrologic alterations, climate change, and habitat conversion and degradation. Peatlands are popular destinations for outdoor recreationalists interested in experiencing unique natural areas, an activity that can prove detrimental to these fragile communities and their associated SGCNs if not properly managed. Trampling of plants is a major concern especially near urban centers and at the more accessible sites. Nutrient enrichment of runoff waters due to agriculture can lead to invasion by exotic plants as well as replacement of rare plant species by more generalist species. The integrity of bogs and fens can be limited by significant changes in adjacent land use, such as development and clear-cutting, that result in increases in runoff and changes in water quality. Activities that alter the quality and quantity of water received from the groundwater recharge zone can be devastating to fen communities. Climate change is especially a concern with the Alpine Peatlands. Development of broadcasting facilities on mountain ridgelines also impacts this community type. Alteration of natural water level fluctuations in lakes, ponds, and streams associated with peatlands can also impact these wetlands. Prevention of natural disturbance regimes, including lightning-ignited fires, may limit the Pitch Pine Woodland Bog community.

**Desired Condition (SGCN Needs):** Many SGCN associated with this open peatlands, particularly some invertebrates and plants, are habitat specialists found only in these natural community types. Several SGCN dragonflies and damselflies require breeding and rearing habitat that is commonly described as bogs, fens, fen puddles, boggy ponds, boggy sloughs, and boggy streams. Many plants are found only in the wet, acid soils of bogs. Some vertebrates, such as bog lemmings (*Synaptomys* sp.) and spruce grouse are closely tied to bogs. Others, such as the blue-spotted salamander, four-toed salamander, spotted turtle, and water shrew, may rely on peatlands for habitat locally. Many of the other SGCN may utilize Open Peatlands but are not dependent on its specific characteristics (e.g., wood turtle, spruce grouse, and brown snake).

### Species of Greatest Conservation Need in Open Peatlands

#### High Priority

American Black Duck (*Anas rubripes*)  
Spruce Grouse (*Falcapennis canadensis*)  
Vesper Sparrow (*Pooecetes gramineus*)  
Spotted Turtle (*Clemmys guttata*)  
Wood Turtle (*Clemmys insculpta*)  
Bog/fen/swamp/marshy pond Odonata group  
Lakes/ponds Odonata group  
Moths group  
Tiger Beetle group  
Vernal pool Odonata group  
Wetland Butterflies group  
Hoary Bat (*Lasiurus cinereus*)  
Water Shrew (*Sorex palustris*)  
Northern bog lemming (*Synaptomys borealis*)  
Southern Bog Lemming (*Synaptomys cooperi*)

#### Medium Priority

Blue-winged Teal (*Anas discors*)  
Red-shouldered Hawk (*Buteo lineatus*)  
Chimney Swift (*Chaetura pelagica*)  
Osprey (*Pandion haliaetus*)  
Black-backed Woodpecker (*Picoides arcticus*)  
Pied-billed Grebe (*Podilymbus podiceps*)  
Lesser Yellowlegs (*Tringa flavipes*)  
Barn Owl (*Tyto alba*)  
Blue-spotted Salamander (*Ambystoma laterale*)  
Spotted Salamander (*Ambystoma maculatum*)  
Four-toed Salamander (*Hemidactylium scutatum*)  
Smooth Green Snake (*Liochlorophis vernalis*)  
Brown Snake (*Storeria dekayi*)

**SGCN Notes:** Plant Species of Greatest Conservation Need not listed here: 62 species. The SGCN invertebrate groups listed here contain numerous species. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| <b>Problem &amp; Info Needs Category</b>                    | <b>Problem &amp; Info Need Detail</b>  | <b>Rank</b> |
|---|--|-------------|
| 1. Habitat Degradation                                      | Significant land-use changes in adjacent areas can result in increases in runoff and changes in water quality (e.g. development, clear-cutting)              | High        |
| 2. Habitat Conversion                                       | Development of broadcasting facilities near alpine peatlands   | Medium      |
| 3. Incompatible Recreation                                  | Trampling of plants and soil in wetlands and on mountain tops  | Medium      |
| 4. Hydrologic Alteration                                    | Activities affecting the quantity and quality of ground water input and surface water runoff, or alter natural hydrologic regimes of associated water bodies | High        |
| 5. Impacts of Roads or Trails                               | Trails leading to sensitive peatlands bring recreational hikers  | Medium      |
| 6. Pollution  | Water quality is easily altered in peatlands and can bring about shifts in species composition (e.g., agriculture near rich fens)                            | High        |
| 7. Climate Change   | Shifts in community composition in peatlands   | Medium      |
| 8. Inadequate Disturbance Regime                            | Fire suppression inhibits pitch pine germination and results in shift in species composition   | Medium      |
| 9. Statewide inventory of Open Peatland natural communities | Need to identify and locate best examples of these habitats that support the most SGCN   | High        |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| <b>Strategy</b>  | <b>Performance Measure</b>   | <b>Potential Partners</b>         | <b>Potential Funding Sources</b> |
|--|--|-----------------------------------|----------------------------------|
| Conduct statewide inventory of Open Peatland natural communities   | Number of sites inventoried  | VFWD, EPA                         | SWG, EPA                         |
| Manage access at sensitive sites   | Number of selected sites with managed/restricted access in place                     | ANR USFWS, Green Mt. Club         |                                  |
| Manage for natural disturbance regime at Maquam Bay  | Work with USFWS to develop and implement a fire plan to promote this natural process | VFWD, USFWS                       | USFWS                            |
| Technical assistance to private landowners to maintain and enhance open peatlands for SGCN.  | Number landowners incorporating SGCN into their land management.                     | ANR, EPA, USFWS, Landowners       | LIP                              |
| Technical assistance to town and regional planning organizations to manage open peatlands for SGCN. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004) | Number of towns considering SGCN in their planning                                   | ANR, EPA, Regional Planning Comm. | SWG, EPA, VT Watershed Grants    |

| Strategy   | Performance Measure   | Potential Partners   | Potential Funding Sources     |
|--|---|--|-------------------------------|
| Develop recreational management plans for state lands where vulnerable, sensitive open peatlands occur   | Number of recreational management plans adopted for state lands identified as having vulnerable peatlands | ANR, VOGA, VASA  |                               |
| Financial incentives for private landowners  | Number of acres conserved   | NRCS, VFWD, USFWS  | NRCS, LIP, other USFWS grants |
| Acquisition/easement of high priority sites and their groundwater recharge areas   | Number of acres acquired/enrolled   | NRCS, VFWD, USFWS  | NRCS, LIP, other USFWS grants |
| Increase enforcement of access restrictions at alpine peatlands  | Number of hours of increased patrol   | ANR, Green Mt. Club  |                               |
| Increase cooperation/coordination among states and provinces and develop trans-jurisdictional actions to address issues such as climate change and acid rain |   | State of VT, other states, CA provinces, US and CA federal governments |                               |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Plan or planning entity               | Goal/Scope of plan                              | Lead |
|---------------------------------------|---|------|
| State Outdoor Recreation Plan (SCORP) | A comprehensive recreation plan for state lands | FPR  |
|                                       |   |      |
|                                       |   |      |

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## Marshes and Sedge Meadows Summary

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Marshes and Sedge Meadows provide some of the largest natural openings to be found in Vermont. These natural communities and the streams and ponds with which they are associated provide critical habitat for many species of wildlife. Often called emergent marshes, these open wetlands have less than 25 percent shrub or tree cover, and in many cases woody plants are absent. Hydrology is the single most important factor controlling these wetlands.

Six different natural community types are included in this community type:

**Shallow Emergent Marsh:** This is a common and variable marsh type with mineral or shallow organic soils that are moist to saturated and only seasonally inundated. Several grasses, bulrushes, and Joe-pye weed may be abundant. This community is commonly associated with old beaver impoundments. This is a widespread natural community found throughout Vermont.

**Sedge Meadow:** These wetlands are permanently saturated and seasonally flooded. Soils are typically shallow organic muck, although mineral soils may be present in some wetlands. Tussock sedge or other sedges are dominant plants here. This common community is found throughout Vermont, most often along stream and pond margins and in beaver meadows.

**Cattail Marsh:** Common cattail or narrow-leaved cattail dominates these marshes. The muck or mineral soils are typically inundated with shallow standing water throughout the year, although the substrate may be exposed in dry years. Cattail Marshes range in size from less than an acre to over 500 acres along the shores of Lake Champlain. These common wetlands occur throughout the state but are most common at lower elevations.

**Deep Broadleaf Marsh:** Water depth in these marshes is typically over one foot deep for most of the year, although some may have only saturated soils in dry summers. Soils are organic. Common plants include pickerelweed, broad-leaved arrowhead, and giant bur-reed. This common community type is found throughout Vermont on the sheltered margins of lakes and ponds, on the slow-moving backwaters of larger rivers, and in isolated basins. The largest examples occur in lowland areas.

**Wild Rice Marsh:** These uncommon marshes are dominated by wild rice, with an organic soil substrate that is inundated with one to two feet of water throughout the summer. Wild Rice Marshes are found in wave-sheltered coves and on river deltas of Lake Memphremagog and Lake Champlain, and in the slow-moving backwaters of our larger rivers (Connecticut River and lower Champlain tributaries).

**Deep Bulrush Marsh:** These are marshes of open water along the shores of lakes and ponds. Water depths can range from one to six feet. Soft-stem bulrush and hard-stem bulrush dominate most of these marshes, although marsh spikerush and other bulrushes may be abundant. These common wetlands occur in open water along the shores of lakes and ponds and can be found throughout the state.

### Marshes & Sedge Meadows Condition

**Current Condition:** These natural community types are not considered rare, but do provide critical habitat to many wildlife species, including SGCN. Sedge Meadows are often successional stages that would lead to forested wetlands if left undisturbed. Although they may occur in isolated basins, Marshes and Sedge Meadows are most commonly associated with water bodies

(lakes, ponds, rivers) and other wetlands and, therefore, are subject to the same problems (e.g., pollution) as these associated communities. Many marshes, particularly Shallow Emergent Marshes, are small and not protected under Vermont Wetland Rules. Additional protection is needed for such wetlands important to SGCN through regulation and/or education. Invasive exotic species are a major problem for some of these community types. Common reed and purple loosestrife can easily become established in Shallow Emergent Marshes, and water chestnut can crowd out native species in Deep Broadleaf Marshes. Alteration of the natural hydrologic regime by dam operation or creation of impoundments can significantly impact deeper water communities. Greater inventory information is needed for all these natural community types as well as further study on the identification and significance of particular problems.

**Desired Condition (SGCN Needs):** Marshes and Sedge Meadows support a host of wildlife species. A variety of SGCN are marsh specialists. Among others, these include many plants, dragonflies, damselflies, butterflies, and birds. Several dragonflies and damselflies require breeding and rearing habitat that is commonly described as marshy ponds, marshy edges of lakes, and marshes. Black terns, least bitterns, and soras spend the nesting season raising their young within marshes. Some other SGCN, such as spotted salamanders, northern water snakes, and mink are commonly associated with these wetland types and may rely on them locally, but do not specifically require marshes to complete their life cycles. Pygmy shrews, smooth green snakes, and chimney swifts are examples of more casual users that may be found foraging in marshes and sedge meadows.

### Species of Greatest Conservation Need in Marshes and Sedge Meadows

#### High Priority

American Black Duck (*Anas rubripes*)  
 Black Tern (*Chlidonias niger*)  
 Northern Harrier (*Circus cyaneus*)  
 Sedge Wren (*Cistothorus platensis*)  
 Least Bittern (*Ixobrychus exilis*)  
 Vesper Sparrow (*Pooecetes gramineus*)  
 Muskellunge (*Esox masquinongy*)  
 Spiny Softshell (Turtle) (*Apalone spinifera*)  
 Fowler's Toad (*Bufo fowleri*)  
 Spotted Turtle (*Clemmys guttata*)  
 Wood Turtle (*Clemmys insculpta*)  
 Western Chorus Frog (*Pseudacris triseriata*)  
 Bog/fen/swamp/marshy pond Odonata group  
 Freshwater Snails group  
 Lakes/ponds Odonata group  
 Mayflies/Stoneflies group  
 Wetland Butterflies group  
 Hoary Bat (*Lasiurus cinereus*)  
 Pygmy Shrew (*Sorex hoyi*)  
 Water Shrew (*Sorex palustris*)

#### Medium Priority

Blue-winged Teal (*Anas discors*)  
 Short-eared Owl (*Asio flammeus*)  
 Red-shouldered Hawk (*Buteo lineatus*)  
 Chimney Swift (*Chaetura pelagica*)  
 Bobolink (*Dolichonyx oryzivorus*)  
 Osprey (*Pandion haliaetus*)  
 Pied-billed Grebe (*Podilymbus podiceps*)  
 Sora (*Porzana carolina*)  
 Lesser Yellowlegs (*Tringa flavipes*)  
 Barn Owl (*Tyto alba*)  
 Blue-spotted Salamander (*Ambystoma laterale*)  
 Spotted Salamander (*Ambystoma maculatum*)  
 Four-toed Salamander (*Hemidactylium scutatum*)  
 Smooth Green Snake (*Liochlorophis vernalis*)  
 Northern Water Snake (*Nerodia sipedon*)  
 Common Musk Turtle (*Sternotherus odoratus*)  
 Brown Snake (*Storeria dekayi*)  
 Eastern Ribbon Snake (*Thamnophis sauritus*)  
 Long-tailed Weasel (*Mustela frenata*)  
 Mink (*Mustela vison*)  
 Muskrat (*Ondatra zibethicus*)  
 Southern Bog Lemming (*Synaptomys cooperi*)

**SGCN Notes:** Plant Species of Greatest Conservation Need not listed here: 24 species. The SGCN invertebrate groups listed here contain numerous species. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| Problems/Info Need Categories                       | Problem & Info Need Detail   | Rank   |
|---|--|--------|
| 1. Habitat Conversion                               | Loss or fragmentation, particularly in small, unmapped (NWI) wetlands; ditching and plowing for agricultural use   | High   |
| 2. Habitat Degradation                              | Cattle grazing   | Medium |
| 3. Hydrologic Alteration                            | Manipulation of the natural hydrologic regimes of associated water bodies through dam operation or impoundment can drastically impact deep water marshes in particular | High   |
| 4. Exotic Invasive Species                          | Crowding out of native plants and wildlife habitat by purple loosestrife, common reed, water chestnut, etc.  | High   |
| 5. Pollution  | Pollutants entering wetlands from runoff and tributaries can impact species and can bring about shifts in community composition  | High   |
| 6. Statewide inventory of Marshes and Sedge Meadows | Inventory is needed for all natural community types, as well as further study on the identification and significance of particular problems                            | High   |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Strategy   | Performance Measure  | Potential Partners  | Potential Funding Sources                      |
|--|--|---|--|
| Conduct statewide inventory of Marshes and Sedge Meadows   | Number of sites inventoried. The number of high quality examples identified containing SGCN  | VFWD, EPA   | SWG, EPA                                       |
| Protect wetlands not on NWI maps through alternative regulations (e.g., Act 250)   | Number of acres conserved  | ANR, Regional Planning Comm, ACOE                           |  |
| Provide technical assistance and/or financial incentives to private landowners, towns and RPC's to maintain and enhance marsh and sedge meadows for SGCN. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004) | Number landowners incorporating SGCN into their land management, Number of towns including SGCN in their planning. Number of acres conserved | ANR, EPA, NRCS, TNC, RPC's, towns, VLCT, private landowners | NRCS, LIP, SWG, EPA, LCBP, VT Watershed Grants |
| Financial incentives for private landowners  | Number of acres conserved  | NRCS, VFWD, USFWS   | NRCS, LIP, other USFWS grants                  |
| Acquisition/easement of high priority sites  | Number of acres acquired/enrolled  | NRCS, VFWD, USFWS   | NRCS, LIP, other USFWS grants, Land trusts     |

| Strategy  | Performance Measure       | Potential Partners              | Potential Funding Sources |
|---|---------------------------|---------------------------------|---------------------------|
| Use existing/new regulations to prevent damage of SGCN-important lake/pond-side and river-side wetlands caused by dam operation | Number of acres conserved | ANR, COE, Hydro operators, FERC |                           |
| Prevent loss of SGCN-important lake/pond-side and river-side wetlands caused by new impoundments                                | Number of acres conserved | ANR, COE, Hydro operators, FERC |                           |

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# Wet Shores Summary

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## Characteristics and Distribution

All of the natural communities contained within the upland shore formation occur as small patches scattered irregularly over the landscape. Four of the natural communities are widely distributed while the three rarest types are restricted to one or more biophysical regions. All the community types in this formation are non-forested and maintained in this early successional state by a combination of flooding, ice scour, and erosional processes. This makes wetland shores perhaps our most dynamic and changeable group of natural communities.

### **The wet shores formation includes the seven following natural community types:**

**Outwash plain pondshore:** This is among the rarest natural communities in the state and is found only in the Southern Vermont Piedmont Biophysical Region. It occurs only on sloping shorelines that are seasonally exposed due to fluctuating water levels. The vegetation is characterized by sedge, rush, and herbaceous species, many of them annuals.

**River mud shore:** This is a common natural community type that occurs in all eight biophysical regions. It is restricted to slow moving rivers whose shorelines are exposed during times of low flow. This community type tends to be sparsely vegetated, primarily by annuals since the shore is often exposed late in the growing season.

**River sand or gravel shore:** This is a common natural community type that occurs in all eight biophysical regions. It is restricted to the swifter rivers where moving water creates sand and gravel deposits. Because of their dynamic nature they are sparsely vegetated, mostly by grasses and herbs but often with a woody component consisting of willows and cottonwood.

**River cobble shore:** This common natural community is widely distributed across the state along high-energy waterways. Due to their dynamic nature, this community is sparsely vegetated, mostly by grass and sedge species, but often with a woody component of willows and cottonwood.

**Calcareous riverside seep:** This is a rare natural community type that is known mostly from the Connecticut Valley. They are restricted to areas where calcareous groundwater seeps on to exposed bedrock on rivershores. The natural processes of flooding and ice scour serve to keep the community open while the limy seepage sustains a unique flora that includes many rare species of sedges, herbs, and bryophytes.

**Rivershore grassland:** This is a widely distributed natural community that occurs in more sheltered, and hence more stable, portions of our larger rivers. Since the natural river processes needed to maintain their open condition occur less frequently, this community tends to have more of a woody component of shrubs and low trees mixed in with the more abundant grasses.

**Lakeshore grassland:** This rare natural community type is restricted to the shores of Lake Champlain and Lake Memphremagog where it occurs on gently sloping shorelines that are kept open by waves, flooding, and ice. They tend to be very narrow in width, but may extend for considerable distances along the shore. The community is dominated by grasses, sedges, and forbs with a varying amount of woody species depending upon the frequency and intensity of the natural disturbance.

## Wet Shores Condition

**Current Condition:** All of the natural communities within the wet shore formation are dependent upon the natural processes of flooding, wave action, and ice scour. As such, they all occur as small patches that are restricted to areas where these processes are focused. Since they are maintained in an open state, all of these natural community types provide a specialized habitat for animals and plants. Spiny softshell, spotted, and wood turtles, Fowler's toad, and tiger beetles all depend on one or more of these communities. Outwash plain pondshore and calcareous riverside seeps provide the unique habitat for plants and contain a disproportionate number of rare or Threatened species.

The primary problems to SGCN in this formation include hydrologic alteration, recreation, exotic species, and habitat conversion and degradation. Since all seven community types are dependent upon periodic disturbance by water, ice or wind, anything that prevents these natural processes from occurring would jeopardize the integrity and continued existence of the SGCN they harbor. These community types also support heavy recreational use, and trampling of vegetation is a major concern especially near urban centers and at the more accessible sites. The continual natural disturbance at these sites also provides excellent opportunity for invasive plants to become established, and recreational use adds to this potential. The river cobble shore and the two grassland types are especially subject to habitat conversion or degradation to create marinas, docks, and bathing beaches.

**Desired Conditions:** Although all the natural communities comprising the wet shore formation occur as small patches on the landscape, they all provide critical habitat to a number of SGCN that utilize both the aquatic and terrestrial environment or require unforested areas for basking, nesting, or foraging. A total of 22 animal and 31 plant SGCN are known to utilize the wet shore communities. To protect these sites we recommend the following activities:

### Species of Greatest Conservation Need in Wet Shores

#### High Priority

American Black Duck (*Anas rubripes*)  
Vesper Sparrow (*Pooecetes gramineus*)  
Spiny Softshell (Turtle) (*Apalone spinifera*)  
Fowler's Toad (*Bufo fowleri*)  
Spotted Turtle (*Clemmys guttata*)  
Wood Turtle (*Clemmys insculpta*)  
Freshwater Snails group  
Tiger Beetles group  
Cobblestone Tiger Beetle (*Cicindela marginipennis*)  
Hoary Bat (*Lasiurus cinereus*)  
Eastern Pipistrelle (*Pipistrellus subflavus*)  
Water Shrew (*Sorex palustris*)

#### Medium Priority

Blue-winged Teal (*Anas discors*)  
Red-shouldered Hawk (*Buteo lineatus*)  
Chimney Swift (*Chaetura pelagica*)  
Osprey (*Pandion haliaetus*)  
Pied-billed Grebe (*Podilymbus podiceps*)  
Lesser Yellowlegs (*Tringa flavipes*)  
Barn Owl (*Tyto alba*)  
Smooth Green Snake (*Liochlorophis vernalis*)  
Long-tailed Weasel (*Mustela frenata*)

**SGCN Notes:** Plant SGCN not listed here 31. The SGCN invertebrate groups listed here contain numerous species. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| Problem/Info Need Categories | Problem/Info Need Detail   | Rank   |
|------------------------------|--|--------|
| Habitat Conversion           | Construction of marinas, docks, bathing beaches, and other activities that remove shoreline vegetation   | High   |
| Hydrologic Alteration        | Communities dependent upon wind, wave, and ice action  | High   |
| Incompatible Recreation      | Intense use of shore disturbs wildlife, tramples rare plants, and introduces exotic species.   | High   |
| Invasion by Exotic Species   | Non-native species can spread and degrade the habitat for wildlife and eliminate some plant species  | Medium |
| Habitat Fragmentation        | Roads and development fragment habitat along wet shores for species such as the wood turtle and smooth green snake   | High   |
| Inventory                    | Distribution, location, and condition of this habitat are not known: A statewide inventory is needed to identify and locate the best examples of these habitats that support the most SGCN | High   |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Strategy   | Performance Measure  | Potential Partners  | Potential Funding Sources |
|--|--|---------------------|---------------------------|
| Conduct statewide inventory of upland shores   | Number of sites inventoried. The number of high quality examples identified containing SGCN    | FPR                 | SWG                       |
| Provide technical assistance to private landowners to prevent or mitigate hydrologic and recreational impacts to wet shores.   | Number landowners incorporating SGCN into their land management                                | NRCS, TNC, VFWD     | LIP, SWG                  |
| Manage exotic species on state owned sites and provide technical assistance to landowners regarding control of exotics   | Number of sites with control activities and/or invasive monitoring. Number of acres conserved. | ANR, NRCS, TNC, EPA | LIP                       |
| Technical assistance to town & regional planning organizations to help maintain and/or enhance SGCN habitat, and to maintain natural processes and hydrologic conditions. Distribute <i>Conserving Vermont's Natural Heritage</i> (Austin et.al. 2004) | Number of towns/RPC's including SGCN in their planning   | VFWD                | VFWD                      |
| Conservation easements on higher quality sites with greatest number of SGCN or T&E listed SGCN   | Number of acres conserved for SGCN   | ANR, VLT, TNC       | VHCB, VLT, LIP            |
| Work with state and municipal managers to reduce and focus recreational impacts  |  | ANR, VOGA           | VFWD,                     |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the lead column

| Plan or planning entity   | Goal/Scope of plan                               | Lead |
|---|--|------|
| New England Plant Conservation Program – various Conservation Plans | Recovery of various plant species in New England | ANR  |
| State Outdoor Recreation Plan                                       | A comprehensive recreation plan for state lands  | FPR  |

## References

- Austin, J.M. C. Alexander, E. Marshall, F. Hammond, J. Shippee, E. Thompson. VT League of Cities and Towns. 2004. *Conserving Vermont's Natural Heritage. A Guide to Community-Based Planning for the Conservation of Vermont's Fish, Wildlife and Biological Diversity.* Vermont Fish & Wildlife Department and Agency of Natural Resources. Waterbury, VT. [www.vtfishandwildlife.com/library.cfm?libbase\\_=Reports\\_and\\_Documents](http://www.vtfishandwildlife.com/library.cfm?libbase_=Reports_and_Documents)
- Thompson, E. H., and E. R. Sorenson. 2000. *Wetland, Woodland, Wildland - A guide to the natural communities of Vermont.* University Press of New England, Hanover and London

# Shrub Swamps Summary

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## Characteristics and Distribution

All of Vermont's shrub dominated natural communities are wetlands, and most are thought to be retained in this early successional state by periodic flooding. Some of the community types, however, are likely to be more transitional and will eventually become forested. These transitional types are believed to have arisen following some type of disturbance either natural, such as a catastrophic flood or beaver activity, or artificially from past agricultural use. If beaver activity and natural flooding are allowed to continue, examples of this community should continue to replace themselves on the landscape.

Of the four natural community types included within this formation two occur as small patches while the remaining two occupy larger areas on the landscape. Only one of the communities, buttonbush swamp, is thought to be rare in the state and restricted in its distribution to four of the state's eight biophysical regions. The other three communities are distributed throughout the state.

### **The shrub swamp formation includes the following four natural community types:**

**Alluvial Shrub Swamp:** This common natural community type is found on alluvial soils in the floodplains of small rivers. This is a high energy, dynamic environment that receives regular flooding and ice scour. As the stream channel naturally wanders across the floodplain, the community also migrates. Senescent channels succeed to floodplain forest while alluvial shrub swamps thrives in newly established channels. While speckled alder is the dominant species here, black willow and boxelder can be very abundant under certain conditions. Ostrich fern typically dominates the ground layer although some grasses, herbs, and vines can also be common in more sheltered areas.

**Alder Swamp:** This is a very common, widely distributed community type that occurs in a variety of settings including lakes and pond margins, backwater floodplains of rivers and streams, beaver flowerages, and poorly drained basins. Depending upon the frequency and duration of flooding, some examples may become more forested over time while others may remain shrub dominated. While speckled alder is the dominant shrub, shrubby willows, dogwoods, and young red maple may be locally abundant. Sedges and grasses along with sensitive fern and Joe pye weed typically dominate the ground layer.

**Sweet Gale Shoreline Swamp:** This relatively common natural community occupies shorelines of ponds and slow moving streams. This swamp typically occurs as a narrow floating mat, but the shrubs may also be rooted directly into the peaty shore. Sweet gale dominates this community, but speckled alder and meadow-sweet are usually also abundant. Leatherleaf may be co-dominant in more acidic, boggy conditions. Various sedge species typically dominate the ground layer.

**Buttonbush Swamp:** This relatively rare natural community occurs in two different settings: on the edges of larger lakes and ponds and in poorly drained, isolated depressions where water is retained through much of the growing season. Because of the permanently saturated conditions, this community typically occurs on deep, organic soils. While in some examples buttonbush may grow so dense that nearly all other vegetation is excluded, in other

situations leatherleaf and meadow-sweet may be common. Depending upon the shrub density and degree of flooding, various herbs and grasses may become established.

### **Shrub Swamps Condition**

**Current Condition:** Shrub swamps are very common wetland types and occur in a variety of situations that are either too wet or too frequently disturbed to allow woody vegetation to become established. Although some examples are becoming forested, new examples continually arise due to natural disturbance. As long as the natural processes of flooding, ice scour, and beaver activity continue unabated, shrub swamps will remain common in our landscape.

The primary problems to the communities and SGCN in this formation include habitat alteration and fragmentation, suppression of the natural disturbance regime, hydrologic alteration, and invasive exotic species.

**Desired Condition:** Providing habitat for 30 SGCN makes shrub swamps among the more valuable community types for wildlife of concern in state. Especially notable is the high number of amphibians included in this total. There are few plant SGCN associated with shrub swamps, however; they provide habitat for only six vascular plants and three bryophytes. Many types of shrub swamps are commonly associated with larger wetland complexes along river and streams. Maintaining the natural flooding regimes and other natural processes including beaver activity of these shrub swamps and associated forested swamps and marshes is critical to their long-term function. Maintaining upland buffers for shrub swamps are especially important for amphibian SGCN as well as for other species.

### **Species of Greatest Conservation Need in Shrub Swamps**

#### **High Priority**

American Woodcock (*Scolopax minor*)  
American Black Duck (*Anas rubripes*)  
Black Tern (*Chlidonias niger*)  
Vesper Sparrow (*Pooecetes gramineus*)  
Spiny Softshell (Turtle) (*Apalone spinifera*)  
Fowler's Toad (*Bufo fowleri*)  
Spotted Turtle (*Clemmys guttata*)  
Wood Turtle (*Clemmys insculpta*)  
Western (Striped) Chorus Frog (*Pseudacris triseriata*)  
Bog/fen/swamp/marshy pond Odonata group  
Freshwater Snails group  
Wetland Butterflies group  
Hoary Bat (*Lasiurus cinereus*)  
Water Shrew (*Sorex palustris*)

#### **Medium Priority**

Blue-winged Teal (*Anas discors*)  
Red-shouldered Hawk (*Buteo lineatus*)  
Chimney Swift (*Chaetura pelagica*)  
Black-billed Cuckoo (*Coccyzus erythrophthalmus*)  
Rusty Blackbird (*Euphagus carolinus*)  
Osprey (*Pandion haliaetus*)  
Pied-billed Grebe (*Podilymbus podiceps*)  
Lesser Yellowlegs (*Tringa flavipes*)  
Barn Owl (*Tyto alba*)  
Blue-spotted Salamander (*Ambystoma laterale*)  
Spotted Salamander (*Ambystoma maculatum*)  
Four-toed Salamander (*Hemidactylum scutatum*)  
Smooth Green Snake (*Liochlorophis vernalis*)  
Northern Water Snake (*Nerodia sipedon*)  
Common Musk Turtle (Stinkpot)  
(*Sternotherus odoratus*)  
Brown Snake (*Storeria dekayi*)  
Eastern Ribbon Snake (*Thamnophis sauritus*)

**SGCN Notes:** Plant SGCN not listed here: 9. The SGCN invertebrate groups listed here contain numerous species. For more information about a specific Species of Greatest Conservation Need see that species' assessment summary in Appendix A.

## Problems & Information Needs

See Appendix C for definitions of problem and strategy categories used here

| Problem/Info Need Category          | Problem/Info Need Detail   | Rank   |
|-------------------------------------|--|--------|
| Habitat Conversion                  | Development, road construction, docks, marinas   | High   |
| Habitat Fragmentation               | Agriculture, roads   | High   |
| Hydrologic Alteration               | Sedimentation, development in watershed, road building, dams, artificial lake fluctuations   | High   |
| Distribution of successional stages | Woodcock are negatively affected by maturing alder stands and adjacent openings.   | High   |
| Invasion by Exotic Species          | Non-native species can spread and degrade the habitat for wildlife and eliminate some plant species  | Medium |
| Inadequate Disturbance Regime       | Suppression of natural processes such as eliminating beaver activity, limiting flooding, etc   | High   |
| Inventory                           | Distribution, location and condition of these communities are not known. A statewide inventory needs to be conducted to identify and protect the best examples | High   |

## Priority Conservation Strategies

See Appendix C for definitions of problem and strategy categories used here.

See Chapter 6 for definitions of acronyms used in the Partners and Funding Source columns

| Strategy  | Performance Measure   | Potential Partners         | Potential Funding Sources |
|---|---|----------------------------|---------------------------|
| Conduct a statewide inventory of shrub swamp natural communities  | The number of high quality examples identified containing SGCN  |                            |                           |
| Provide information to State Wetlands Office & EPA  | Number of sites discussed   | DEC, EPA                   | SWG, EPA                  |
| Provide technical assistance and/or financial assistance in maintaining natural processes and hydrologic conditions to landowners, especially to municipal and private owners concerned with beaver activity. | Number landowners incorporating SGCN into their land management, Number of towns considering SGCN in their planning | NRCS, TNC, VFWD, RPC, VLCT | NRCS programs, LIP        |
| Acquisition and conservation easements on higher quality sites with greatest number of SGCN or T&E listed SGCN  | Number of acres conserved for SGCN  | ANR, VLT, TNC              | VHCB, VLT, LIP            |
| Manage exotic species on state lands & provide technical assistance to other landowners regarding control of exotics  | Number of sites with control activities and/or invasive monitoring  | ANR, NEPCoP, TNC, NRCS     | LIP, SWG                  |

## Coordination with other plans

See Chapter 6 for definitions of acronyms used in the lead column

| Plan or planning entity   | Goal/Scope of plan                               | Lead         |
|---|--|--------------|
| New England Plant Conservation Program – various Conservation Plans | Recovery of various plant species in New England | ANR          |
| Partners in Flight Plan   | Bird conservation                                | ANR, Audubon |

## References

Thompson, E. H., and E. R. Sorenson. 2000. Wetland, Woodland, Wildland—A guide to the natural communities of Vermont. University Press of New England, Hanover and London.

# Upland Shores Summary

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## Characteristics and Distribution

All of the natural communities contained within the upland shore formation occur as small patches scattered irregularly over the landscape. Both the riparian associated natural communities occur in all eight biophysical regions of the state. In contrast, the three lakeshore natural communities are more restricted with both lake or shale cobble beach and sand dunes occurring in a single biophysical region and lake sand beach in three regions. Since all the upland shores are naturally kept open, all five natural community types provide specialized habitat for animals and plants. Riverside outcrops and sand dunes in particular provide habitat for some plants that occur nowhere else in the state. Generally SGCN have the best potential for persisting at sites with the most intact natural processes. These same sites likely provide the best and most abundant habitat for SGCN.

### **The upland shores formation includes the five following natural community types:**

**Riverside outcrop:** This relatively common natural community occurs throughout the state wherever bedrock is exposed along waterways. They are dependent upon natural hydrologic processes that typically keep the sites open via either flooding or ice scour. This community type is sparsely vegetated, primarily by herbaceous species with only a few shrubs and vines able to withstand the regular disturbance regime.

**Erosional river bluff:** This is a rare natural community type with a statewide distribution that is restricted to steep banks where soil is actively eroding. Both the nature of the soils and the intensity of the erosional action greatly influences the vegetative cover of these communities, but rarely are woody species frequent.

**Lake or shale cobble beach:** This uncommon natural community can occur on any large lake in the state, but the only significant examples occur on Lake Champlain. Due to the constant wave action and seasonal flooding and ice scour, they tend to be sparsely vegetated. Although the vegetation is mostly herbaceous, willows, cottonwood, silver maple, and ash can become established at their upper reaches.

**Lake sand beach:** This is a rare natural community with the most extensive examples on the shore of Lake Champlain, and only scattered examples occurring in other regions of the state. Their formation and sustenance depends upon a regular source of material this is subsequently transported and deposited by waves and/or wind. Due to the constant wind and wave action and seasonal flooding and ice scour, this community is largely kept open. Typically herbs, grasses, and low sedges dominate although willows, cottonwood, box elder, and ash often becomes established at their higher reaches.

**Sand dune:** This extremely rare natural community is restricted to the present and previous shoreline of Lake Champlain where they are situated on the leeward side of sand beaches. They are dependent upon a continual supply of depositional sand and will be adversely affected by anything that inhibits this process. Because of the shifting nature of the substrate and the dry windy conditions, they are sparsely vegetated mostly by grasses, low sedges, and viney herbs. Cottonwoods, aspen, and gray birch eventually become established and make the dune system more stable.

























































































