

# Chapter 4: Management Direction

## Goals, Objectives and Strategies

The Environmental Assessment in Appendix A describes and analyzes three management alternatives for Patoka River NWR. The Service identifies one as its preferred alternative and it is described in the following chapter as the proposed future management direction that would guide activities on the Refuge for the next 15 years. In some cases the proposed future management direction describes initial steps of a long-term vision that may take 100 years or more to achieve.

Figure 14 and Figure 13 depict the long-term vision (100 years or more in the future) for habitat distribution within the Refuge & MA. It was derived using soils data to determine potential vegetation and by reviewing historical maps and photos. The bottomland forest shown to cover much of the Refuge would be a patchy mosaic with a variety of wetland habitats as well as open areas created by dead and dying trees. Over time, disturbances from wind, water, and wildlife would shift the amount and distribution of these habitats. Lands reclaimed after strip mining may eventually revert to forest or remain as grassy upland openings. A meandering Patoka River is also part of the long-term vision. Channel restoration that includes reconnecting oxbows would add many miles to the straightened portion of the river (Figure 14). The management direction that follows describes steps that move towards the long-term vision, but that are practical and attainable within the 15-year timeframe of this plan.

Goals, objectives, and strategies comprise the proposed future management direction. Goals are descriptive broad statements of desired future con-



*Patoka River NWR & MA. Photo credit: USFWS*

ditions that convey a purpose. There are three goals for Patoka River NWR. Goals are followed by objectives, specific statements that describe management intent. Objectives provide detail and are supported by rationale statements that describe background, history, assumptions, and technical details to help understand how the objective was formulated. Finally, beneath each objective there is a list of strategies – specific actions, tools, and techniques required to fulfill the objective.

### **Goal 1: Habitat**

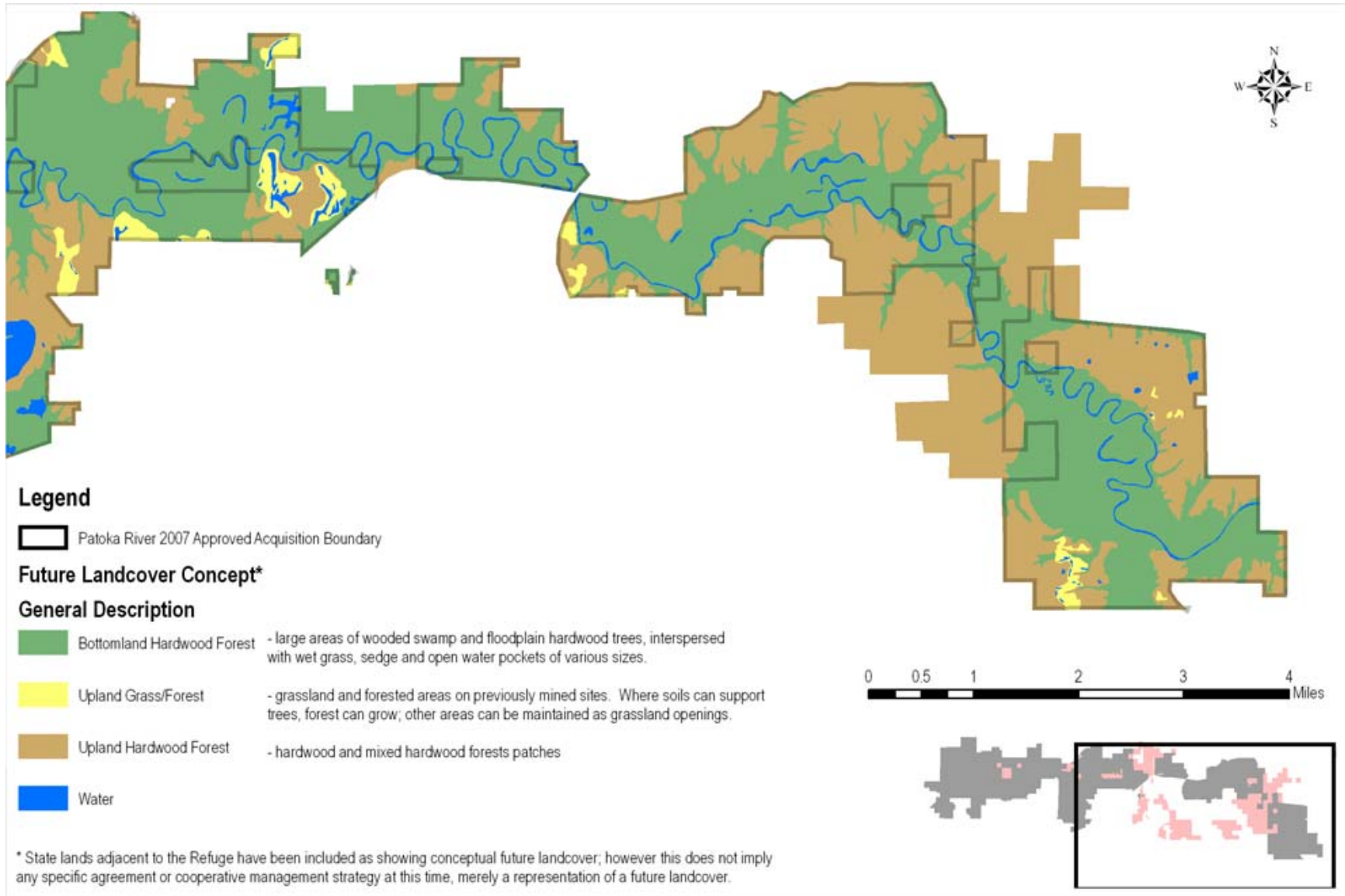
Manage a diversity of habitats to benefit threatened and endangered species, waterfowl, other migratory birds, and indigenous species in the Patoka River and associated watersheds.

#### ***Objective 1.1: Forested Wetlands (Bottomland Forest)***

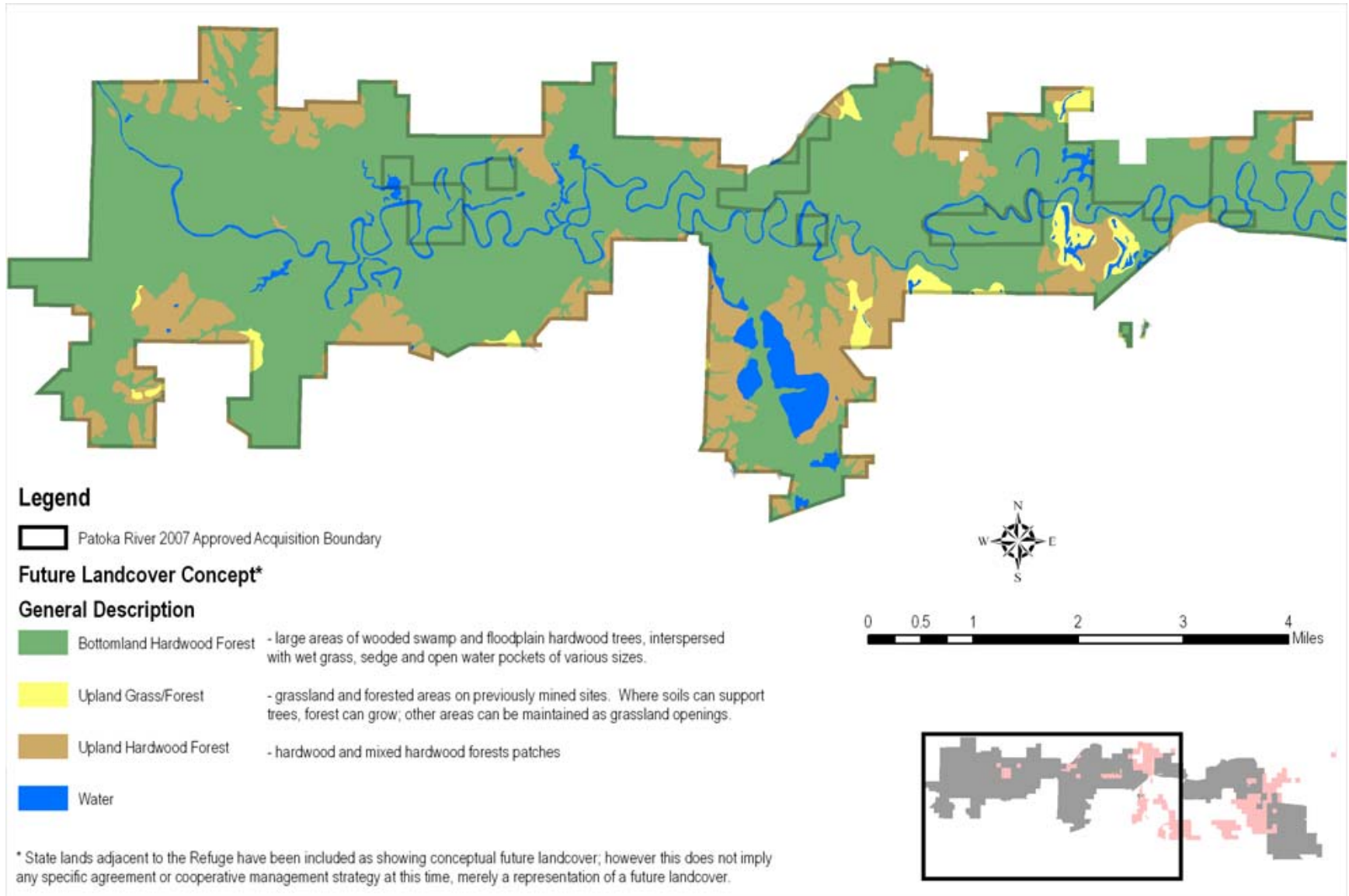
Total Acres: 8,647; 2007 Owned Acres: 3,056

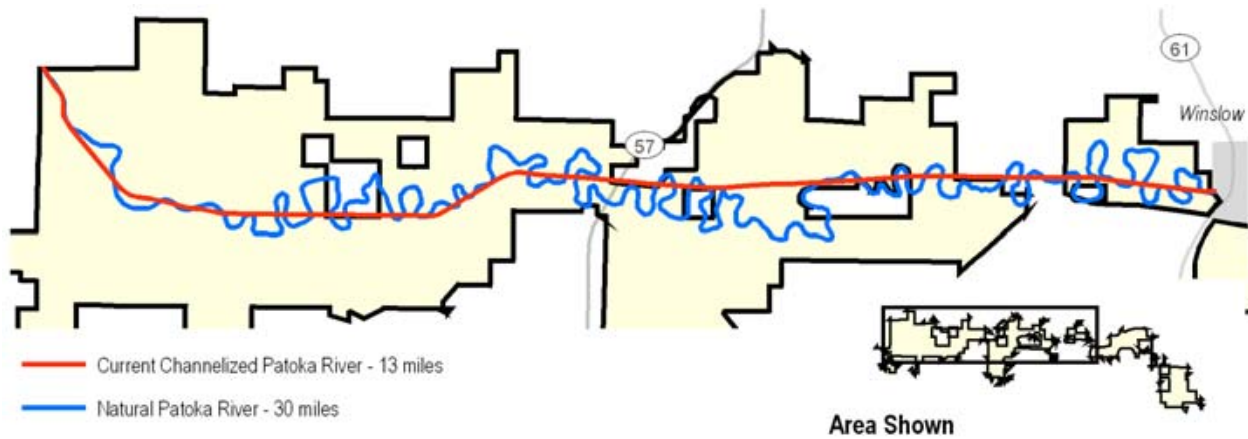
Over the long-term (100-200 years), achieve approximately 12,000 to 13,000 acres of bottomland hardwood stands with a mosaic of age and structural classes distributed across a narrow elevation gradient with lower elevations domi-

**Figure 12: Long-term (100 Years) Landcover, Patoka River NWR & MA (East)**



**Figure 13: Long-term (100 Years) Landcover, Patoka River NWR & MA (West)**



**Figure 14: Current and Future Concept of Patoka River Channel**

nated by black willow, sweetgum, silver maple, and river birch, mid elevations dominated by pin oak, shumard oak, swamp chestnut oak, swamp white oak, red maple, green ash, sycamore, and cottonwood, and upper elevations dominated by cherry bark oak, other oaks, hickory, and pecan. Over the life of the plan, maintain existing bottomland forest (presently 3,056 acres) and reforest to bottomland hardwoods future land acquisitions that have suitable soils and that are outside of areas managed as non-forested habitat (see Objective 1.6 Bottomland Farmland and Objective 1.7 Moist Soil Units).

**Rationale:** Bottomland forests are diverse wetlands with many hydrologic features including sheet or overland flow, meander scrolls or relic channels, vernal pools, habitat mounds, depressions, and ridge and swale topography (Wharton et al. 1982, Dunn and Roach 2001). Incorporating these features in wetland restoration creates a diverse wetland habitat providing areas with permanent water, semi-permanent water and seasonally flooded wetlands (Smith 2001). Bottomland forests are also characterized by a multi-tiered canopy and a shifting mosaic of age classes. Canopy gaps created by one or more fallen trees resulting from flooding, windstorms, beaver activity, or other disturbance make up 3-5 percent of bottomland forests (Heitmeyer et al. 2005). These openings in the forest canopy quickly succeed to scrub-shrub habitats and most eventually succeed to bottomland forest.

We identified 15,633 acres of bottomland soils – those on the Indiana list of hydric soils as well as

other frequently flooded soils – within the Refuge boundary. Presently, 9,032 acres of these soils are covered by bottomland forest. The Natural Resources Conservation Service’s Official Soil Series Descriptions (Soil Survey Staff NRCS – USDA undated) show hardwood forest as the natural vegetation suited for all but 166 acres of the remaining 6,601 acres of bottomland soils (Figure 12 and Figure 13). These potential bottomland forest sites are presently in various cover types with the majority in farmland (5,367 acres). Restoring the extent and species diversity of forested wetlands within the planning area is consistent with Refuge purposes, existing soils information, known presettlement vegetative cover (Parker and Ruffner 2004), and Service policy (U.S. Fish and Wildlife Service 2001). We derived the long-term goal of 12,000 to 13,000 acres by subtracting acreages devoted to moist soil units, and other land uses from the total acres of bottomland soils suited for bottomland forest.

#### Strategies

1. Plant mast producing bottomland hardwood species on sites with suitable soils.
2. Conduct forest surveys or inventories every 5 years to monitor changes in health, composition, and structure of bottomland forest.
3. Complete a Habitat Management Plan with specific management recommendations to maintain bottomland forest species and age class diversity.
4. Restore micro and macro topographic features on selected bottomland farmland and



Habitat restoration, Patoka River NWR & MA. Photo credit: USFWS

reforest 60-80 percent of these sites with the balance (20-40 percent) remaining as scrub-shrub wetlands. See Stratman (2000) and Dunn and Roach (2001) for additional information.

5. On suitable sites enhance or restore native canebrakes.
6. Add one full-time (1.0 FTE) forester/wildlife biologist.
7. Target reforestation to minimize fragmentation, create large contiguous blocks of forest, and increase connectivity to other forested areas.

### **Objective 1.2: Emergent Wetlands**

Total Acres: 775; 2007 Owned Acres: 465

Over the next 15 years, maintain presently owned emergent wetlands at Snakey Point and Buck's Marsh in a mixture of vegetation such as cattail, bulrush, sedges, spatterdock, water lily and smartweeds. Allow the amount and species composition of emergent wetlands across the remainder of the refuge (both currently owned and future acquisitions) to fluctuate through natural succession.

Rationale: Snakey Point and the adjoining Buck's Marsh contain much of the 775 acres of emergent wetlands within the Refuge acquisition boundary. These sites are likely wetter than before the South Fork Patoka River was channelized in the 1920s. Sediments dredged from the stream bottom and piled along either side of the channel form levees that impede drainage creating a mixture of open water and emergent vegetation. Siltation and beaver activity also played a role in creating the present

condition of these wetlands. Emergent wetlands attract a variety of wildlife. In addition to providing food and resting sites for resident and migrating waterfowl, numerous wading birds, song birds, fur-bearing mammals, reptiles and amphibians, and fish and other aquatic organisms use the marshes during various seasons of the year.

#### *Strategies*

1. As part of a Habitat Management Plan, develop a management regime for emergent wetlands that maintains desired plant species and vegetation/open water interspersions.
2. Conduct a study to learn more about the hydrology and geomorphology of the Snakey Point/Buck's Marsh complex in order to determine the feasibility of future water level manipulations that may be necessary to enhance/maintain habitat conditions.

### **Objective 1.3: Lakes and Ponds**

Total Acres: 885; 2007 Owned Acres: 345

Over the next 15 years, maintain the number of lakes and ponds at or above the amount present in 2006 and increase their aquatic habitat diversity.

Rationale: Natural and man-made lakes within the Refuge acquisition boundary provide habitat diversity, support aquatic species, and provide wildlife dependent recreation opportunities.

#### *Strategies*

1. Place structure (tree tops, boulders, etc.) in lakes and ponds to increase aquatic habitat diversity.

### **Objective 1.4: Patoka River, Oxbows, and Patoka Tributaries**

Total Acres: 534; 2007 Owned Acres: 200

Within 5 years of plan approval, collect information necessary to evaluate stream channel restoration options for the Patoka River and its tributaries that includes restoring channelized stream to meandering stream.

#### Rationale:

In the 1920s there was an attempt to drain nearly 100,000 acres of forested wetlands along the Patoka River to make it suitable for farming. Known as Houchin's Ditch and beginning at the town of Winslow, the project replaced 36 miles of natural, meandering river with about 17 miles of dredged, straight ditch. Nearly 19 miles of natural river meanders



Snakey Point fishing pier, Patoka River NWR & MA.  
Photo credit: USFWS

were cut off and isolated from the main channel. Water exchange within these man-made oxbows is now limited to periods of high water, but heavy sediment loads carried during these periods results in increased deposition in the oxbows. Consequently, these important ecological units are becoming shallower and hold water for a shorter duration. Although this process occurs in all natural riverine systems, normally new oxbows are continually being created as river meanders are severed from the main channel. In the case of Houchins's Ditch, these oxbows are not being replaced and the associated wetland habitat is being lost. We require more information about the morphology and hydrology of the Patoka River and its tributaries before undertaking channel restoration.

#### *Strategies*

1. Develop partnership with Corps of Engineers to complete evaluation of stream restoration.

#### **Objective 1.5: Water Quality**

Within 15 years of plan approval, improve water quality within the Patoka River and its tributaries to move towards compliance with Indiana Department of Environmental Management standards with the long-term goal of removal of the streams from the list of impaired waters.

***Rationale:*** Presently, the Patoka River and its tributaries are listed as impaired waters by the Indiana Department of Environmental Management (IDEM 2006b). Waters are considered impaired when they fail to meet one or more standards necessary to support one or more of the following uses: aquatic life support, fish consumption, drinking water supply, and recreational use. Improving water quality will help restore the biolog-

ical integrity and environmental health of the Patoka River system and is consistent with current Service policy (U.S. Fish and Wildlife Service 2001).

#### *Strategies*

1. Continue working on abandoned mine land reclamation in conjunction with the IDNR Division of Mining and Reclamation and Department of Interior Office of Surface Mining and Reclamation.
2. Work with local groups to monitor and identify opportunities to improve water quality within the Patoka River watershed.
3. Attend and support watershed planning activities to enhance water quality.
4. Cooperate with Upper and Lower Patoka River Conservancy Districts to maximize wildlife benefits associated with their activities.
5. Maintain relationships with Indiana DNR Division of Oil and Gas, Indiana Department of Environmental Management to ensure proper operation of oil and gas wells in the watershed.

#### **Objective 1.6: Bottomland Farmland**

Total acres: 4,507; 2007 Owned acres: 1,059

Over the life of the plan, maintain up to 1,000 acres of bottomland farmland in two to three contiguous blocks as stopover habitat for migratory waterbirds. Convert all other bottomland farmland, both currently owned and future acquisitions, to bottomland forest (including ridge/swale macrotopography wetlands) or moist soil management units.

***Rationale:*** Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (U. S. Fish and Wildlife Service 2001). Retaining up to 1,000 acres of bottomland farmland departs substantially from the bottomland forest indicated by historic conditions (Parker and Ruffner 2004) and soils (Soil Survey Staff NRCS—USDA undated) of these sites, but it helps fulfill Refuge purposes by providing stopover habitat for migrant waterbirds that favor wetlands with short vegetation (Helmert 1992). This type of stopover habitat historically occurred as sandbars, mudflats, and oxbows along the floodplains and tributaries of the Mississippi and Ohio Rivers before they were extensively altered (de Szalay et al. 2000). Migrants shifted to flooded farmland in the absence of this habitat. Presently, spring flooding inundates bot-

tomland farmland along the Patoka River, providing stopover habitat for migrant shorebirds and some types of waterfowl. Such frequently flooded farmland is a focus of the Indiana Wetland Reserve Program (WRP). Nearly 49,000 acres are enrolled in the Indiana WRP with more than 25,000 acres occurring along the lower reaches of the Wabash and White Rivers, areas close to Patoka River NWR (USDA—NRCS website, G. Roach personal communication June 6, 2006). The majority of sites along the lower reaches of the Wabash and White River are being reforested, making them unsuitable for some migrant waterbirds. This trend is expected to continue. Given the loss of native habitat and the restoration of frequently flooded farmland to forest, it is consistent with Refuge purposes to retain one or more large open blocks of bottomland to provide habitat for open wetland dependent migratory species. Retarding succession on these sites through moist soil management, prescribed burning, or other mechanical or chemical means is not possible because of insufficient land ownership and/or it would exceed current and projected future funding and staffing levels. For the 15-year planning horizon of this CCP, farming is the most cost-effective means to prevent these sites from succeeding to forest and to maintain them as stopover foraging habitat.

Each spring thousands of waterfowl, shorebirds, and wading birds use flooded bottomland farmland within the Refuge as stopover habitat. Many of these migrant waterbirds prefer non-forested wetlands with short vegetation (Helmers 1992) and would not use these areas if they were forested. The birds prefer flooded bottomland farmland within the Refuge for several reasons. Surrounding privately owned farmland is not buffered by bottomland forest and agricultural practices on these sites do not leave residual vegetation as is done on Refuge owned farmland.

#### *Strategies*

1. Maintain cooperative agreements, which require cooperating farmers to annually leave a portion of crops as food for wildlife.
2. Where feasible, restore micro and macro topographic features on portions of bottomland farmland fields to increase the duration they provide wetland conditions. See Stratman (2000) and Dunn and Roach (2001) for additional information.

#### **Objective 1.7: Moist Soil Units**

500-700 acres

Within 15 years of plan approval, maintain existing moist soil areas (265 acres) and convert up to a total of 700 acres of bottomland farmland to moist soil management that provides a diversity of native herbaceous plant foods such as wild millet (*Echinochloa* spp.); panic grass (*Panicum* spp.); sedges (*Cyperus* spp. and *Carex* spp.); and beggarticks (*Bidens* spp.).

*Rationale:* Moist soil management is a widespread practice for producing a diverse mixture of native herbaceous plant foods and invertebrates (Frederickson and Taylor 1982). It mimics seasonal flooding that has long occurred in the lowlands of the Patoka River corridor, but moist soil units – areas impounded by levees, dikes, and structures that permit precise control of water levels – allow managers to consistently produce conditions favorable to growth of native plants. Seeds produced by these plants provide balanced nutrition for migrating waterfowl, and also provide food and habitat for other migratory birds and wildlife. The diverse mixture of native plants also creates conditions that produce abundant invertebrates, a high protein wildlife food source.

#### *Strategies*

1. Disturb (through mowing, disking, fire, etc...) an average of one third of Moist Soil Unit acreage annually to set back succession.



*Bottomland forest hydrology, Patoka River NWR & MA.  
Photo credit: USFWS*

2. Moist soil units will be maintained in early successional native plant communities for the production of annual seed crops.
3. Flood Moist Soil Units in stages beginning in October or November, initially flooding one-third and progressively flooding more of each unit as waterfowl deplete the food supply until units are entirely inundated.
4. Begin draining in March to expose mudflats by April to benefit migrating shorebirds which can feed on invertebrates.
5. Maintain pumps, dikes and water control structures in good working order.
6. Maintain units to demonstrate comparison practices for educational purposes.

### **Objective 1.8: Upland Forest**

Total Acres: 2,704; 2007 Owned Acres: 183

Over the long-term (100-200 years), achieve a mosaic of hardwood stands of different age and structural classes distributed on upland areas and dominated by white oaks, black oaks, hickory, and blackgum on drier sites, and by red oaks, yellow poplar, beech, sugar maple, walnut, hickory, and cherry on wetter sites. Over the life of the plan, maintain upland forest on presently owned acres (183) and for future acquisitions maintain existing upland forest and restore upland forest on non-forested upland sites with suitable soils.

*Rationale:* We identified 6,720 acres of upland soils within the Refuge boundary. Presently, 2,704 acres of these soils are covered by upland forest. The Natural Resources Conservation Service's Official Soil Series Descriptions (Soil Survey Staff NRCS – USDA undated) shows hardwood forest as the potential natural vegetation suited for the remaining 4,016 acres of upland soils. These potential upland forest sites are presently in various cover types with the majority in farmland (3,213 acres). Restoring the extent and species diversity of upland forest within the planning area is consistent with Refuge purposes, existing soils information, known presettlement vegetative cover (Parker and Ruffner 2004), and Service policy (U.S. Fish and Wildlife Service 2001).

There is additional support for maintaining or restoring upland sites within the Refuge to oak-hickory forest. McNab and Avers (1994) identify oak-hickory forest as the potential natural vegetation for the uplands within the Central Till Plains Oak-Hickory Ecological Section where the Refuge

is located. Parker and Ruffner (2004) and Fralish (1997) assert that human caused disturbance played a major role in the dominance of oak-hickory forest in this region for at least the past 400 years and likely much longer (Fralish 2004). Fire suppression within this landscape over the past century has shifted the forest composition away from oaks towards maple and beech (Ruffner and Groninger 2004). Fralish (2004) argues that oak and hickory play a keystone role in the Central Hardwood Forest and are of major importance in maintaining biodiversity. Thompson and Dessecker (1997) also note the importance of oak and early successional communities within the Central Hardwood Forest.

#### *Strategies*

1. Conduct forest surveys or inventories every 5 years to monitor changes in health, composition, and structure of forestlands.
2. Develop and implement 5-year forest management plan to promote regeneration of white and red oaks.
3. As indicated, conduct timber stand improvement, including selective harvest if necessary, to provide habitat diversity and stimulate regeneration and plant growth on the forest floor.
4. Plant tree species appropriate to upland sites with emphasis on mast producing species particularly oaks.

### **Objective 1.9: Upland Openings**

Total Acres: 2,139; 2007 Owned Acres: 98

Over the life of the plan, maintain reclaimed minelands as early successional habitat (grasslands) and convert other upland openings to upland forest.

*Rationale:* Surface mining has and continues to occur on upland sites within the Refuge acquisition boundary. Since 1977 federal law requires coal operators to restore mined land to beneficial uses. Some reclamation sites were planted to grass and remain in this condition. Populations of many grassland bird species are declining in part because of loss of grassland habitat. These "mine grasslands" serve as surrogate habitat for some grassland birds including Grasshopper Sparrows, Henslow's Sparrows, Eastern Meadowlarks, and Dickcissels, which are identified as conservation priorities for the Midwest Region of the Service (Bajema et al. 2001, DeVault et al. 2002).



Service policy calls for maintaining or restoring refuge habitats to historic conditions if doing so is feasible and does not conflict with refuge purposes (U. S. Fish and Wildlife Service 2001). Available information on historic vegetation indicates hardwood forests occurred on upland sites within and surrounding the Refuge (Parker and Ruffner 2004). Hardwood forest is also listed as the potential natural vegetation for upland soils (those not classified as hydric or frequently flooded) within the Refuge (Soil Survey Staff NRCS – USDA undated). Surface mined lands may eventually revert to forest, but mining activity severely altered soil structure and properties allowing grasses to predominate. Although grasslands probably did not historically occur on surface mined areas within the Refuge the habitat is not out of place. Homoya (personal communication March 8, 2007) notes that historically grassland habitat did occur near the Refuge. This is further supported by the description of the Central Till Plains Oak-Hickory Ecological Section where the Refuge is located. It notes fire and other disturbance agents generally discouraged woody vegetation and encouraged grasslands on the flatter upland divides between forested drainages and opened the canopy in the ravines and on slopes (McNab and Avers 1994).

#### *Strategies*

1. Use prescribed burning, mechanical, or chemical methods to maintain upland openings.
2. Where feasible, place openings along perimeter of Refuge to minimize fragmentation and promote habitat diversity.

#### **Objective 1.10: Invasive Plant Species**

Within 5 years of plan approval assess the location and extent of invasive plant infestations and develop measurable annual targets to help eradicate or slow the spread of invasive plant species (of present interest are Japanese honeysuckle, reed canary grass, autumn olive, Johnson grass, and Japanese knotweed).

*Rationale:* Exotic or non-native plants are those that have been deliberately or inadvertently transported and transplanted by humans outside their native range, often found on another continent. Certain exotic plants become “invasive” if they survive and begin to spread on their own, in the absence of the population controls (e.g. diseases, parasites, environmental constraints, organisms that fed on them) that held their propagation in check in their native ranges. Invasive exotics are



*Habitat restoration – tree planting, Patoka River NWR & MA. Photo credit: USFWS*

troublesome because they displace native vegetation on which native animal species depend.

#### *Strategies*

1. Complete a comprehensive inventory to assess the location and extent of invasive plant infestations.
2. Use mechanical, chemical and biological controls to check the spread of invasive plant species.
3. Communicate with other state and federal resource agencies, as well as non-governmental organizations, to stay current on emerging threats and effective management and control techniques related to invasive species.

#### **Objective 1.11: Private Lands and Watershed Management**

Over the life of the plan, increase wildlife habitat and reduce sedimentation on 150 acres of private lands within the Patoka River and surrounding watersheds.

*Rationale:* The Patoka River watershed extends beyond the boundaries of the Refuge. Land use and activities within the watershed affect the quality of Refuge habitats. Working with neighboring land owners to improve wildlife habitat and water quality complements conservation actions on the Refuge. The Service’s Partners for Fish and Wildlife Program is devoted to providing technical and financial assistance to private landowners and Tribes who are willing to work with the Service and other partners on a voluntary basis to help meet the habitat needs of Federal Trust Species.

*Strategies*

1. Distribute information concerning habitat development opportunities on private lands during Refuge presentations and via local media and other agency (USDA, Indiana DNR) publications and web sites.
2. Coordinate with interested landowners on a timely basis to assess habitat development or improvement opportunities and secure voluntary agreements for appropriate projects.
3. Provide technical resource assistance to other agencies, particularly NRCS, to maximize wildlife benefits associated with programmatic conservation programs such as the Conservation Reserve Program, Wetlands Reserve Program and others.
4. Conduct annual review of Farm Services Agency easements for compliance. Reviews may be completed through a variety of methods including contact with land owners, aerial photography reconnaissance, or on-site inspection.

**Objective 1.12: Interior Least Tern Nesting Habitat**

Over the life of the plan, continue to provide 6 acres of nesting habitat for Interior Least Terns at Cane Ridge Wildlife Management Area capable of accommodating up to 100 nesting adult terns and producing 75 fledglings annually.

**Rationale:** The Interior Least Tern is federally listed as endangered. Cane Ridge Wildlife Management Area, a 488-acre satellite of Patoka River NWR, contains two islands created and maintained as nesting habitat for Least Terns. The site was created as part of a Habitat Conservation Agreement with Duke Energy to lure nesting terns away from sites at a neighboring power plant. The site now harbors the largest nesting colony of Interior Least Terns east of the Mississippi River.

*Strategies*

1. Annually inspect and repair, as necessary, predator fencing which encloses the two nesting islands.
2. Ensure adequate water depth surrounding the nesting islands to provide foraging habitat for the terns and to discourage mammalian predators.
3. Through mechanical and chemical means, ensure that the nesting substrate remains relatively free of vegetation and attractive to nesting terns.



*Oxbows adjacent to the channelized river, Patoka River NWR & MA. Photo credit: USFWS*

4. Ensure the Refuge has all necessary permits to allow staff to utilize whatever methods necessary to minimize avian predation on the nesting tern colony.

**Objective 1.13: Land Acquisition**

Within 5, 10 and 15 years of Plan approval, the Refuge will include 50 percent (11,000 acres), 70 percent (15,400 acres) and 80 percent (17,600 acres) respectively, of the lands within the acquisition boundary.

**Rationale:** Land acquisition is a critical component of fish and wildlife conservation since it permanently protects their basic need of habitat. On a narrow, linear refuge, land acquisition is a critical component of restoring the habitat connectivity needed for the health of many species. Land acquisition can also be cost-effective in the long-term due to inflation of land costs and the costs of acquiring undeveloped land versus developed land that also needs restoration. This objective represents an aggressive land acquisition program and averages 1,080-acres per year from 2007-2011, 880-acres per

year from 2012-2016 and 450-acres per year from 2017-2021 to achieve goals set in the 1994 Land Protection Plan and other approved acquisition documents.

*Strategies*

1. Secure land by any legal means from cooperative landowners including donations, bequeaths, purchases and land trades.
2. Secure funding from any available source including donations, bequeaths, appropriations, grants and through collaborative efforts with partners to include cost-sharing programs such as the Wetland Reserve Program, carbon sequestration trade-offs and similar programs that may become available.
3. Provide accurate and up-to-date information on land acquisition opportunities to Citizen Committees, Friends Groups, other conservation-oriented non-government organizations, Joint Venture partners and elected officials to assist in their efforts to secure adequate land acquisition funding.
4. Maintain communication with land owners within and around the Refuge of the status of the Service's land acquisition program.
5. Prioritize tracts for acquisition based on most critical wildlife needs and highest threat of loss due to other land development proposals.
6. Continue to be open to review of proposals by partners to protect other lands that may become available in the vicinity of the Refuge that provide critical habitat for threatened, endangered and other species of concern and consider all avenues of protecting that habitat including fee title purchase, conservation



*Migrating Mallards, Patoka River NWR & MA. Photo credit: USFWS*

easements and cooperative agreements by the Service or other conservation entities.

**Objective 1.14: Air Quality**

Over the life of the plan, work to improve air quality within the Refuge to levels that meet or exceed Environmental Protection Agency standards.

*Rationale:* Maintaining air quality to protect Refuge resources is consistent with the Service policy on Biological Integrity, Diversity, and Environmental Health. In recent years, the air quality within portions of Pike and Gibson counties as well as neighboring counties Warrick, Dubois, and Vanderburgh has failed to attain the national standard for particulate matter, one of six principal pollutants that have National Ambient Air Quality Standards set by the Environmental Protection Agency. Much of Gibson and Pike counties, where the Refuge is located, are outside this “nonattainment area” most likely because no air quality data are available. In addition to primary standards intended to protect public health, the Clean Air Act sets secondary standards to protect public welfare. These secondary standards include protection for animals and vegetation, two resources that play an important role in fulfilling Refuge purposes. In 2007 there was a proposal to site an industrial facility near the Refuge that would discharge additional effluent into the atmosphere. This generated concern among Refuge staff and the local public. In 2008 the Refuge working in conjunction with the Indiana Department of Environmental Management placed an air quality monitoring station near the Refuge.

*Strategies*

1. Continue to work with Indian Department of Environmental Management and local citizens groups (currently Pike/Gibson Citizens for a Quality Environment).
2. Support establishment of a permanent air monitoring station in the vicinity of the Refuge.

## **Goal 2: Wildlife**

Perpetuate listed species, waterfowl, other migratory birds, and native fish and wildlife, within the Patoka River and associated watersheds while restoring and preserving the biological integrity, diversity, and environmental health of the Refuge.

### ***Objective 2.1: Threatened and Endangered Species***

Within 5 years of plan approval, implement a monitoring program to track abundance, population trends, and/or habitat associations of listed species.

*Rationale:* To evaluate whether management actions are having the predicted consequences, we need to monitor actual outcomes, most often using a representative sample of sites to ensure that, on average, the effects of a particular type of treatment match expectations. Information gained through monitoring helps us learn and adapt, increasing our effectiveness in meeting conservation objectives. Established in 2005, the Service's Biological Monitoring Team is developing a series of monitoring protocols to ensure uniform data collection and analysis. Refuge monitoring activities will be compliant with the goals of the Biological Monitoring Team shown below (U. S. Fish and Wildlife Service 2005).

- Refuges will evaluate achievement of their wildlife and habitat goals, and track the management and conservation of their natural resources over time and space through systematic collection, storage, and reporting of biological data that address specific management information needs.
- Refuges will initiate management-focused research (Adaptive Management) and develop new tools and techniques to fill information gaps. Adaptive management research will be used to clarify the outcomes of specific management actions and guide future management programs.
- Refuges will contribute to regional, national, and continental conservation of trust resources as partners with other FWS Programs (Migratory Birds, Fisheries, Endangered Species, others) and the States, by collaborating with other agencies performing similar monitoring efforts to ensure that data can be easily exchanged for analyses at multiple landscape scales.

### *Strategies*

1. Monitor Bald Eagle nest(s) to track nest success/productivity
2. Every 5 years cooperate/contract with university/Coop unit/ES endangered species specialist to determine status of Indiana bats on the Refuge.
3. Continue cooperative efforts with Indiana DNR, Duke Energy to monitor Interior Least Tern nesting colony (nesting success, production, predation)
4. Candidate species (Indiana crayfish, northern copperbelly watersnake) – survey, inventory, habitat evaluation.
5. Complete Inventory and Monitoring step-down plan.

### ***Objective 2.2: Migratory and Resident Birds***

Within 5 years of plan approval, implement a monitoring program to track abundance, population trends, and/or habitat associations of selected migratory and resident bird species or groups of species (e.g. waterfowl, migrating land birds, shorebirds, marsh birds).

*Rationale:* See rationale for Objective 2-1 Threatened and Endangered Species.

### *Strategies:*

1. In cooperation with Indiana DNR, conduct weekly waterfowl surveys at Patoka River NWR, Cane Ridge WMA, and Gibson Generating Station.
2. Develop partnership with local birding organizations and other competent birders to conduct Christmas Bird Count, Breeding Bird Survey, colonial nesters survey, and shorebird surveys in conformance with appropriate protocols
3. Develop, as appropriate, surveys designed to measure the impacts of habitat management efforts on migratory bird populations and use (reforestation, water manipulation, early successional habitat management).

### ***Objective 2.3: Native Resident Wildlife***

Over the life of the plan, track abundance, population trends, and/or habitat associations of selected native resident wildlife species.

*Rationale:* The Indiana Comprehensive Wildlife Strategy identifies species of greatest conservation need within the state including many that are not

Federal Trust Species. The Refuge, which includes intermingled state lands (Pike State Forest and Sugar Ridge Fish and Wildlife Area) contains habitat for many of these species. Monitoring their status in cooperation with the Indiana Department of Natural Resources supports implementation of the Indiana Comprehensive Wildlife Strategy.

*Strategies*

1. Cooperate with IDNR to collect monitoring information on selected native resident wildlife.

**Objective 2.4: Fish and Other Aquatic Species**

Over the next 15 years, create or maintain diverse, self-sustaining fisheries in Refuge lakes, ponds, and streams. Within the Patoka River and its tributaries, improve the Index of Biotic Integrity for fish and other aquatic species communities with the long term goal of meeting or exceeding the Indiana Department of Environmental Management threshold for “fully supporting”.

*Rationale:* Presently, the Patoka River and its tributaries are listed as impaired waters by the Indiana Department of Environmental Management (IDEM 2006b). Waters are considered impaired when they fail to meet one or more standards necessary to support one or more of the following uses: aquatic life support, fish consumption, drinking water supply, and recreational use. Improving water quality will help restore the biological integrity and environmental health (U.S. Fish and Wildlife Service 2001) of the Patoka River system as measured through an increase in the Index of Biotic Integrity as monitored and reported by the Indiana Department of Environmental Management (IDEM 2006a). The Index of Biotic Integrity is a composite indicator that incorporates multiple dimensions of living systems to quantify biological conditions in aquatic environments. Such indicators have been recommended for monitoring ecological conditions on Refuges (Meretsky et al. 2006).

*Strategies*

1. Periodically inventory and monitor fish and aquatic species in Refuge waters.
2. See strategies under Objective 1-5 Water Quality.

**Goal 3: People**

Visitors, nearby residents and other stakeholders have the opportunity to enjoy wildlife-dependent recreation, understand and appreciate the natural resources, ecological processes and cultural resources of the Refuge, thereby supporting the Service’s mission.

**Objective 3.1: Welcoming and Orienting Visitors**

Within 5 years of plan approval, improve directional signing, determine the feasibility of off-site welcoming and orientation facilities, and place new entrance signs and kiosks at existing boat ramps, Snakey Point, and along Highway 57.

*Rationale:* Welcoming and orienting Refuge visitors contributes to several of the criteria defining a quality wildlife dependent recreation program (U.S. Fish and Wildlife Service 2006a). The number of visitors and amount of visitor services has increased to 21,221 visits since the Refuge was established in 1994. There are multiple access points to the Refuge and with approximately 75 percent of the land within the Refuge boundary not yet acquired, Refuge lands are intermingled with other holdings requiring clear signing and visitor information.

*Strategies*

1. Provide online Refuge information and map of boundaries.
2. Post boundaries on lands that abut the acquisition boundary of the Refuge and along selected sites that abut county roads.
3. Develop Visitor Facility enhancement projects to provide new entrance signs and kiosks at major access points.



*Trumpeter Swans, Patoka River NWR & MA. Photo credit: USFWS*

4. Develop and maintain a general brochure and fact sheet.

### **Objective 3.2: Hunting**

Over the life of the plan, provide hunting in line with State seasons and regulations except within designated sanctuary areas and according to the Refuge hunting and fishing plan.

**Rationale:** Hunting programs help promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Hunting is a priority general public uses of the National Wildlife Refuge System, and Service policy directs us to provide hunting opportunities when compatible (U. S. Fish and Wildlife Service 2006b).

#### *Strategies*

1. Enlist assistance from the Indiana DNR and volunteers to run any additional hunts.
2. Manage hunts to minimize conflicts with other uses and resources.
3. Assist as appropriate with hunter education, youth hunts, hunts for the disabled, and a women's skill program.
4. As more land is acquired more sanctuary areas will be identified and posted closed to all hunting to provide a feeding and resting area for migratory birds. Maintaining waterfowl sanctuary areas free of all hunting serves waterfowl and hunters by keeping birds in the area thereby providing prolonged hunting opportunities in adjoining areas.
5. Maintain Cane Ridge as a sanctuary free of all hunting.

### **Objective 3.3: Fishing**

Over the life of the plan, continue to provide fishing in line with State seasons and regulations according to the Refuge hunting and fishing plan. Continue to work cooperatively with the Indiana Department of Natural Resources on fisheries management. Within 5 years of plan approval, provide enhanced fishing access (more docks, ramps, etc...).

**Rationale:** Fishing programs help promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Fishing is a priority general public uses of the National Wildlife Refuge System, and Service policy directs us to provide



*Plant identification workshop, Patoka River NWR & MA. Photo credit: USFWS*

fishing opportunities when compatible (U. S. Fish and Wildlife Service 2006c).

#### *Strategies*

1. If successful in acquiring suitable lands, install a boat ramp near Oatsville in cooperation with the IDNR.
2. Provide additional accessible facilities such as trails, boat ramps, and fishing piers along fishable waters as lands are acquired within the Refuge.
3. Provide accessible bank fishing opportunities.

### **Objective 3.4: Wildlife Observation and Photography**

Over the life of the plan, continue to provide opportunities for wildlife observation and photography at Cane Ridge and Snakey Point. Within 5 years of plan approval, enhance observation and photography Refuge-wide as opportunities present themselves.

**Rationale:** Wildlife observation and photography programs can help promote understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Wildlife observation and photography are priority general public uses of the National Wildlife Refuge System, and Service policy directs us to provide wildlife observation and photography opportunities when compatible (U. S. Fish and Wildlife Service 2006d and 2006e).

#### *Strategies*

1. Provide additional accessible wildlife observation and photography facilities such as blinds,

observation platforms, trails, etc. at selected sites as lands are acquired within the Refuge.

2. Install spotting scope at Cane Ridge Wildlife Management Area observation platform.
3. Determine the feasibility of a canoe route along the Patoka River.

### **Objective 3.5: Interpretation**

Over the life of the plan, continue to provide guided tours and programs upon request and maintain monument on McClure Tract. Within 5 years of plan approval, provide interpretive elements in proposed kiosks and other selected sites and increase opportunities for interpreted trails, walks, and programs.

Rationale: Well-designed interpretive programs can be effective resource management tools that provide us an opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service and to influence visitor behavior when visiting units of the Refuge System. Interpretation is a priority general public use of the National Wildlife Refuge System, and Service policy directs us to provide interpretation programs when compatible (U. S. Fish and Wildlife Service 2006g).

#### *Strategies*

1. Evaluate interest and feasibility of developing an interpretive canoe/boating route along the Patoka River.
2. Place orientation kiosks at one or more of the following locations: Pikeville boat ramp, Survant boat ramp and Snakey Point.
3. Place kiosk and interpretive signs at Cane Ridge Wildlife Management Area.
4. Place interpretive signs at all observation sites.
5. Consider providing a visitor contact area within or adjoining the Refuge office to offer interpretive materials.

### **Objective 3.6: Environmental/Conservation Education**

Over the life of the plan, continue to provide environmental education upon request at the current level of less than 5 times per year. Within 3 years of plan approval, develop capacity to provide Environmental Education materials and programs to teachers and others upon request.

Rationale: Providing and promoting environmental education helps develop a citizenry that has the

awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our Nation's environmental resources. Environmental education is a priority general public use of the National Wildlife Refuge System, and Service policy directs us to provide environmental education programs when compatible (U. S. Fish and Wildlife Service 2006f).

#### *Strategies*

1. Offer teacher workshops to introduce educators to the Refuge, Refuge System and Service provided environmental education materials.
2. Provide opportunities for scouts and 4H students to complete conservation projects on the Refuge.
3. Maintain a supply or access to a source of environmental education materials for local teachers.

### **Objective 3.7: Friends and Volunteers**

Within 5 years of plan approval, establish a Friends group.

Rationale: A Refuge Friends Group is a grass-roots organization formed by citizens who have a shared vision of supporting their local National Wildlife Refuge. They join with Service personnel in a partnership that seeks to accomplish mutually defined goals. Establishing a Friends group helps build a constituency of support for the Refuge, provides people with opportunities to assist us in the accomplishment of our mission, enhances our performance through the creativity and innovations, labor, and expertise contributed by Friends members.

#### *Strategies*

1. Continue to work with Southwest Four Rivers Project Committee of the Upper Mississippi River Joint Venture.
2. Continue to maintain a working relationship with Evansville Audubon Society and the Izaak Walton League, Ducks Unlimited, Waterfowl USA, Quail Unlimited, and other organizations.
3. Continue to solicit support from the local community for special projects.

### **Objective 3.8: Outreach**

Over the life of the plan, continue to speak to local civic and sportsmen's groups upon request approximately 12-15 times per year. Also con-



*Canoeing the Patoka River, Patoka River NWR & MA.  
Photo credit: USFWS*

tinue to provide information and interviews for local news media and outdoors writers as well as distribute news releases 2-3 times annually. Within 5 years of CCP approval, explore opportunities to establish off-site facilities and opportunities.

***Rationale:*** The Service's National Outreach Strategy (U.S. Fish and Wildlife Service, 1997) defines outreach as two-way communication between the U.S. Fish and Wildlife Service and the public to establish mutual understanding, promote involvement, and influence attitudes and actions, with the goal of improving joint stewardship of our natural resources. Providing a clear consistent message about the role of the Refuge helps build support and understanding.

*Strategies*

1. Work with county tourism associations to help promote the Refuge.
2. Continue with active participation and communication throughout the watershed through media articles, meeting with elected officials, representatives or other organizations such as soil and water conservation districts to promote Refuge programs.