

## HABITAT PROFILE

# Floodplain Forests

**Associated Species:** Jefferson Salamander, northern leopard frog, Wood Turtle, Red Shouldered Hawk, Cerulean Warbler, Eastern Red Bat, Silver Haired Bat

**Federal Listing:** Not listed

**State Listing:** Not listed

**Global Rank:** Not ranked

**State Rank:** Alder alluvial shrubland (S<sub>3</sub>), Alder – dogwood – arrowwood alluvial thicket (S<sub>4</sub>), Alluvial mixed shrub thicket (S<sub>4</sub>), Aquatic bed (S<sub>4</sub>S<sub>5</sub>), Balsam fir floodplain/silt plain (S<sub>2</sub>), Basswood – white ash – black maple floodplain forest (S<sub>1</sub>), Blue-joint – goldenrod – virgin’s bower riverbank/floodplain (S<sub>3</sub>S<sub>4</sub>), Herbaceous riverbank/floodplain (S<sub>2</sub>S<sub>4</sub>), Herbaceous/wooded riverbank/floodplain (S<sub>4</sub>), Meadow-sweet alluvial thicket (S<sub>3</sub>?), Oxbow buttonbush swamp (S<sub>3</sub>), Oxbow marsh (S<sub>3</sub>), Red maple floodplain forest (S<sub>2</sub>S<sub>3</sub>), Riverbank/floodplain fern glade (SU), Silver maple – false nettle – sensitive fern floodplain forest (S<sub>2</sub>), Sugar maple – ironwood – short husk floodplain forest (S<sub>1</sub>), Sugar maple – silver maple – white ash floodplain forest (S<sub>1</sub>S<sub>2</sub>), Swamp white oak floodplain forest (S<sub>1</sub>), Sycamore floodplain forest (S<sub>1</sub>)

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## ELEMENT 1: DISTRIBUTION AND HABITAT

### 1.1 Habitat Description

Floodplains occur in river valleys adjacent to river channels and are prone to periodic flooding. Floodplains are often comprised of forests, oxbows, meadows, and thickets. The habitats, vegetation, and hydrologic regime of floodplains are strongly influenced by watershed size, gradient, and channel morphom-

etry. Most open or partially wooded floodplain communities occur on low floodplains. Sloughs, oxbows, vernal pools, and other depressions in the floodplain tend to be inundated for longer periods than low floodplains (Sperduto 2004). Floodplain soils range from well-drained coarse sand on levees to poorly drained silts and mucks in depressions, and tend to be moderately to strongly minerotrophic (Sperduto 2004).

*Montane/near-boreal floodplains* are found primarily along rivers in the White Mountains or northern New Hampshire, and have relatively high gradients and flashy flood regimes compared to other floodplain systems. Sugar maple and balsam fir are dominant trees, and riparian wetlands such as oxbows and sloughs are uncommon in these high-gradient floodplains.

*Major river silver maple floodplains* occur primarily along the Connecticut and Merrimack Rivers, and occasionally on lower reaches of major tributaries. These floodplains are often interspersed with oxbow marshes and shrub communities. The forested areas are characterized by a canopy of silver maple (*Acer saccharinum*) over a lush herbaceous layer, with a sparse shrub layer.

*Temperate minor river floodplains* are found along large streams and small rivers in central and southern New Hampshire. These ecosystems are usually comprised of a mosaic of red maple forests, oxbows, vernal pools, and shrub thickets. Minor river floodplains generally have reduced flood intensity and duration compared to large river floodplains. In addition to red maple, sycamore and swamp white oak floodplain forests occur less commonly (Sperduto and Nichols 2004).

## 1.2 Justification

Riparian forests support diverse natural communities, protect and enhance water quality (they filter and sequester pollution), and control erosion and sediment (NHOSP 1989, Welsch 1991, Dahl 2000). Tockner and Stanford (2002) estimate that in Europe and North America, up to 90% of flood plains are under cultivation and are functionally extinct.

Riparian forests support a variety of wildlife resources. They provide breeding habitat for a number of bird species, including the red-shouldered hawk (*Buteo lineatus*), veery (*Catharus fuscescens*), cerulean warbler (*Dendroica cerulea*), American redstart (*Setophaga ruticilla*), warbling vireo (*Vireo gilvus*), Baltimore oriole (*Icterus galbula*), and chestnut-sided warbler (*Dendroica pensylvanica*) (Foss et al. 2000a, Hunt 2005). They also provide habitat for migratory and upland breeding birds (Foss et al. 2000b). Mammals associated with rivers and streams, particularly beaver (*Castor canadensis*), mink (*Mustela vison*), and river otter (*Lutra canadensis*), rely on riparian forests. Floodplain wetlands, such as vernal pools and oxbow marshes, are important breeding areas for a number of amphibians, including Jefferson salamander (*Ambystoma jeffersonianum*) and northern leopard frog (*Rana pipiens*). These wetlands also provide habitat for reptiles, such as wood turtle (*Glyptemys insculpta*), Blanding's turtle (*Emydoidea blandingi*), and spotted turtle (*Clemmys guttata*).

## 1.3 Protection and Regulatory Status

- Any laws that deal with regulation of freshwater wetlands would apply in portions of the floodplain considered jurisdictional wetlands (RSA 482-A).
- FEMA administers the National Flood Insurance Program, which works with local jurisdictions to regulate development in floodplains, with the primary purpose of minimizing future flood damage (FEMA 2005).
- The Shoreland Protection Act (NHDES, RSA 483-B) requires that farmers follow BMPs as established by the New Hampshire Department of Agriculture. Most of these BMPs pertain to the storage and/or application of fertilizers and pesticides near water-

ways for maintaining water quality and do not address floodplain habitats. The Shoreland Protection Act also limits the amount of tree removal and other activities within 250 ft of rivers and requires a primary structure setback of at least 50 ft.

## 1.4 Population and Habitat Distribution

Floodplain forests are found along rivers throughout New Hampshire. The *montane/near-boreal floodplain system* is found primarily in the White Mountains and North Country, although there are some examples in the Sebago-Ossipee region and along the Pemigewasset River south of the White Mountains. *Major river silver maple floodplains* are found along the main stems of large rivers, such as the Merrimack, Connecticut, Pemigewasset, and Androscoggin Rivers, and the lower stretches of major tributaries. *Temperate minor river floodplains* occur on rivers and large streams throughout central and southern New Hampshire (Sperduto 2004).

## 1.5 Town Distribution Map

See attached.

## 1.6 Habitat Map

The majority of floodplain forest element occurrences (NHNHB 2005) encompassed an elevation range of up to 21 feet up the bank away from the river. Thus, all areas within 21 feet of elevation change of a river were mapped, using the most recent state plane grid derived from the digital elevation model (Complex Systems Research Center 1999). Resulting polygons that extended into lakes, the ocean, or unreasonably far from the river were clipped to extend no more than 500m from a river, or 1000m from a river if they also were within 250m of a tributary stream. This resulted in a base floodplain layer. Areas within this floodplain layer that were dominated by forest cover (Complex Systems Research Center 2001) were selected. In addition, floodplain wetlands that were adjacent to a selected forest polygon were also selected. The resulting polygons were merged, creating the floodplain forest layer.

All polygons within 1 km of major rivers (USEPA 1998) were classed as *major river silver maple floodplain systems* (Sperduto 2004). Polygons that did not

fall into this system classification, and which occurred within the 4 northern ecoregion subsections (Connecticut Lakes, Mahoosic-Rangeley, Vermont Piedmont, and White Mountains), and which overlapped coniferous or mixed forest (from the New Hampshire Landcover Assessment 2001) were classed as *montane/near-boreal floodplain systems*. *Montane/near-boreal floodplain systems* often have both a deciduous and coniferous component (Sperduto 2004), so in addition, any non-coniferous floodplain polygons within 1 km of the same river segment as the coniferous floodplain polygons were also classed as *montane/near-boreal floodplain system*. All of the floodplain polygons not falling into one of these 2 systems were assigned to the third system, the *temperate minor river floodplain*. Mapped floodplain forest polygons (see element 1.6) were grouped into complexes of polygons within 500m of each other, and attributes characterizing habitat quality and quantity were assigned using available GIS data layers.

**Data limitations:** Errors in the elevation data could create some error in the base floodplain layer. In most cases, this creates an over prediction of habitat rather than an under prediction. Potential inaccuracy in landcover classification would also cause some errors in the data. Because of the limitations of the modeling process, some floodplain polygons have been assigned to systems incorrectly. As a result, a single floodplain complex may contain polygons from different systems. Despite some polygons being incorrectly attributed, the predicted area of floodplain forest systems can provide an informative picture of floodplain habitat in the state.

### 1.7 Sources of Information

NHNHB publications, State and Federal Agency web sites, NatureServe website, textbooks, and peer-reviewed literature.

### 1.8 Extent and Quality of Data

See section 1.6

### 1.9 Distribution Research

Surveys should verify predicted floodplain forests, particularly for rare communities within the temperate minor river floodplain system, such as basswood–

white ash–black maple floodplain forest (S1), swamp white oak floodplain forest (S1), and Sycamore floodplain forest (S1). Rare wildlife should be incorporated into habitat-based inventories.

## ELEMENT 2: SPECIES/HABITAT CONDITION

### 2.1 Scale

Mapped floodplain forest polygons were assessed within 10 digit watershed units (HUC-10).

### 2.2 Relative Health of Populations

The average area of floodplain forest in a watershed was 633 ha ± 565 SD and varied from 23 to 2792 ha. The *temperate minor river floodplain* system comprised approximately half of all mapped floodplain hectares in the state. The remaining floodplain polygons were divided roughly evenly between the *major river silver maple floodplain* and the *montane/near-boreal floodplain*. This imbalance is due in part to the number of small rivers in southern New Hampshire, and in part to the amount of *major river silver maple floodplain* that has been converted to agriculture. The greatest area for the *montane/near-boreal floodplain* was in the Upper Ammonoosuc River drainage, while the Middle Androscoggin River watershed had the largest amount of *major river silver maple floodplain*. Both of these watersheds are in northern New Hampshire. The largest area of *temperate minor river floodplain* was in the Lamprey River watershed, in the seacoast region.

### 2.3 Population Management Status

Otter, mink, other furbearers, and waterfowl, are managed by NHFG.

### 2.4 Relative Quality of Habitat Patches

A number of habitat quality attributes were computed through GIS for the mapped floodplain forest polygons, but because of the number of polygons and attributes, they will not be described here. Also, a number of exemplary floodplain forest natural communities have been identified across the state. Many floodplain forests near developed areas (e.g., much of the Merrimack River floodplain) have been invaded

by exotic plants (see element 3.3.3- Invasive Species) or are fragmented by roads or agriculture.

## 2.5 Habitat Patch Protection Status

Protected floodplain forest habitat (area, percent) was calculated for HUC 10 watersheds (n=72) using the conservation lands data layer (UNH Complex Systems, GRANIT). The mean protected floodplain forest within watersheds was 24 %  $\pm$  22 SD (0-92%). Eight watersheds had greater than 50% protection. However, these statistics can be misleading in some cases because of varying hectares of habitat within watersheds. For example, approximately 75% of the floodplain forest habitat in the Lower Pemigewasset River watershed was on protected land (in WMNF), totaling 350 ha. In comparison, only 18% of the habitat in the Lamprey River watershed was on protected land, but this totaled 496 ha. There were 7 watersheds in which none of the mapped habitat was on protected lands (e.g., Upper and Lower Millers River, Littleton Tributaries) or had relatively low amounts of habitat (185 ha, range: 34-655 ha).

There was some variation in the percentage of protected land among the 3 floodplain forest systems: 22% for *temperate minor river floodplain* habitat, 24% for *major river silver maple floodplain* and 34% for *montane/near-boreal floodplain* systems. The higher percentage of *montane/near-boreal floodplain* protected reflected its occurrences on WMNF land and the Second College Grant, owned and managed by Dartmouth College. Although the *temperate minor river floodplain* system had the lowest percentage of protected land of the 3 systems, it had the greatest area of protection.

## 2.6 Habitat Management Status

In New Hampshire and throughout the country, USACE is working with TNC to develop strategies for managing dams and waterways (USACE 2005). The New Hampshire chapter of TNC is currently working with USACE on management of dams and river flows in the Ashuelot River watershed and may expand this work to other managed river systems.

## 2.7 Sources of Information

Condition of floodplain habitats was based entirely on available GIS analyses. GIS data layers were attained from various sources (see Metadata for details).

## 2.8 Extent and Quality of Data

Condition of floodplain habitats was based largely on available GIS analyses (see section 1.6). A portion of predicted floodplain forests has been designated as exemplary natural communities by the NHNHB.

## 2.9 Condition Assessment Research:

Conduct GIS analyses to categorize quality of floodplain forest complexes (e.g., high, moderate, low). Attributes have been assigned to floodplain forest complexes but these variables need to be weighted. A subset of high quality sites should be field verified. Floodplain forest sampling should include an assessment of habitat availability for at-risk wildlife. This work can be conducted by NHFG with assistance from other wetland and wildlife experts. Ranked floodplain forest complexes should be incorporated into NHDES wetland permit review and mitigation prioritization and selection.

## ELEMENT 3: SPECIES AND HABITAT THREAT ASSESSMENT

### 3.1.1 Development (Fragmentation, Habitat Loss and Conversion)

#### (A) Exposure Pathway

Floodplain habitats are restricted to relatively narrow bands that occur discontinuously along rivers, and are naturally fragmented by changes in topography or underlying geology along a river's course. However, fragmentation by human activities can be a serious threat to wildlife that use these floodplains. Agricultural fields, roads, and residential and commercial development all contribute to the fragmentation of floodplain forests, with agriculture having the greatest impact.

#### (B) Evidence

The effects of habitat fragmentation on many types of wildlife are well documented. Open upland habitats

(agricultural and old fields) present a significant barrier to amphibian dispersal (Gibbs 1998, Rothermel and Semlitsch 2002). Literature regarding the effects of fragmentation on forest birds is even more extensive (Blake and Carr 1987, Darveau et al. 1995, Hobson and Bayne 2000).

### 3.1.2 Altered Hydrology, Altered Natural Disturbance

#### (A) Exposure Pathway

Floodplain forests are periodically flooded, and this regular disturbance creates and maintains these communities (Bornette and Amoros 1996). There are over 5000 dams in New Hampshire, and a large percentage of New Hampshire's floodplain forests occur along stretches of river that have had their flow and flood regimes modified by dams.

#### (B) Evidence

Dams significantly alter natural flood regimes. Higher floodplain terraces that may have naturally flooded every 20-100 years may never receive flooding after a dam is built to regulate flow (Nislow and Magilligan 2000). Water storage dams often have different effects on floodplains than "run-of-river" dams that allow for normal river flow outside periods of high water. Water storage dams often permanently alter the species composition and structural diversity of downstream floodplains, whereas such effects are much less severe below run-of-river dams (Nilsson et al. 1997). On a heavily dammed river, Kingsford and Thomas (2004) found dramatic declines in all bird groups that used floodplain wetlands. Both storage dams (NHNHB 1998, NHNHB 1999, NHNHB 2000) and run-of-river dams (NHNHB 1996, NHNHB 1997) have been built in New Hampshire. The changes in vegetation resulting from these impoundments can also impact the wildlife that use these habitats.

### 3.1.3 Introduced Species

#### (A) Exposure Pathway

Invasive plant species are a serious threat to natural systems (Stein et al. 2000). Invasive alien plants threaten natural communities by out-competing native plants for light, nutrients and space, altering the physical structure of the vegetation, and altering nutrient cycles. Many native plants support host-

specific invertebrates, which could be impacted by competition from invasives. Floodplain habitats are particularly vulnerable to invasive plants because the frequent disturbances from flooding give aliens opportunities to establish, and because these species tend to thrive in the nutrient rich soils characteristic of floodplains.

#### (B) Evidence

In New Hampshire, there are several exotic plants that are particularly problematic in floodplain habitats, including Oriental bittersweet (*Celastrus orbiculatus*), Japanese knotweed (*Polygonum cuspidatum*) and black swallow-wort (*Vincetoxicum nigrum*) (ISI 2005). Although research into specific effects of invasive plants on wildlife has been limited, at least one study has shown that Japanese knotweed can have measurable negative impacts on amphibians (Maerz and Blossey 2002).

### 3.2 Sources of Information

Literature reviews, state and federal agency websites, fact sheets, and reports were used to assess the exposure pathway and evidence of threats to floodplain forest systems in New Hampshire. GIS data layers were gathered from GRANIT, NHDES, USGS, and NHDOT to assess threats.

Initially, a list of threats was identified by NHFG and sent out for review. A group of wetland and wildlife experts met on 27 January 2005 to rank threats to marsh and shrub systems (participants included Kim Babbitt, Kim Tuttle, Pam Hunt, Carol Foss, Chris Martin, Laura Deming, Heather Hermann, Benjamin Nugent, and Matthew Carpenter), and at this meeting threats to floodplain habitats were ranked and further modified based on expert review and new information.

### 3.3 Extent and Quality of Data

Some threats to floodplain forest habitats and the associated flora and fauna are well understood (e.g., habitat destruction/fragmentation). Other threats (e.g., invasive plants, alteration of river flows) need further study.

### 3.4 Threat Assessment Research

- Collect vegetation data along impounded rivers to gauge effects of river flow modification.
- Collect invasive plant data to identify current threat areas and species, and target sites for invasive management, in conjunction with the efforts of the Invasive Plant Atlas of New England (IPANE) project (IPANE 2005).

#### ELEMENT 4: CONSERVATION ACTIONS

Many of the habitat protection strategies described in watershed profiles will benefit floodplain forests. These include managing river impoundments to simulate natural water flows, removing non-functioning dams, strengthening the Shoreland Protection Act (RSA 483-B), and protecting the highest quality sites.

##### 4.1.1 Identification of potential floodplain forest restoration sites, and development of a floodplain forest restoration plan, Restoration and Management

###### (A) Threats

Development (Fragmentation, Habitat Loss and Conversion, Non-Point Source Pollution (Chemical Contaminants, Runoff and Sedimentation)

###### (B) Justification

- A successful restoration plan will identify sites that will connect patches of fragmented floodplain forest, preclude the conversion of floodplain agricultural fields to residential or commercial development, and reduce the effects of agricultural runoff by replacing agricultural fields and enhancing riparian buffers to remaining fields.
- Successful restoration will create or restore quantifiable areas of habitat and will enhance connectivity between extant habitat patches.
- Monitoring of the restoration sites will allow managers to assess successional processes at restoration sites and modify management strategies as necessary.

###### (C) Conservation Performance Objective

The objective of identifying floodplain forest restoration sites and developing a restoration plan is to restore floodplain forest habitat in areas currently used for agriculture. The plan will set goals for the number of restoration sites and the number of restored hectares within the first 5 years of the project. Success will be measured by determining whether these goals were met, and subsequently, by monitoring of the sites to ensure that the restoration sites are developing toward floodplain forest composition and structure, as defined by New Hampshire natural community and natural community system descriptions.

###### (D) Performance Monitoring

The restoration plan should select sites based upon their ability to connect existing blocks of floodplain forest habitat. Sites will also need to be in areas in which a natural flood regime still exists (i.e., the stretch of river is not influenced by impoundments). Site selection should ensure that sites are distributed among affected watersheds throughout the state.

###### (E) Ecological Response Objective

The desired ecological response to floodplain forest restoration is to increase and enhance New Hampshire's floodplain forest habitat. Successful habitat restoration would result in the creation of floodplain forest communities and systems as described by the NHNHB. These restored habitats would also support the range of affected wildlife species, where appropriate, as listed in the plan.

###### (F) Response Monitoring

Once work begins on given sites, monitoring will require annual visits to ensure that floodplain forest vegetation is developing and that invasive species are not threatening to inhibit floodplain habitat development. These monitoring visits will provide the necessary information to determine if succession is proceeding as desired, or if additional management (invasive control, further planting) is needed.

(G) Implementation

Prior to the development of the plan, maps will be created showing existing floodplain forest habitat and agricultural areas within floodplains, to enable the selection of potential restoration sites. The restoration plan, including prioritized sites, will be written in consultation with experts in riparian ecology and ecological restoration, and completed within 1 year. Once the plan is written and sites are identified, the first projects should begin within 3 years.

(H) Feasibility

A restoration project of this sort is large-scale and resource intensive and will require the participation of outside experts and organizations as well as willing landowners. Projects will have to occur on public land, or access will need to be gained on private land, either through cooperation with the landowner, landowner incentive programs, or direct acquisition. Funding for this project will probably need to be procured through federal grant programs.

**4.1.2 Develop and implement invasive plant species management plan for floodplain forests, Restoration and Management**

(A) Threats

Invasive plants

(B) Justification

- An invasive species management plan will identify high-quality floodplain forest habitat that is threatened by invasive plant species and will develop strategies to control them. Evaluations of habitat quality will include the presence of at-risk wildlife species.
- Controlling invasive plant species will allow for the restoration and enhancement of native vegetation, which will benefit an array of wildlife.
- Management will be targeted to specific sites, because invasive plant control can be time and labor intensive.
- Because the spread of invasive plants is a relatively slow process, management activities can extend over a period of many years.

- Monitoring sites for decreases in the abundance of invasive plants and a subsequent increase in the cover of native vegetation will allow for refinement of management techniques.

(C) Conservation Performance Objective

The objective of developing and implementing an invasive plant species management plan is to alleviate the impact of invasive plant species on floodplain forests, using standardized methods developed by other organizations (IPANE). Success will be indicated by the creation and implementation of the plan within 2 years.

(D) Performance Monitoring

In the first season, invasive species surveys should be conducted on at least 25 floodplain forest sites. Following site evaluation, an invasive species control plan will be developed for selected sites, with an associated site monitoring plan.

(E) Ecological Response Objective

The desired ecological response is a reduction in the abundance of invasive plant species in floodplain forests. Successful invasive control will be indicated by a measurable reduction in the cover of invasives, and a resultant increase in the cover of native vegetation.

(F) Response Monitoring

Management sites will be sampled for cover of invasive plant species and cover of native plant species using standard fixed vegetation plot techniques. The effects of control methods on both native and exotic species will be monitored by regular re-sampling of these fixed plots. The analysis of these plot data will provide an assessment of the efficacy of the control treatments and will direct any alterations of the management plan.

(G) Implementation

Floodplain forest sites will be selected from the habitat map for invasive sampling. Once data have been gathered at the sites, an invasive control plan will be

developed in collaboration with experts in invasive species management. At the sites, fixed vegetation plots will be established to measure the effects of the control techniques. Vegetation data will be collected before and after treatment, with return visits in subsequent years to monitor the site and conduct additional control measures.

#### (H) Feasibility

The implementation of an invasive species control plan would be very labor intensive and would likely require help from volunteer organizations. Herbicides and mechanical devices could be very expensive. An effective control project is a long-term endeavor which will require an equivalent commitment of resources.

#### 4.2.1 Conservation Action Research

- The development of the restoration plan will require considerable research into the best current methods in ecological restoration. The restoration projects themselves will require extensive monitoring to evaluate their success in restoring floodplain forest habitat.
- Thorough inventories of invasive species in floodplain habitats will need to be conducted prior to developing a management plan. Development of a series of permanent plots will be necessary to monitor changes following management activities.

### ELEMENT 5: REFERENCES

#### 5.1 Literature

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## Distribution of Floodplain Forest in New Hampshire

Distribution  
■ Known  
■ Potential



0 10 20 40 Miles

Known - areas mapped in the field by NH Natural Heritage Bureau  
Potential - areas identified through mapping and analysis of remotely sensed data. See text in Element 2 for more detail.

