



U.S. Department of the Interior
Fish and Wildlife Service
Southeast Regional Office
1875 Century Boulevard
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Environmental Assessment

I. Purpose of and Need for Action

The purpose of the proposed action is to prepare and implement a Comprehensive Conservation Plan for Pond Creek National Wildlife Refuge. This plan will identify the role the refuge will play in support of the mission of the National Wildlife Refuge System, and provide guidance regarding its management direction and operations for the next 15 years (1999-2014). More specifically, the plan will identify the goals, objectives, and strategies necessary to conserve fish, wildlife and plant populations, including threatened and endangered species and related habitats on the refuge, and provide opportunities for the public to participate in compatible wildlife-dependent recreational uses.

Following the guidelines of the National Environmental Policy Act, the planning team identified issues and concerns by holding a public scoping meeting, identified a range of reasonable alternatives, evaluated the consequences of the alternatives, and chose the alternative (preferred alternative) which, in the opinion of the Service and the team, is the best approach to guide the refuge's future direction. These alternatives and their consequences are described in the following pages, and the persons who contributed to this environmental assessment are identified.

II. Issues and Concerns

Early in the process of developing this plan, the planning team identified a list of issues and concerns that was likely to be associated with the management of the new refuge. These preliminary issues and concerns were based upon the team members' knowledge of the area, contacts with citizens in the local community, and ideas already expressed to the refuge staff in previous public meetings that were held in January-March 1997, in conjunction with the development of interim regulations. More than 150 individuals attended these public meetings with their responses and concerns incorporated in refuge regulations where possible.

A scoping meeting was held on June 26, 1997, to provide the public with an opportunity to identify additional issues and concerns. Fifty-six persons attended the meeting. After a 15-minute presentation on the values of the refuge, the meeting participants were divided into six groups, with the group discussions facilitated by a consultant and planning team members. The comments of each group, following a predetermined format, were recorded on flip charts. These comments are summarized in Appendix A.

Using the information obtained, the team developed an abbreviated list of statements, reflecting major issues and concerns. While the summary statements, presented below, may not be identical to the original statements given by the public, the statements accurately reflect the intended meaning of the comments received.



White-throated sparrow

Photo by Nick Milam

Summary Statements

Wildlife and Habitat Management

- The refuge's wildlife populations are lower than desired.
- Recent timber management (loss of old-growth forests and conversion to pine) is negatively affecting the refuge's habitat and wildlife populations.
- Changes in local and regional water flows, such those caused by beaver, are causing destruction to wildlife habitat.

Wildlife-Dependent Recreation and Environmental Education

- Regulations are needed to provide continued access for hunting, fishing, and camping.
- Current access to the refuge should be maintained, with an increased accessibility for hunting and fishing.
- Roads and trails should be provided for all-terrain vehicles, hiking, horseback riding, and vehicle access.
- There are too few opportunities to observe wildlife from trails and roadways to minimize conflicts with hunting.
- There is a lack of education programs and facilities on the refuge for the public and for schools.

Community Involvement

- The community should be involved in making decisions about the refuge.
- There is a need for community involvement and assistance in implementing refuge programs
- There is a need for positive relationships between the refuge and the community.

Administrative

- The lack of information on wildlife diversity, populations, and habitat use hampers management.
- The lack of Service personnel close to the refuge limits staff from performing essential functions.

III. Alternatives

Description of the Alternatives

The planning team for Pond Creek refuge evaluated four alternatives for achieving the refuge vision. These alternatives are: Alternative 1, Custodial Management; Alternative 2, Minimal Management; Alternative 3, Balanced Management; and Alternative 4, Resource Management. Each alternative consists of a set of objectives which are reflections of the issues and concerns identified by the planning team and by participants at the public scoping meeting held in Horatio, Arkansas.

Tables 1-3 reflect how each of the alternatives address major issues and concerns. In other words, “What actions does the Service plan to take in response to these issues and concerns?” As the reader will note, while most alternatives are responsive to the issues and concerns, others provide little improvement in the actions to address identified needs.

After considering the responsiveness of the alternatives to the issues and concerns, the environmental consequences of the alternatives, and legal mandates for managing national wildlife refuges, it is the opinion of the planning team and the Service that Alternative 3, Balanced Management, is the preferred alternative and best achieves the desires and needs of the public. The Service will strive to accomplish the objectives set for the 15-year period, assuming that the necessary funding and staffing are available.

Table 1. Responsiveness of alternatives to wildlife and habitat management issues and concerns.

Issue or Concern	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
<i>The refuge's wildlife populations are lower than desired.</i>	No active wildlife management would occur.	On 2,000 acres, intensively manage to maintain habitat conditions for threatened and endangered species.	On 27,000 acres, intensively manage to enhance and maintain viable populations of waterfowl, migratory forest birds, threatened and endangered species and resident wildlife. Create and manage up to 1000 acres of wetland units to provide needed habitat for shore birds and wintering waterfowl.	On 27,000 acres, intensively manage to enhance and maintain maximum populations of waterfowl, migratory nongame birds, threatened and endangered species and resident wildlife. Provide up to 2,000 acres of wetland units for wintering and other seasonal habitat for waterfowl and migratory nongame birds.
<i>Recent timber management (loss of old growth and conversion to pine) is negatively affecting habitat and wildlife populations.</i>	No habitat management would occur. “Let nature take its course.”	No active management would occur on 25,000 acres. “Let nature take its course.”	Six thousand acres of pine plantation would be liquidated as they mature and replanted with hardwoods. Habitat management would be conducted refuge wide to achieve viable wildlife populations.	By 2001, convert 6,000 acres of pines to native bottomland hardwood forests. Intensive habitat management would be conducted refuge wide to achieve maximum wildlife populations.
<i>Changes in local and regional water flows, such as those caused by beaver, are causing destruction to wildlife habitat.</i>	No hydrological restoration or beaver control would occur. “Let nature take its course.”	Hydrology improvements would consist only of those associated with maintenance of 6-8 miles of roads. Beaver control activity/removal of dams would implemented only along these roads.	Restore/manage hydro logic regime to maintain native bottomland hardwood forest ecosystem refuge wide. Improve drainage at all stream road crossings. Implement beaver control and remove dams as needed.	Hydrology on refuge lands would be restored to the extent possible (by 2001) through reconstruction of stream road crossings, removing some roads, etc. Control beaver through extensive use of contract trappers and remove all dams impacting timber.

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Table 2. Responsiveness of alternatives to wildlife-dependent recreation and environmental education issues and concerns.

Issue or Concern	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
<i>Regulations are needed to provide continued access for hunting, fishing, trapping and camping.</i>	Public use activities would not be permitted. There would be a minimum amount of law enforcement.	Hunting would be allowed for wildlife population control only; user opportunities very limited. Fishing would be limited to waters accessible by boat from Little River and along roads open to public use. Refuge seasonally closed to entry (Dec. - Feb.). Camping would be permitted only during scheduled hunts.	Provide quality hunting and fishing at optimal levels. Most waters would be open to fishing year-round. Camping would be provided in designated sites to support all wildlife-dependent recreation.	Hunting would be allowed only to meet wildlife population goals; user opportunities would be very limited. Fishing would be limited to waters accessible by boat from Little River or from roads open to public use. Camping would be permitted only during scheduled hunts.
<i>Current access to the refuge should be maintained, with an increased accessibility for hunting and fishing on the refuge.</i>	Refuge would be closed to all public access.	No new access facilities. Access via 6-8 miles of designated roads open to year-round use. About 17-18 additional miles of roads would be opened only during hunts. Fishing same as above. Rookery sites would be closed to public entry year-round. All-terrain vehicle use would be totally prohibited.	Provide optimum access via a system of roads and trails (current level open to public use includes 25 miles of roads and 15 miles of all-terrain vehicle trails). Establish boat ramps and provide access to most refuge waters. Rookery sites would be closed only if necessary due to disturbance.	Fishing access would be limited to waters accessible from 15 miles of roads and access by boat from Little River. All-terrain vehicles would be permitted on 5-8 miles of designated trails only during scheduled hunts.
<i>Roads and trails should be provided for all-terrain vehicles, hiking, horseback riding and vehicle access.</i>	Refuge would be closed to all public access.	Six to eight miles of roads would be open to public use. All-terrain vehicle use would be prohibited. All roads would be seasonally closed. User opportunities would be very limited.	Twenty-five miles of roads would be open year-round. Fifteen miles of all-terrain vehicle trails would be open during hunting season. Trail head parking areas would be developed. Three to five miles of roads would be open year-round for fishing access. Use of horses for wildlife-dependent activities would be allowed on roads and trails open to public use.	Activities would use 15 miles of existing roads. All-terrain vehicle use would be permitted on 5-8 miles of trails only during designated hunts. Parking at all-terrain vehicle and foot trailheads would be provided.
<i>There are too few opportunities to observe wildlife from trails and roadways to minimize conflicts with hunting. Refuge closed to all public access.</i>	Refuge would be closed to all public access. There would be no opportunities for wildlife observation.	Opportunities would be provided only along 6-8 miles of roads open to use. All roads would be seasonally closed. Interpretive trails would not be provided. Camping would not be permitted.	Observation opportunities would be open year-round along 25 miles of roads. Wildlife observation and photo sites would be selectively developed. Float trails and foot trails would be developed. Platforms and blinds for wildlife observation would be developed.	Foot trails and an auto tour route will be self-guided and opened seasonally. Wildlife observation opportunities would be available along 15 miles of road opened to year-round use.
<i>There is a lack of educational programs and facilities on the refuge for the public and for schools.</i>	There would be no education programs or facilities.	There would be no facilities developed. Only hunting and fishing brochures would be published.	An environmental education program with local schools and other groups would be developed. Self-guided trails and tour routes would be developed.	Teacher assistance would be provided. Brochures and kiosks would be developed. In-classroom presentations would be developed as workload and staffing permit.

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Table 3. Responsiveness of alternatives to community involvement issues and concerns.

Issue or Concern	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
<i>The community should be involved in making decisions about the refuge.</i>	No partnerships would be established.	No partnerships would be established.	Enhance ecological well being and environmental awareness through partnerships with neighbors, organizations and groups.	Partnerships (\$\$, expertise) with organizations interested in habitat improvement would be established.
<i>There is a need for community involvement and assistance in implementing refuge programs.</i>	No partnerships would be established.	No partnerships would be established.	Enhance ecological well being and environmental awareness through partnerships with neighbors, organizations and groups. Partners for Wildlife Program would be implemented.	Partnerships (\$\$, expertise) with organizations interested in habitat improvement would be established. Partners for Wildlife Program with adjacent landowners would be implemented.
<i>There is a need for positive relationships between the refuge and the community.</i>	A beaver damage report system for neighboring landowners would be established. Access for land in-holders would be provided.	Respond to issues and concerns of adjacent land owners and land in-holders. Technical information for beaver dam removal would be provided.	Enhance ecological well being and environmental awareness through partnerships with neighbors, organizations and groups. Beaver dams on refuge land impacting adjacent landowners would be removed.	Partnerships (\$\$, expertise) with organizations interested in habitat improvement would be established. Technical assistance to implement WRP/CRP programs in the surrounding counties would be provided.

Listed below are the objectives for each alternative and a description summarizing these objectives. A comparison of the alternatives by management goals can be found in Table 4. The staffing, operational and one-time project costs can be found in Table 5.

Alternative 1. Custodial Management (No Action Alternative)

Under this alternative, all lands within the approved 30,500-acre acquisition boundary would be purchased. No action would be taken to implement an active management and recreational use program (virtually all recreation uses would be eliminated); nature would simply be allowed to take its course. The refuge’s wildlife habitats would be protected only by virtue of ownership by the Service. Minimal law enforcement activities would occur to enforce regulations. Access to private property within the refuge boundary would be permitted, and meetings would be held with neighboring landowners to explain easement and access procedures. The neighboring landowners would also be provided with procedures for reporting flooding problems caused by beaver.

Goal 1. Habitat Management

Objectives:

1. Protect 27,300 acres of refuge land and water through ownership by the Service. Ownership by the Service eliminates threats such as additional conversion of hardwoods to monoculture pine plantations and construction of additional roads through wetlands.
2. Allow nature to take its course - “natural succession.” Management actions to maintain or enhance habitat conditions would not be implemented.

Goal 2. Populations Management

Objective:

1. Provide complete protection to all species of wildlife and fish that utilize the area through closure to all public use and implementation of law enforcement activities.

Goal 3. Land Conservation

Objectives:

1. Complete the purchase of lands in approved acquisition boundary.
2. Protect existing cultural resources from disturbance.
3. Partnerships - No action
4. Land in-holders - Allow permitted access to landowners; hold meetings to explain easement and access procedures.
5. Neighbors - Establish damage reporting procedures.

Goal 4. Wildlife-Dependent Recreation and Environmental Education

Objective:

1. Provide minimal law enforcement for refuge resource protection
2. Public use activities would not be permitted.

Alternative 2. Minimal Management

Under this alternative, no management actions would be taken on more than 90 percent (approximately 25,000 acres) of the refuge. Throughout this part of the refuge, the approach would be simply to let nature take its course. Any management actions taken would be limited to those that protect threatened and endangered species. Minimal improvement in hydrology would be associated with routine maintenance activities on a few refuge roads.

Hunting and trapping would be allowed only as necessary to control wildlife population levels. Public access would be limited to only the level necessary to achieve the wildlife population goals. Fishing would be permitted only on waters accessible by boat from the Little River and the limited number of primary gravel roads. The entire refuge would be closed seasonally to provide maximum wildlife protection. Management would respond to the concerns of adjacent landowners by providing technical information and access as needed for them to remove beaver dams impacting their property. No efforts would be made to establish partnerships with the local community.

Goal 1. Habitat Management

Objectives:

1. Implement limited habitat management actions for threatened and endangered species on approximately 2,000 acres. These actions include such things as water management, removal of beaver dams impacting critical habitat areas and, on occasion, limited forest management actions.
2. Water flow improvements would be associated with the long-term maintenance of 25 percent of the existing road system (approximately 6 - 8 miles); no other improvements would be accomplished.
3. On 25,000 acres of refuge lands, let "nature take its course;" no active habitat management would be implemented.

Goal 2. Populations Management

Objectives:

1. Utilize wildlife-dependent recreation use programs to maintain wildlife population levels of game species within carrying capacity. Implement hunting activities only as needed to achieve this objective.
2. Develop waterfowl sanctuary areas that would be closed to public use. This would include all known sites traditionally receiving high levels of waterfowl use.
3. Protect colonial bird nesting sites by closing these areas to all public use.
4. Manage beaver populations only as needed to meet threatened and endangered species requirements or where beaver on refuge property directly impact adjacent landowners.

Goal 3. Land Conservation

Objectives:

1. Complete purchase of lands in the approved acquisition boundary.
2. Protect existing cultural resources from disturbance.
3. Partnerships - No action.
4. Respond to concerns of adjacent landowners and inholding owners by providing technical information and access as needed for them to access their property, remove beaver dams affecting their property, etc.

Goal 4. Wildlife-Dependent Recreation and Environmental Education

Objectives:

1. Hunting opportunities would be provided only as needed to maintain population levels of resident game species (deer, raccoon) within carrying capacity levels.
2. Fishing opportunities would be provided through opening those waters directly accessible by boat from Little River or from the limited number of gravel roads open for public use.
3. Opportunities for wildlife observation, photography, and environmental education and interpretation would be limited to those areas accessible through that part of the existing refuge road system left open to year-round public use - about 6-8 miles. Public use developments such as interpretive trails and trail head parking areas would not be provided.
4. Provide public access as needed to support hunts essential for population control. During scheduled hunts only, approximately 25 miles of roads would be opened for use; otherwise, all vehicle access would be restricted to about 6 - 8 miles of road. The refuge would be closed seasonally (December - February) to provide maximum protection for waterfowl. All-terrain vehicle trails would not be provided; camping would be allowed only during scheduled hunts.

Alternative 3. Balanced Management (Preferred Alternative)

Under this alternative, 27,000 acres of refuge lands would be protected, maintained, and enhanced for resident wildlife, waterfowl, migratory nongame birds, and threatened and endangered species. Extensive wildlife and plant census/inventory activities would be initiated to develop the baseline biological information needed to implement management programs on this recently established refuge. Active habitat management would be implemented through actions such as forest management and waterfowl impoundments to achieve refuge plan objectives and to correct deficiencies resulting from years of commercial forest management. All pine plantations would be converted to native bottomland hardwoods as they become merchantable through cutting and replanting. The hydrology in the pine plantations would be restored by plugging the canals and "V" ditches that were constructed by the previous owners. In addition, the main or primary gravel roads would be maintained and upgraded for access and to improve water flows at stream crossings. Secondary roads that impede water flows would be removed if not needed for management or public access, and the stream crossings of those left in place would be improved to enhance water flows. The refuge staff would implement an active beaver control program and provide direct assistance to adjacent landowners where beaver dams on refuge property are impacting private property.

High quality wildlife-dependent recreation activities (hunting, fishing, wildlife observation) and environmental education opportunities would be provided. Access to support wildlife-dependent recreation would be provided at a level that does not exceed wildlife capability to tolerate human disturbance. Quality hunting and fishing opportunities would be provided, consistent with sound biological principles. Fishing would be allowed in most refuge waters. Opportunities for camping, all-terrain vehicle trails, and hiking would be provided to support wildlife-dependent recreation to the extent that these opportunities do not significantly interfere or detract from the achievement of wildlife conservation. Partnerships would be developed with landowners, organizations, and private firms to improve environmental awareness through education programs, and to achieve wildlife habitat and wildlife-dependent recreation objectives.

Goal 1. Habitat Management

Objectives:

1. Manage 27,000 acres of refuge forests and waters to maintain viable populations of native flora and fauna consistent with sound biological principles and other objectives of this plan.
2. Maintain and manage approximately 20,000 acres of existing bottomland hardwood forests for a diversity of wildlife species, particularly waterfowl, wading birds, and migratory forest birds.
3. Restore approximately 6,000 acres of bottomland hardwood forests and manage for a diversity of wildlife species particularly waterfowl, wading birds, and migratory birds.
4. Create and manage up to 1,000 acres of wetland units (e.g., moist soil, agriculture fields) to provide needed habitat for shorebirds and wintering waterfowl.

Goal 2. Populations Management

Objectives:

1. Maintain and/or enhance conditions (habitat, nesting areas, protection zones) as needed to meet the needs of threatened and endangered species.
2. Protect colonial bird nesting sites by minimizing disturbance due to human activity.
3. Manage waterfowl populations in accordance with the North American Waterfowl Management Plan, focusing on target dabbler species including mallard, pintail, black duck, wood duck, and gadwall.
4. Manage for neotropical migratory birds, shorebirds and other nongame migratory birds.
5. Manage for resident wildlife species (e.g., white-tailed deer, turkey, raccoon, squirrel).
6. Manage furbearer populations to achieve habitat management objectives and stable relationships among flora and fauna.

Goal 3. Land Conservation

Objectives:

1. Purchase the remaining 3,500 acres of land within the acquisition boundary.
2. Protect existing cultural resources from disturbance or from inadvertent damage that could occur as a result of refuge activities.
3. Establish partnerships with organizations interested in habitat management and recreational opportunities (Audubon Society, Ducks Unlimited, Wild Turkey Federation, The Nature Conservancy, etc.).
4. Establish partnerships with landowners inside and adjacent to the refuge to participate in habitat and populations management activities. Implement Partners for Wildlife Program with adjacent landowners.
5. Provide assistance to agencies of the Department of Agriculture in delivery of various private lands programs such as WRP, CRP, WHIP, and EQUIP, emphasizing wetland and wildlife habitat restoration.

Goal 4. Wildlife-Dependent Recreation and Environmental Education

Objectives:

1. Provide high quality hunting opportunities consistent with sound biological principles. Open refuge lands to hunting of upland game, big game, small game, and waterfowl consistent with other plan objectives.
2. Provide high quality fishing opportunities consistent with sound biological principles. Most waters open to fishing year-round. Three to five miles of all-terrain vehicle trails would be open year-round for fishing access to remote locations. Establish boat ramps.
3. Provide opportunities for wildlife observation, photography, environmental education and interpretation. Develop self-guided interpretive trails, platforms and blinds for wildlife observation. Observation opportunities open year-round along 25 miles of road.
4. Provide access to support wildlife-dependent recreation activities while limiting disturbance to wildlife and its habitat. About twenty-five miles of road would be open year-round. Roughly fifteen miles of all-terrain vehicle trails would be open during the hunting season. Camping would be provided in designated sites to support all wildlife-dependent recreation.

Alternative 4. Resource Management

This alternative would intensively manage 27,300 acres of refuge land to maximize wildlife populations. Additional emphasis would be placed on the development of high quality habitat for waterfowl, nongame birds, and threatened and endangered species. Special efforts would be made to accelerate (within 3 years) the conversion of pine plantations to native hardwoods and restore the refuge's hydrology.

Hunting and trapping would be allowed on the basis of wildlife population control only. Limited camping would be permitted only to support the hunting being allowed. Public access would be provided only to support management and recreation programs. Fishing would be permitted in waters accessible by boat from the Little River and from a few main gravel roads. Only moderately developed wildlife observation opportunities would be provided, and educational opportunities would be minimal.

Partnerships would be established only with organizations interested in habitat improvement. Expertise and funding through Partners for Wildlife projects would be provided to landowners for habitat improvements. The refuge staff would implement an active beaver control program on all refuge lands and remove beaver dams that impact live hardwood trees and adjacent private lands.

Goal 1. Habitat Management

Objectives:

1. Intensively manage 27,000 acres of refuge lands to maximize wildlife populations with special emphasis on habitat needs of migratory birds and listed species as the primary consideration.
2. Provide up to 2,000 acres of development units (moist soil units, agricultural areas and greentree reservoirs) for wintering and other seasonal habitat for waterfowl and migratory nongame birds. Acreage dedicated to this type management is expected to increase across time as bird population levels increase.
3. Enhance conditions suitable to meet the needs of threatened and endangered species such as developing water management capability on areas receiving alligator or bald eagle use.
4. Immediately (by 2001) implement hydrologic and hardwood restoration to convert 6,000 acres of pine plantations to native bottomland hardwood forests.
5. Immediately (by 2001) restore the hydrologic regime to maintain native bottomland hardwood forest ecosystem.

Goal 2. Populations Management

Objectives:

1. Implement inventory and in-depth research activities to determine population status and species specific habitat needs/ limiting factors for all listed species, candidate species, and migratory nongame birds.
2. Develop management programs (forest management, water management) designed to eliminate all limiting factors inhibiting maximizing migratory bird and listed species population levels.
3. Close all colonial bird nesting sites to public use.
4. Close the refuge to all public entry during peak waterfowl wintering period (December - February).
5. Maintain wildlife populations at maximum sustainable levels consistent with other objectives of this goal and plan.
6. Through extensive use of contract trappers on a year-round basis, maintain beaver population at levels where no new beaver impoundments are being found.

Goal 3. Land Conservation

Objectives:

1. Land Acquisition - purchase the remaining 3,500 acres of lands within the acquisition boundary on a willing seller basis.
2. Protect existing cultural resources from disturbance or from inadvertent damage that could occur as a result of refuge activities.
3. Aggressively implement Partners for Wildlife programs with adjacent landowners; provide technical assistance as needed to Natural Resource Conservation Service for implementation of WRP/CRP programs within surrounding counties.
4. Through dynamic partnerships with other federal, state and community agencies and organizations, fulfill the goals and vision of the refuge. Through partnerships with neighboring landowners, organizations and groups, work to enhance ecological well-being and environmental awareness.

Goal 4. Wildlife-Dependent Recreation and Environmental Education

Objectives:

1. Hunting opportunities would be provided at levels sufficient to maintain resident game species population levels within carrying capacity or at levels where game/furbearer animal numbers do not interfere with/impact migratory bird utilization.
2. Provide fishing opportunities through opening those waters directly accessible by boat from Little River or from the limited number of gravel roads open for public use.
3. Opportunities for wildlife photography, observation, and interpretation would be provided through that part of the existing road system left open to year-round public use - approximately 15 miles. Public use developments would be provided only at levels necessary to meet minimum levels (based upon demand). Minimum educational activities would be provided through classroom presentations as staff workloads permit.
4. Provide access as needed to support public use and management programs. During scheduled hunts, approximately 25 miles of gravel road, 5 - 8 miles of all-terrain vehicle trails would be open; otherwise, all vehicle access would be restricted to about 15 miles of road and all-terrain vehicles prohibited. Camping would be allowed only during scheduled hunts.

Alternative Considered but Rejected

An alternative entitled, "Recreation Management," proposed and considered by the planning team would provide maximum recreational user opportunities. Hunting, trapping, and fishing opportunities would be provided to the maximum extent possible within state guidelines. To maximize these opportunities, considerations pertaining to quality of the visit and wildlife population levels of target species must be omitted. This alternative, however, conflicts with the Service's policy and compatibility standards regarding recreational use programs on national wildlife refuges. These policies and standards require that quality of visit (8RM1.3) and biological soundness (8RM5.3B) must be considered in the development of all public use programs. If biological soundness of the program (consumptive use programs designed to maintain optimum wildlife population levels) cannot be achieved, then the use must be viewed as incompatible. Therefore, this alternative was rejected.

Table 4. Alternatives by management goals

Habitat Management			
<i>Alternative 1 Custodial Management</i>	<i>Alternative 2 Minimal Management</i>	<i>Alternative 3 Balanced Management</i>	<i>Alternative 4 Resource Management</i>
<ul style="list-style-type: none"> ■ Protect 27,300 acres of refuge land and water through ownership by the Service. Ownership eliminates threats such as additional conversion of hardwoods to monoculture pine plantations and construction of additional roads through wetlands. ■ Allow nature to take its course - "natural succession." Management actions to maintain or enhance habitat conditions will not be implemented. 	<ul style="list-style-type: none"> ■ Implement limited habitat management actions for threatened and endangered species on approximately 2,000 acres. These actions include such things as water management, removal of beaver dams impacting critical habitat areas and, on occasion, limited forest management actions. ■ Water flow improvements would be associated with the long-term maintenance of 25 percent of the existing road system (approximately 6 - 8 miles); no other improvements would be accomplished. ■ On 25,000 acres of refuge lands, let "nature take its course;" no active habitat management would be implemented. 	<ul style="list-style-type: none"> ■ Manage 27,000 acres of refuge forests and waters to maintain viable populations of native flora and fauna consistent with sound biological principles and other objectives of this plan. ■ Maintain and manage approximately 20,000 acres of existing bottomland hardwood forest for a diversity of wildlife species, particularly waterfowl, wading birds, and migratory forest birds. ■ Restore approximately 6,000 acres of bottomland hardwood forests and manage for a diversity of wildlife species particularly waterfowl, wading birds, and migratory birds. ■ Create and manage up to 1,000 acres of wetland units (e.g., moist soil, agriculture fields) to provide needed habitat for shorebirds and wintering waterfowl. 	<ul style="list-style-type: none"> ■ Intensively manage 27,000 acres of refuge lands to maximize wildlife populations, with special emphasis on habitat needs of migratory birds and listed species as the primary consideration. ■ Enhance conditions suitable to meet the needs of threatened and endangered species such as developing water management capability on areas receiving alligator or bald eagle use. ■ Immediately (by 2001) implement hydrologic and hardwood restoration to convert 6,000 acres of pine plantations to native bottomland hardwood forests. ■ Immediately (by 2001) restore the hydrologic regime to maintain a native bottomland hardwood forest ecosystem. ■ Provide up to 2,000 acres of wetland units (moist soil units, agricultural areas and greentree reservoirs) for wintering and other seasonal habitat for waterfowl and migratory nongame birds. Acreage dedicated to this type management is expected to increase across time as bird population levels increase.

Table 4. Alternatives by management goals (continued)

Populations Management			
<i>Alternative 1 Custodial Management</i>	<i>Alternative 2 Minimal Management</i>	<i>Alternative 3 Balanced Management</i>	<i>Alternative 4 Resource Management</i>
<ul style="list-style-type: none"> ■ Provide complete protection to all species of wildlife and fish that utilize the area through closure to all public use and implementation of law enforcement activities. 	<ul style="list-style-type: none"> ■ Utilize wildlife-dependent recreation use programs to maintain wildlife population levels of game species within carrying capacity. Implement hunting activities only as needed to achieve this objective. ■ Develop waterfowl sanctuary areas closed to all public use that includes all known sites traditionally receiving high levels of waterfowl use. ■ Protect colonial bird nesting sites by closing these areas to all public use. ■ Manage beaver populations only as needed to meet threatened and endangered species requirements or where beaver on refuge property directly impacts adjacent landowners. 	<ul style="list-style-type: none"> ■ Maintain and/or enhance conditions (habitat, nesting areas, protection zones) as needed to meet the needs of threatened and endangered species. ■ Protect colonial bird nesting sites by minimizing disturbance due to human activity. ■ Manage waterfowl populations in accordance with the North American Waterfowl Management Plan, focusing on target dabbling species including mallard, pintail, black duck, wood duck, and gadwall. ■ Manage for neotropical migratory birds, shorebirds and other nongame migratory birds. ■ Manage for resident wildlife species (e.g., white-tailed deer, turkey, raccoon, squirrel). ■ Manage furbearer populations to achieve habitat management objectives and stable relationships among flora and fauna. 	<ul style="list-style-type: none"> ■ Implement inventory and in-depth research activities to determine population status and species specific habitat needs/limiting factors for all listed species, candidate species, and migratory nongame birds. ■ Develop management programs (forest management, water management) designed to eliminate all limiting factors inhibiting maximizing migratory bird and listed species population levels. ■ Close all colonial bird nesting sites to public use. ■ Close the refuge to all public entry during peak waterfowl wintering period (December - February). ■ Maintain wildlife populations at maximum sustainable levels consistent with other objectives of this goal and plan. ■ Through extensive use of contract trappers on a year-round basis, maintain beaver population at levels where no new beaver impoundments are being found.

Table 4. Alternatives by management goals (continued)

Land Conservation			
<i>Alternative 1 Custodial Management</i>	<i>Alternative 2 Minimal Management</i>	<i>Alternative 3 Balanced Management</i>	<i>Alternative 4 Resource Management</i>
<ul style="list-style-type: none"> ■ Complete the purchase of lands in approved acquisition boundary. ■ Protect existing cultural resources from disturbance. ■ No partnerships would be established. ■ Allow permitted access to land in-holders; hold meetings to explain easement and access procedures. ■ Establish damage reporting procedures for neighboring landowners. 	<ul style="list-style-type: none"> ■ Complete purchase of lands in the approved acquisition boundary on a willing seller basis. ■ Protect existing cultural resources from disturbance. ■ No partnerships would be established. ■ Respond to concerns of adjacent landowners and inholding owners by providing technical information and access as needed; remove beaver dams affecting their property, etc. 	<ul style="list-style-type: none"> ■ Purchase the remaining 3,500 acres of land within the acquisition boundary on a willing seller basis. ■ Protect existing cultural resources from disturbance or from inadvertent damage that could occur as a result of refuge activities. ■ Establish partnerships with organizations interested in habitat management and recreational opportunities (Audubon Society, Ducks Unlimited, Wild Turkey Federation, The Nature Conservancy, etc.). ■ Establish partnerships with landowners inside and adjacent to the refuge to participate in habitat and populations management activities. Implement Partners for Wildlife Program with adjacent landowners. ■ Through dynamic partnerships with other federal, state and community agencies and organizations, fulfill the goals and vision of the refuge. 	<ul style="list-style-type: none"> ■ Land Acquisition - purchase the remaining 3,500 acres of lands within the acquisition boundary on a willing seller basis. ■ Protect existing cultural resources from disturbance or from inadvertent damage that could occur as a result of refuge activities. ■ Aggressively implement Partners for Wildlife programs with adjacent landowners; provide technical assistance as needed to implement Natural Resource Conservation Service's WRP/CRP programs within surrounding counties. ■ Through partnerships with neighboring landowners, organizations and groups, work to enhance ecological well-being and environmental awareness.

Table 4. Alternatives by management goals *(continued)*

Wildlife-Dependent Recreation and Environmental Education			
<i>Alternative 1 Custodial Management</i>	<i>Alternative 2 Minimal Management</i>	<i>Alternative 3 Balanced Management</i>	<i>Alternative 4 Resource Management</i>
<ul style="list-style-type: none"> ■ Provide minimal law enforcement for refuge resource protection. ■ Public use activities would not be permitted. 	<ul style="list-style-type: none"> ■ Hunting opportunities would be provided only as needed to maintain population levels of resident game species (deer, raccoon) within carrying capacity levels. ■ Fishing opportunities would be provided through opening those waters directly accessible by boat from Little River or from the limited number of gravel roads open for public use. ■ Opportunities for wildlife observation, photography, and environmental education and interpretation would be limited to those areas accessible through that part of the existing refuge road system left open to year round public use - about 6-8 miles. Public use developments such as interpretive trails and trail head parking areas would not be provided. Rookery sites would be closed to public entry. ■ Provide public access as needed to support hunts essential for population control. During scheduled hunts only, approximately 25 miles of roads would be opened for use; otherwise, all vehicle access would be restricted to about 6 - 8 miles of roads. The refuge would be closed seasonally (December - February) to provide maximum protection for waterfowl. All-terrain vehicle use would be prohibited; camping would be allowed only during scheduled hunts. 	<ul style="list-style-type: none"> ■ Provide high quality hunting opportunities consistent with sound biological principles. Open refuge lands to hunting of upland game, big game, small game, and waterfowl consistent plan objectives. ■ Provide high quality fishing opportunities consistent with sound biological principles. Most waters open to fishing year-round. Three to five miles of all-terrain vehicle trails would be open year-round for fishing access to remote locations. Establish boat ramps. ■ Provide opportunities for wildlife observation, photography, and environmental education and interpretation. Develop self-guided interpretive trails, platforms and blinds for wildlife observation. Observation opportunities open year-round along 28 miles of roads. Develop an environmental education program with local schools and other groups. ■ Provide access to support wildlife-dependent recreation activities while limiting disturbance to wildlife and its habitat. About 28 miles of roads would be open year-round. Roughly 18 miles of all-terrain vehicle trails would be open during the hunting season. Camping would be provided in designated sites to support all wildlife-dependent recreation. 	<ul style="list-style-type: none"> ■ Hunting opportunities would be provided at levels sufficient to maintain resident game species population levels within carrying capacity or at levels where game/furbearer animal numbers do not interfere with/impact migratory bird utilization. ■ Provide fishing opportunities by opening those waters directly accessible by boat from Little River or from the 15 miles of gravel roads open for public use. ■ Opportunities for wildlife photography, observation, and interpretation would be provided through that part of the existing road system left open to year-round public use - approximately 15 miles. Public use developments would be provided only at levels necessary to meet minimum levels (based upon demand). Minimum educational activities would be provided through teacher assistance and classroom presentations, as staff work loads permit. ■ Provide access as needed to support public use and management programs. During scheduled hunts, approximately 25 miles of gravel roads, and 5 - 8 miles of all-terrain vehicle trails would be open; otherwise, all vehicle access would be restricted to about 15 miles of roads and all-terrain vehicles would be prohibited. Camping would be allowed only during scheduled hunts.

Environmental Assessment

Table 5. Staffing, operational, and one-time project costs for the alternatives

Wildlife-Dependent Recreation and Environmental Education

<i>Cost Category</i>	<i>Alternative 1 Custodial Management</i>	<i>Alternative 2 Minimal Management</i>	<i>Alternative 3 Balanced Management</i>	<i>Alternative 4 Resource Management</i>
Annual Staffing/cost	1 staff \$50,000	3 staff \$150,000	10 staff \$482,000	13 staff \$630,000
Annual Operations	\$10,000	\$40,000	\$305,000	\$450,000
One-time Project	0	\$4,500,000	\$13,150,000	\$18,500,000
Total Costs	\$60,000	\$4,690,000	\$13,937,000	\$19,580,000

IV. Affected Environment

Physical Environment

Climate

The refuge is located in the humid subtropical zone. The climate is controlled by two principal air masses such as warm, moist air from the Gulf of Mexico, which generally dominates in the spring and summer, and cooler, drier air from the Central Plains, which makes itself felt in winter (Stroud and Hansen 1981). Extended hot, sultry summers and moderately cool winters are normal. The summers typically have 85 days with highs

greater than 90 degrees Fahrenheit. The winters are marked by brief cold periods with little snow. Average winter highs are in the mid-50s and average summer highs are in the low 90s. The mean January low does not fall below freezing. This leads to a relatively long growing season of 220 days (Skiles n.d.).

The average annual precipitation is 50 inches. Rainfall is well distributed throughout the year, ranging from 3-4 inches per month from June through November, and 4-6 inches per month from December through May (Smith 1989). The average annual runoff in the watershed is 18-20 inches, with most of it occurring from December to April. Evaporation exceeds

precipitation in the summer months (Skiles n.d.). These climatic values play an important role in influencing the area's hydrologic regime, which subsequently shapes ecosystem processes and functions.

Physiography and Geology

Physiographically, the refuge is located on the upper West Gulf Coastal Plain under the Bailey ecoregion classification system (USDA Forest Service Publication 1995). Much of the geology is recent (Holocene and Pleistocene) alluvium derived from Coastal Plain Cretaceous parent material and outwash from the Ouachita Mountains, including extensive calcareous deposits in association with the usual noncalcareous material typical of the Coastal Plain. This alluvium, which forms the channels of the Cossatot and Little rivers and associated terraces and meander scars, has been sorted, reworked, and deposited many times by riverine processes. The rest of the area located between the Little and Cossatot rivers contains Upper Cretaceous Woodbine and Tokio formations formed by silt and clay deposition into shallow ocean water 135 million years ago (U.S. Geological Survey 1996).

This forested wetland has a relatively narrow topographic relief, with a difference of only 30 feet between the lowest point at the mouth of the Cossatot River (elevation 260 feet above mean sea level), and the furthest point seven miles upstream on Pond Creek. Although relatively flat, this topography is complex with numerous stream and river channels, small tributaries and depressions, old river meanders and oxbow lakes, multiple river terraces in various stages of erosion and deposition, and adjacent poorly drained flats. The subtle but complex topography has a dramatic effect on the biotic communities that have evolved here.



Bottomland hardwood wetlands

USFWS Photo

Soils

The soils provide further evidence of the complexity of the Pond Creek system. The majority of the soils are hydric and form two broad series of soil groups.

The Guyton-Sardis soil series group consists of deep, usually level, poorly drained loams and silty loams formed from alluvium on floodplains and terraces. These soils are often sorted by particle size, creating clay lenses and perched water tables as well as restricted areas of well-drained deep sands. This series group is also associated with more recent alluvium and riverine deposits (U.S. Soil Conservation Service 1984).

The Smithdale-Sacul-Savanna-Saffel soil series group contains deep, moderately well drained, and well drained loamy soils formed in loamy and clayey deposits from marine sediments. These soils date from older Cretaceous age sediments with some input of clay size particles during recent (Holocene) flood events (U.S. Soil Conservation Service 1974, 1984).

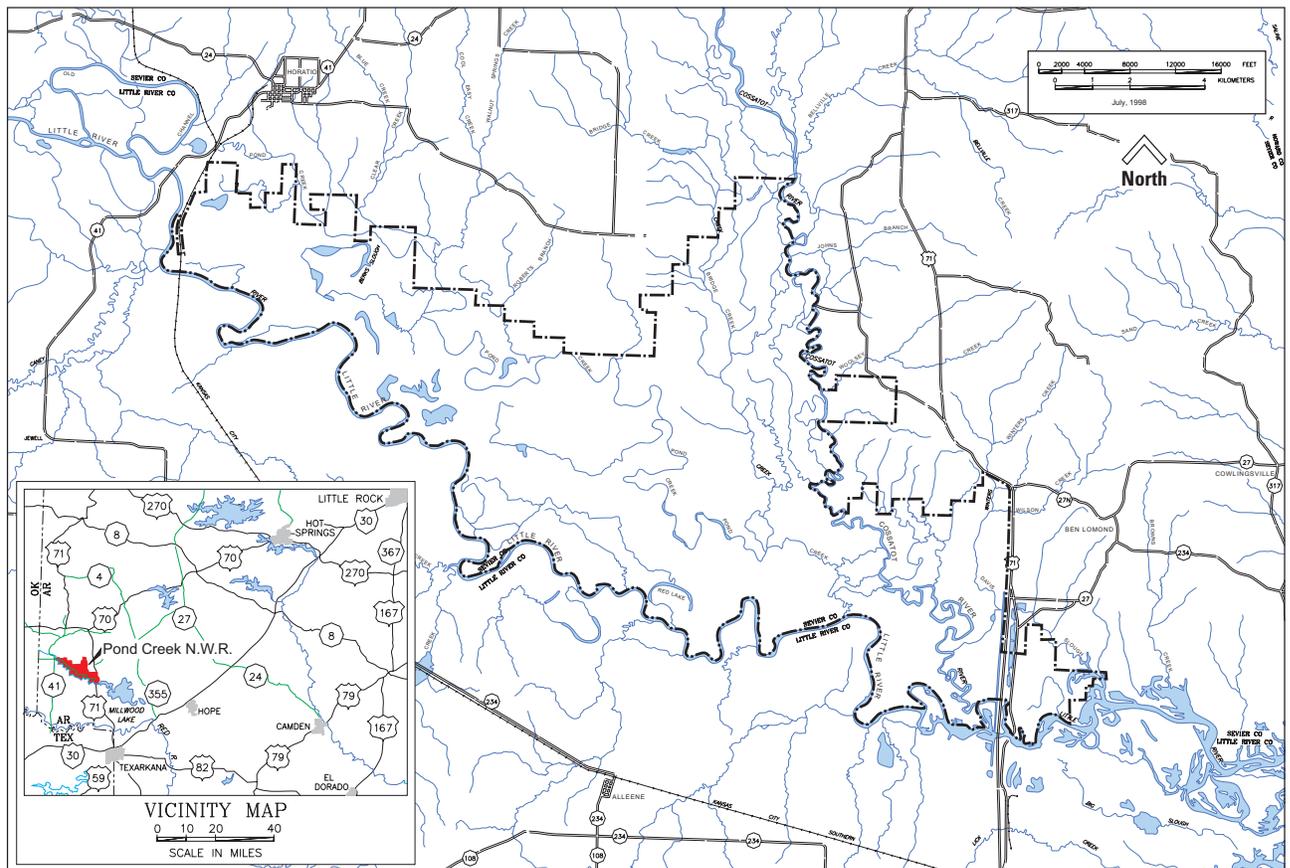
Both groups of soils are rich and fertile and support a diverse bottomland hardwood forest cover. They are subject to a low erosion hazard and have high capability to recover after disturbance.

Hydrology

The refuge is located on the floodplain and overflow bottoms formed at the junction of the Little and Cossatot rivers upstream from Millwood Lake. Generally, the Little River forms the southern boundary of the refuge and the Cossatot River forms the eastern boundary (Figure 1).

The refuge's northern boundary follows the Woodbine escarpment, a

Figure 1. Hydrology of Pond Creek National Wildlife Refuge





Oxbow Lake

Photo © Weyerhaeuser Company

relatively low rise that separates the bottoms from the uplands. Pond Creek runs through the middle of the refuge, with approximately half of its watershed within the refuge and many of its south-flowing tributaries reaching into the uplands directly north. Open water covers about 2 percent of the refuge. Virtually all of the refuge (elevation below 290 feet) is part of the Millwood Lake floodpool, with the flowage easement held by the U.S. Army Corps of Engineers.

From its headwaters in the Ouachita Mountains, the Little River system drains a 3,450-square-mile watershed in southeast Oklahoma and southwest Arkansas (U.S. Geological Survey

1978). The Little River and its tributaries support a high quality, biologically diverse system, with portions of the river in Arkansas and Oklahoma designated “wild and scenic,” “high quality water,” “ecologically sensitive waterbody,” and “outstanding resource water.” Many of the Little River’s tributaries, including the Cossatot River, have similar designations. Within the refuge, the State of Arkansas has designated the Little River as an “Ecologically Sensitive Waterbody” (Arkansas Department of Pollution Control and Ecology 1991; Oklahoma Water Resources Board 1991).

Historically, before the construction of man-made dams and artificial impoundments in the Little River watershed, the area’s annual hydrologic cycle reflected the natural effects of seasonal rainfall patterns, runoff from the Ouachita Mountains, localized heavy rains, and a flat topographic profile. Generally, low flows on the Little and Cossatot rivers combined with high rates of evapotranspiration caused the bottoms to dry out from June through November. Localized heavy rains could cause parts of the bottoms to flood temporarily at any time. Flooding of low areas would begin in December with high water levels reached in February and March. This flooding was prolonged and deep in areas directly adjacent to Pond Creek and the often extensive isolated depressions and low bottoms; it was shallow and temporary in the higher bottoms and terraces. The system’s abundant sloughs, oxbows, beaver ponds, and shrub swamps held water throughout the year in all but the driest times. Although probably infrequent, these extremely dry periods dried out a significant percentage of the small streams and depressions which were required for the successful reproduction of many otherwise water-tolerant plants.

Hence, before the dams were built, the wetlands of the refuge were an extremely dynamic system with the hydrology over short and long periods shaping the biota in a spatially and temporally diverse manner. Precipitation in conjunction with the flat topography and small channels quickly exceeded the short-term capacity of the system to carry away rainfall. The relatively shallow depressions in the bottoms were the first to be inundated by fall rains, and this slowed down the evapotranspiration rates and consequently increased runoff. Runoff from the upper mountainous watershed filled the main river channels and caused back flooding in Pond Creek and its tributaries, as well as the lower bottoms.



Altered hydrology due to road construction

Photo © Weyerhaeuser Company

As the season proceeded, the flooded areas expanded and connected, affecting larger and larger areas. Actual overbank flooding of the Little and Cossatot rivers, however, does not appear to have been an annual occurrence, and many higher terraces were seldom flooded. If any overbank flooding did occur, it was caused by the subsequent runoff of heavy winter rains in the Ouachita Mountains. Drying out took place in reverse order; the first areas flooded were thus the last to dry in a complex interaction between the mainstem rivers and their tributaries and distributaries.

Today, the hydrologic regime has changed. Flood control dams on the Little River and its main tributaries, in both upper and lower watersheds, have altered the high and low flows of the rivers with cascading impacts on the duration, timing, and depth of flooding in the bottoms. Landscape changes in the watershed—primarily from the conversion of forests and grasslands to pine plantations and pastures—could also be impacting the ecosystem. Although historical hydrological data for the ecosystem is lacking, some impacts can be projected. Local knowledge combined with historical accounts of the area, along with changes in the current forest cover, reflect the altered hydrologic regime and will become more evident over time (The Nature Conservancy 1995).

The dams and artificial impoundments in the upper watershed are intended for flood control (Alan Smith, pers. comm. 1997). During times of high runoff they store water; during times of low water they release it. The effects on the forested wetlands of the refuge include a reduction in peak flooding with a longer duration of moderate and low flooding and drying out periods. The Millwood Lake pool, below the refuge, extends the duration of low and moderate flooding by causing back flooding when the lake's water levels are high, thus extending the time it takes the bottoms to drain and dry out. Although never used, the Corps' flood easement could store water in the refuge during severe floods for extended periods of time. The effects of the land use changes are much harder to analyze, but they appear to be working in the opposite direction of the dams, with land clearing increasing runoff and short-term peak flows.

Locally, recent silvicultural practices in the refuge area have resulted in a much younger forest, with 25-30 percent in an early successional stage and/or young pine plantation. An extensive elevated road and drainage network, which was constructed to support these silvicultural activities, now modifies and restricts the local water flow patterns. Ironically, these changes have greatly favored the life cycle and population growth of beaver, resulting in a large increase in beaver density, beaver pond formation, and subsequent destruction of timber.

These hydrologic changes are a complexity laid on an already complex ecosystem. Different parts of the refuge are now adapting in different ways to the various impacts. The highest peaks of flooding have been reduced; the high bottoms and terraces are no longer flooding; and the drying out of the lowest areas is being prevented. Much of the refuge today appears to be wetter longer than it was historically, and the forest cover is changing in response to this hydrologic change (The Nature Conservancy 1995). Ponding by beavers also appears to be more extensive than it was historically, according to the experience of local people.



Little River
USFWS Photo

The refuge is located in the high recharge area of the Quaternary aquifer of the Red River Basin. This is the single most important aquifer in the three counties surrounding the refuge. Most municipal use is drawn from this aquifer, as well as rural and agricultural use to the south of the Little River in Little River County. The well closest to the refuge is at Wilton, where 20,000 gallons are withdrawn per day. Recharge to the aquifer is from precipitation and seasonal high river flows. Well water levels have remained stable through the 1980s and no significant problems exist with current uses. Although the groundwater is hard and needs treatment for municipal use, no degradation in quality has occurred. Relatively small amounts

of water are withdrawn from localized aquifers in various Cretaceous geologic formations to the north (at Horatio, Lockesburg, and Ben Lomond) for rural and municipal use. The discharge from these aquifers provides base flow for the south-flowing tributaries of Pond Creek. The water levels in these aquifers are also essentially stable and no degradation in quality has occurred (U.S. Department of Agriculture 1987). There is no known current impact from groundwater withdrawals on the Pond Creek Bottoms ecosystem. Large increases in withdrawals are not anticipated due to the lack of irrigated agriculture. The refuge is important for the role it plays in protecting a significant portion of the Quaternary aquifer recharge area.

The most important aspect of the refuge is its large, functioning forested wetland ecosystem. Although the many direct and indirect hydrologic alterations described above have impacted the processes that maintain the refuge's ecosystem function and plant community composition, forested wetlands are naturally dynamic and display a high resiliency to disturbance due to the nature of the riverine processes that maintain them.

Water Quality

Historical data on water quality for the refuge is not available. The water quality in pre-settlement times was likely excellent; early explorers refer to the Little and Cossatot rivers as being clear rivers of high quality and productivity. There would have been little erosion from the largely forested watershed beyond normal bank erosion along the main rivers.

Today, the overall water quality in the Little River Basin is fair with degradation resulting from agriculture-related nonpoint pollution and municipal and industrial discharges (Arkansas Department of Pollution Control and Ecology 1996). Water quality stations are currently located on the Little River, above the refuge near Horatio, and on the Cossatot River, above the refuge near Lockesburg. The water flowing into the refuge past these gauges meets all Environmental Protection Agency legal parameters (Mike Burns, pers. comm. 1997).

The Little River has been degraded from the Bear Creek Superfund site, which resulted in fish kills in the past, and from discharges from the city of DeQueen. The Arkansas Department of Pollution Control and Ecology considers the problem much improved.

The Cossatot River and Pond Creek have elevated nutrient and sediment concentrations relating to agricultural runoff that are degrading water quality (Arkansas Department of Pollution Control and Ecology 1996). Forested wetlands such as those of the refuge act as ecosystem sponges by collecting and filtering water during the annual flood events. The deposition of sediment and nutrients is an important ecosystem function and wetland systems have the capacity to absorb some excess nutrients without loss of function. Other pollutants entering the system are also likely being deposited in the refuge.

Biological Environment

Vegetation

The refuge is an extensive wetland complex comprised of the forested overflow bottoms and riparian forests of the Little and Cossatot rivers. The refuge is approximately 95 percent forested with small areas of open water, shrub swamps, beaver ponds, open marsh, and roads. The plant communities reflect the small elevational changes, complex soils, hydrologic regime, and other ecosystem processes that have created and maintained a high diversity of plant species across the refuge. The forested matrix contains mostly natural second- and third-growth bottomland hardwood forests, with inclusions of loblolly pine communities



Hardwood ridges/shrub swamp

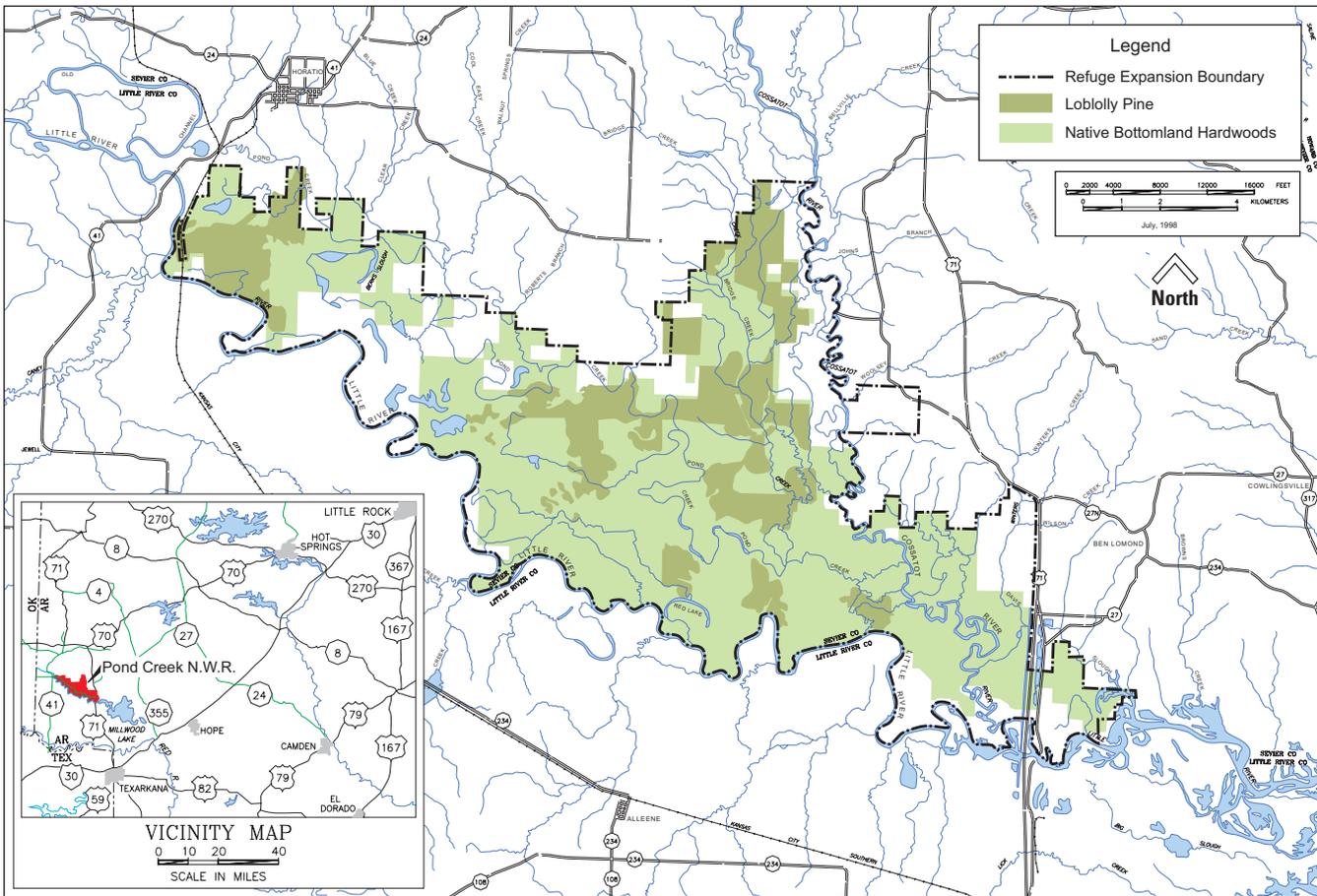
Photo © Weyerhaeuser Company

on high terraces, stringers of riparian forests along the Little and Cossatot rivers, cypress swamps and cypress-lined oxbow lakes, buttonbush shrub swamps, open sedge marshes, and young pine plantations (Figure 2). The canopy trees in this matrix forest are 50-70 years old, with scattered patches of much older trees (The Nature Conservancy 1995; Arkansas Natural Heritage Commission 1991).

The forest communities are complex and change rapidly over short distances in response to small elevational changes and slight differences in hydrologic regimes. Pond Creek refuge is a fertile area with a high site index, fast tree growth, and quick recovery from

disturbance (Arkansas Natural Heritage Commission 1991). The significance of the refuge lies partly in its geographic position beyond the ranges of many dominant overstory trees found just to the north and east (water tupelo, water locust, swamp privet), creating different ecological balances between the species. The forest types include an abundance of oaks (water, willow, overcup, Nuttall's, cherrybark, cow, white, Shumard, delta post) and hickories (water, pecan, shellbark, bitternut, mockernut). Other species present include bald cypress, loblolly pine, American holly, river birch, red and silver maple, sweetgum, sycamore, blackgum, sugarberry, American elm, and green ash. The understory includes small trees and shrubs such as swamp dogwood, buttonbush, pawpaw, hornbeam, and switch cane. These forests also contain a heavy vine

Figure 2. Major vegetation types of Pond Creek National Wildlife Refuge



component (grape, rattan, greenbrier, Virginia creeper, peppervine, cross vine, poison ivy) that adds substantially to the vegetative mosaic (The Nature Conservancy 1996).

The forests in this area have been selectively harvested since settlement, except perhaps for a few isolated stands of bottomland hardwoods and cypress-lined lakes which appear uncut. The bottomland forests have retained their species diversity but appear relatively even-aged without some of the structure found in old-growth forests. Very large trees, apparently ancient culls, and small stands of old growth are scattered throughout the bottoms mostly in the wettest and least accessible areas. Higher quality forest communities are also found in streamside management zones. The most impacted forest communities were found on the drier sites and areas easier to drain (The Nature Conservancy 1995). Prior to settlement it is likely that willow and water oak with loblolly pine were the dominant trees across the refuge. A thorough analysis of pre-settlement vegetation is not available for this section of Arkansas; however, the community composition appears to have been maintained albeit with a younger structure.

Southern forested wetlands have always been subject to natural disturbance. Weather phenomena, especially wind storms, ice storms, and severe drought, cause short-term permutations through the creation of gaps and episodic reproductive events. Flooding, even severe events, is probably not a primary disturbance due to the diffusing and buffering effects a large forested wetland has on floods. The natural meandering of river channels does cause disturbance by removing land from one bank and depositing it on the other. Although many of the older large trees in



Ditched area

the refuge have been struck by lightning, fire may not have been a primary, short-term disturbance but a long-term catastrophic event, probably combined with severe drought or Native American use.

Work by Runkle (1991) shows that natural disturbance on a landscape scale (10,000-100,000 acres) occurs at a relatively constant rate of 1 percent a year across many different forest types. Disturbance adds greatly to the structure of forested wetlands across the landscape. Early explorers reported a condition ranging from open forests of large trees and little understory to dense impenetrable thickets of small trees and vines. In the refuge, these relatively

small-scale and temporally constant disturbances are discontinuously distributed across an already complex forested wetland mosaic. Forested wetland ecosystems with intact natural processes do not proceed to a static climax condition or even a dynamic equilibrium; they exist in a fundamental state of disequilibrium and change.

More recently, 25-30 percent of the refuge has experienced heavy disturbance due to attempts to convert bottomland hardwood forests to pine plantations. These planted areas were ditched and drained and the plantations now exist in several different stages and conditions. Many have been flooded by beaver and the pine has died, leaving open wetlands; others have been thinned and are growing rapidly; and still others are dense impenetrable thickets of pine and sweetgum. Many natural stands of bottomland hardwoods have been harvested by diameter-limit cuts and the best trees removed (Arkansas Natural Heritage Commission 1991). Consequently, the forested wetland ecosystem is now skewed to a younger and more even structure than existed historically.

These recent silvicultural impacts, combined with the previously described changes in the area's hydrological regime, have changed the forested wetlands in the refuge. Over the long term, the forest composition will continue to change in response to hydrologic alterations. The current conditions and projected trends will direct refuge stewardship and management in the future.

Fish and Wildlife

Bottomland hardwood ecosystems are very productive habitats for a wide array of fish and wildlife species. The refuge and the surrounding area are no exception. The refuge's abundance of high quality forested wetlands provides outstanding habitat for a diversity of fish and wildlife.

In general, a thorough documentation of the population status (or even presence) of most species of wildlife in the refuge has not been conducted. The absence of a nearby college or university has resulted in a limited amount of available research or survey information. Omissions of certain wildlife species in this document may therefore represent a lack of information rather than a lack of concern about those particular species.



Beaver pond
USFWS Photo

Mammals. The only attempt at producing a comprehensive species list for public lands in the Cossatot/Little River region has been for Little River National Wildlife Refuge in southeastern Oklahoma, located about 30 miles west of Pond Creek refuge. Some 48 mammalian species are listed as occurring or likely to occur on the Little River refuge (Berlin Heck, pers. comm. 1997). The only preliminary species list for mammals occurring in the immediate Pond Creek refuge area was conducted by The Nature Conservancy, with only 17 species of mammals positively identified (The Nature Conservancy 1996). However, due to the geographical

proximity and similarity in habitats between the Pond Creek and Little River refuges, it is reasonable to assume that the diversity and abundance of mammalian species are similar for the two refuges.

Important game species occurring on Pond Creek refuge include white-tailed deer and gray and fox squirrels. The deer population on the refuge is thought to be significantly below carrying capacity due largely to unmanaged hunting pressure prior to recent Service acquisition. However, the current habitat conditions are excellent, and deer numbers are expected to increase as a result of increased protection and management.



White-tailed deer
Photo © Larry W. Richardson

Gray and fox squirrels are both abundant, particularly where suitable mast-producing hardwoods are available. Although the habitats of these two species overlap, gray squirrels prefer deep woods with a heavy mid-story vegetation, whereas fox squirrels tend to favor small woodlots and the edges of larger forested tracts. Due to their high potential recruitment rate (directly resulting from levels of available mast) and high natural mortality rates, it is unlikely that any long-term changes in squirrel population densities have occurred within the available habitat.

Cottontail rabbits and, to a somewhat lesser extent, swamp rabbits are common in this area. Again, their basic high recruitment and mortality rates would lead to the expectation that no long-term population changes have occurred and that rabbits should occupy all suitable habitat.

A number of furbearers, including beaver, nutria, muskrat, raccoon, opossum, mink, river otter, coyote, red fox, gray fox, striped skunk, and bobcat, is collectively abundant on the refuge. Among this group, the beaver, nutria, muskrat, and mink are usually associated with the more permanently inundated wetlands and riverine systems. The raccoon is well-adapted to all existing habitats, and the opossum, coyote, fox, and bobcat are mostly associated with upland habitats. Most furbearers are distributed throughout the ecosystem.

Little or no information is available to provide population indices for these species. However, beaver and raccoon population levels have become quite high in recent years, probably associated with depressed fur demands. These two species are of major concern because of their potential to significantly impact ecosystem functions. An increased beaver population has altered the area's hydrology by causing more dams and

beaver ponds to be built, inundating the bottomland forests and keeping them under water for prolonged periods. In addition, beaver have become a greater nuisance problem to private landowners in the area. The negative impacts of high raccoon populations include their effect in reducing populations of migratory and resident birds. Raccoon predation may be adversely affecting reproduction of breeding neotropical migratory birds (Cooper and Ford 1993) and ground-nesting wild turkeys (Moore 1993) in the hardwood habitats of Arkansas.

Other problem species include high populations of feral swine and, immediately after transfer of Weyerhaeuser land to the Service, the presence of free ranging cattle at several locations. Refuge staff worked closely with adjacent landowners and with some effort, all cattle were removed from refuge lands by mid-1998. No further recurrence of cattle on the refuge has developed but problems remain with high feral swine populations.

Much scientific literature exists that documents adverse impacts by feral swine to habitat productivity and reproduction of most native wildlife (Lipscomb 1989; Belden 1972; Belden and Pelton 1976; Scott 1973; Yarrow 1987; Jacobi 1980; Baron 1980; Lacki and Lancia 1986; Willy 1987). Being omnivorous, feral swine utilize virtually every component of the habitat resulting in direct competition with native wildlife, reductions in carrying capacities and adverse impacts to reproduction/recruitment. In addition, existing documentation indicates feral swine serve as a source for many diseases that impact wildlife as well as domestic livestock and swine. A partial list of these diseases include black plague (Clark et al., 1983), bovine tuberculosis (Nettles et al., 1989), brucellosis (Becker et al., 1978), coccidiosis (Greiner et al., 1982), foot and mouth disease (Pech and Hone 1988), hog cholera (Nettles et al., 1989), Leptospirosis (Clark et al., 1983), parvo (New et al., 1994), pseudorabies (Clark et al., 1983), swine fever (Dahle and Leiss 1992), and Trichinosis (Nettles et al., 1989).



Common yellowthroat
USFWS Photo

Birds. The hardwood-dominated forests and forested wetlands of Pond Creek refuge provide outstanding habitat for an abundance of birdlife. Again, the Little River refuge is the only public land in the region with a checklist of species, with 198 avian species listed as either occurring on or migrating through the refuge (Berlin Heck, pers. comm. 1997). The Nature Conservancy (1996) has a list of 133 species of birds identified for Pond Creek refuge. Much seasonal variation occurs in avian species populations in the area because most of the bird use is by migratory species. Neotropical migratory songbirds use these habitats for breeding in the spring and summer and during migration in the spring and fall. The forested wetlands of Pond Creek refuge are also used by migrating and wintering waterfowl during the fall, winter and spring. Finally, a small number of resident species use the habitat year-round.

Waterfowl, primarily mallards, gadwall and wood ducks, have traditionally used the seasonally flooded wetland habitats of the refuge. Other species of lesser occurrence include wigeon and green-winged teal. Flooded beaver ponds and sloughs provide excellent nesting and brood-rearing habitat for resident wood ducks. The hooded merganser, another cavity nester, is an uncommon breeding species in the region, and does not occur anywhere in large concentrations.

The Lower Mississippi Valley is one of the six highest priority habitat regions identified in the North American Waterfowl Management Plan as requiring special attention and conservation action (Yaich 1990). Within the Lower Mississippi Valley, 10 management units were delineated for Arkansas. One of these units is the Red River-Sulphur River-Little River



Bird rookery

Photo © Weyerhaeuser Company

Unit in southwest Arkansas, which encompasses the refuge area. Although waterfowl populations for this region are low compared to those in the more extensive wetland and river systems of the Mississippi Alluvial Valley of eastern Arkansas, the numbers of waterfowl that use the area are adequate to provide a base from which to build larger populations through wetland protection and enhancement. It should be noted that continental duck populations have recently rebounded from low levels, primarily due to greatly improved conditions on the northern breeding grounds, as well as wetland conservation efforts on the wintering habitats.

Many species of neotropical migratory songbirds are experiencing long-term declines as a result of widespread habitat loss. Bottomland hardwood forests and riparian woodlands have been identified as a top habitat conservation priority throughout the southeast (Hunter et al., 1992). Conservation and management of the critical bottomland forests on the refuge will enhance the breeding, wintering, and transitional habitats for many species of migratory and resident songbirds. Some of the more commonly occurring bird species include the Carolina chickadee, tufted titmouse, Carolina wren, prothonotary warbler, northern cardinal, and white-throated sparrow. The forested wetlands of the refuge are also frequented by many species of wading birds, including the great blue heron, little blue heron, green heron, cattle egret, snowy egret, great egret, anhinga, and yellow-crowned night heron. Four known colonial nest sites (rookeries) exist on the refuge. The species composition of these rookeries is not known, but it could include several herons and egrets.

The primary resident game bird of particular interest in the ecosystem is the wild turkey. Turkey populations have remained quite low in the area in recent years, probably due to over-exploitation and illegal harvest. In addition, high levels of predation on turkey nests, especially by raccoons, may also be having a significant negative impact on this species.

Reptiles and Amphibians. Reptiles and amphibians require quality wetland habitat for their survival, and they may be important indicator species of environmental well-being. The damp, forested bottomland hardwood habitat of the refuge is conducive to an abundance and diversity of reptiles and amphibians. As with the other wildlife groups, detailed information on the species of herpetofauna found on the refuge is lacking. A preliminary list compiled by The Nature Conservancy (1996) includes 23 species of reptiles and 10 species of amphibians.

Some reptiles thought to most commonly occur on the refuge include the common snapping turtle, Mississippi mud turtle, red-eared slider, five-lined skink, black rat snake, broad-banded water snake, and western cottonmouth. Alligator snapping turtles, the largest of the turtle group, attaining sizes of up to 200 pounds, were once more abundant and widespread throughout the southeast. However, due to recent exploitation, their numbers have been reduced in many areas, including the Cossatot-Little River ecosystem. Because of concerns about the recent population reduction and the unknown reproductive capabilities of this long-lived species, the Arkansas Game and Fish Commission halted all take of alligator snapping turtles in Arkansas in 1994. (Fish and Wildlife Service 1994.)

Amphibian species thought to be common in the refuge area include the smallmouth salamander, dwarf American toad, green treefrog and southern leopard frog. No threatened or endangered amphibian species are known to occur. However, recent research findings indicate that amphibian populations, particularly frogs, are undergoing significant population declines throughout the world. Also, in the United States, alarming numbers of frogs of various species are being observed with deformities such as abnormal organs, feet, and toes.

Fish. The refuge has a diversity of aquatic habitats that include rivers, creeks, oxbow lakes, beaver ponds, swamps, and borrow pits varying in size and depth. These waters provide sportfishing opportunities for bass, bream, catfish, and crappie. The oxbow lakes, Little River, and Cossatot River have primitive boat launches that provide some access.

The southeastern portion of the refuge joins Millwood Lake, a 20,000-acre artificial impoundment that provides excellent fishing. One improved boat launch and parking lot is located off U.S. 71, where the Little and Cossatot rivers converge and proceed into Millwood Lake.

No attempt has been made to prepare a comprehensive fish species list for the Pond Creek refuge. The Little River refuge has a list of 68 species. It is reasonable to assume that the same species of fish occur on Pond Creek refuge, since the two refuges are part of the same drainage system.

Threatened Species and Species of Management Concern. Wintering populations of the threatened bald eagle utilize the lakes, streams and sloughs of the refuge. The Rafinesque's big-eared bat, a species of management concern, uses the very large hollow trees scattered throughout the site (The Nature Conservancy 1996). Another species of management concern, the rabbitsfoot mussel, occurs in the Little and Cossatot rivers. The alligator snapping turtle, also a species of management concern, may occur in refuge wetlands and the river systems.

Socioeconomic Environment

History

Sevier County was established in 1828. Cotton was the primary staple and economic basis for the county through much of its early history. During this time, steamboats operated up the Saline, Cossatot, and Little rivers ferrying cotton to market. The Saline River also supported several salt works during the mid-1800s that extracted salt from the river and converted it to a useful form. The arrival of the railroads in the 1880s opened more of the county to settlement and the towns of DeQueen and Horatio were created.

When the cultivation of cotton waned in the early 1900s, fruit production—especially strawberries, melons, cantaloupes, and peaches—increased and supported areas of the county. Fruit harvesting provided employment for residents and seasonal workers from Arkansas and Oklahoma as well. Logging also became important. The Dierks Lumber Company operated the largest sawmill and employed several hundred men until 1936, when much of the timber was cut over (McCommas 1980). The Weyerhaeuser Company bought out the Dierks Lumber Company in the early 1940s, and established a pole treatment plant in DeQueen in 1945. Sevier County, like most rural counties throughout the south, lost population after World War II when many people left in search of better jobs and opportunities.

In the mid-1950s, the poultry industry moved into Sevier County and quickly became a key economic force. The Mountaire Corporation established a broiler processing plant in DeQueen in 1954 and went through several expansions in the early 1970s. This new industry attracted people back to the county, which resulted in a 23 percent increase from 1970 to 1980. Broiler production is the primary agricultural product in Sevier County and in 1995, the county ranked fourth in the state in broiler production. Livestock operators ranked third in the state in hog production, and produced 40,000 head of cattle in 1997.

Land Use and Productivity

Sevier County remains a rural county. Roughly 70 percent of the land in Sevier County is forested, 26 percent is in farms, and 4 percent is under crop cultivation. Hay pasture covers approximately 19,614 acres or 0.5 percent of the county.

In 1992, there were 549 farms with an average of 239 acres each. In 1992, the estimated market value of the average farm, including farm machinery, was \$25,753 (U.S. Department of Agriculture 1992). The average estimated market value of all agricultural products sold in 1992 was approximately \$162,475 per farm (U.S. Department of Agriculture 1992). More than 200 farms seasonally hire farm laborers and approximately 615 farm laborers were reported in 1992.

The number of farms has declined over the past ten years. However, the total acreage in farms, its market value and average size have increased over the same time period (Table 6). Some of this change can be attributed to dramatic increases in hog and broiler production. Hog production (number of hogs sold) has increased by more than 3300 percent and broiler production by more than 72 percent since 1982 (U.S. Department of Agriculture 1992). Although livestock and poultry operators are regulated, this exponential increase in hog production may eventually impact the county's water quality, including the refuge area.

Table 6. Agriculture summary highlights, 1982-1992, Sevier County, Arkansas.

Characteristic	Percent Change			
	(1982-1992)	1992	1987	1982
Farms (number)	-3.2%	549	558	567
Land in farms (acres)	+7.6%	131,353	126,457	122,126
Average size of farms (acres)	+11.2%	239	227	215
Estimated market value, land & buildings @ avg/farm	(\$)+39.7%	248,913	173,977	178,222
Hogs & pigs inventory (number)	+2,272%	71,560	3,472	3,017
Hogs & pigs sold (number)	+3,334%	193,079	12,403	5,622
Chickens >3 mos. old inventory (number)	+159%	318,818	200,798	123,260
Broilers - chickens sold (number)	+72%	42,844,810	32,029,255	24,899,061

Source: U.S. Department of Agriculture. 1992. Census of Agriculture, Arkansas.

Forestry

Sevier County is roughly 70 percent forested by primarily mixed stands of pine and hardwood. The forest industry is the largest forest landowner and leases or owns roughly 49 percent of the county’s forest land. Non-industrial private forest landowners, corporations, and the Federal Government own approximately 34 percent, 13 percent, and 4 percent, respectively, of the forest land in Sevier County (USDA Forest Service 1995).

The total volume of sawtimber, including softwood and hardwood species, has decreased since the last USDA Forest Service inventory, whereas the growing stock of all species has remained about the same (Table 7). The largest decrease is the volume of planted pine sawtimber. These stands have been largely harvested and replanted, with some converted to natural pine or soft hardwood stands. Average net growth and average annual removal data from 1988 to 1995 suggest that removals exceeded net growth across all species. Some of this might be attributed to timberland conversion.

In terms of number of employees and annual payroll, the forest products manufacturing industry is third in economic importance to Sevier County. The percentage of the county’s direct earnings from the timber industry was less than 10 percent in 1990 (USDA Forest Service 1996). However, Sevier County lies within the procurement zone of a large sawmill, plywood mill, and chipper mill operating in neighboring Howard County, as well as a paper mill operating in Little River County. Thus, there is a high demand for timber in the county.

Table 7. Volume of growing stock and sawtimber by species group, Sevier County, Arkansas, 1988 and 1995.

All Species	Growing Stock					Sawtimber							
	Planted	Pine			Hardwood		All Species	Planted	Pine			Hardwood	
		Natural	Other	Soft [^]	Hard	Natural			Other	Soft	Hard		
1988													
248.2	2.7	73.3	5.3	63.8	103	915.2	377.4	9.6	197.1	197.1	329.4		
1995													
246.3	38.3	25.8	4.7	84.3	92.7	729.9	43.7	103.4	9.7	259.8	313.4		

[^] Species such as gums, yellow-poplar, cottonwoods, red maple, basswoods, and willows.

Source: U.S. Department of Agriculture, Forest Service 1996. Forest statistics for Arkansas counties, 1988 and 1995. Arkansas counties, 1988 and 1995.

Demographics

Sevier County is a rural county with a total population of 14,501 in 1995 (Table 8). DeQueen, the county seat, is the largest town and has a population of approximately 4,600. The county has gained population by about 6 percent since 1990 due primarily to in-migration and natural increase. Although the majority of the population is Caucasian, there is a growing Hispanic population. Hispanic residents began entering the county in the late 1970s, probably in response to new job opportunities resulting from the expanding poultry processing industry.

Personal incomes, educational levels, and job earnings have increased while the unemployment rate has generally declined since 1980. After the recession in the early 1980s, the county experienced some population out-migration and higher unemployment rates; these rates had recovered by 1995. The percentage of all persons below poverty level in 1990 was approximately 19 percent, a figure slightly less than the 20 percent reported for the state.

Table 8. Socioeconomic profile of Sevier County, Arkansas, 1980 -1995.

<i>Characteristic</i>	<i>1995</i>	<i>1990</i>	<i>1980</i>
Population (number)	14,501	13,637	14,060
Population Density (pop'l/sq. mile)	26.4	24.8	25.1
Race	not available		
White		12,081	13,097
Black		787	783
Hispanic		632	137
American Indian		222	110
Asian		16	1
Education (% pop'l. > 25 yr. old)			
completed high school)	59.0	58.9	52.5
Labor Force			
Civilian Labor Force	7,001	7,125	5,877
Unemployment (%)	4.8	5.8	7.1
Median Family Income (\$)	not available for '95	23,287	14,729
Per Capita Income (\$)	15,501	9,060	7,780
Poverty Levels (%)			
All persons below poverty level	not available	18.6	17.1
Families below poverty level		13.7	13.7

Sources: 1988 and 1994 County Data Books, Statistical Abstract of Arkansas, 1988, 1994; U.S. Bureau of Census 1990, 1980.

Employment

Manufacturing non-durable goods, primarily poultry products, is the leading industry in the county and employs more than 1,000 people (Table 9). Pilgrim’s Pride, the largest industry in the county, has expanded several times since its establishment in 1954. Other significant employers are industrial machinery manufacturing and the forest products industries. Three sawmills, a plywood mill, and a large timber treatment plant operate in the county (Arkansas Forestry Commission 1994; U.S. Department of Commerce, Census Bureau 1994). The retail trade sector is also growing and employs more than 900 people in about 77 small businesses.

Table 9. Estimates of employment by industry for Sevier County, Arkansas, 1990, 1994.

<i>Industry</i>	<i>Number of Employees *</i>	<i>Establishments by Employment-size Class</i>				
		<i>Total</i>	<i>1-19</i>	<i>20-99</i>	<i>100-499</i>	<i>> 499</i>
Agriculture, forestry and fisheries	498	8	5	0	0	0
Construction	375	23	21	2	0	0
Manufacturing (non-durable goods)						
Food & Kindred	1,065	1	0	0	0	1
Manufacturing (durable goods)						
Lumber & wood	374	18	14	2	2	0
Printing & publishing	24	2	2	0	0	0
Rubber & misc. plastics	175	2	0	1	1	0
Stone, clay, & glass	74	1	0	1	0	0
Industrial Machinery & Equip.	550	4	3	0	0	1
TOTAL	761	30	21	4	3	2
Electronic & other equip.	10	1	1	0	0	0
Instruments & related	10	1	1	0	0	0
Transportation & Public Utilities	369	23	21	2	0	0
Wholesale Trade	198	21	19	2	0	0
Retail Trade	961	77	65	11	1	0
Finance, insurance, & real estate	133	18	16	2	0	0
Business & repair services	190	25	25	0	0	0
Personal services	173	8	8	0	0	0
Entertainment & recreation services	26	6	6	0	0	0
Professional & related service	500	20	16	2	2	0

* Employment figures are estimates derived from the 1994 County Business Patterns for Sevier County, Arkansas, and from the U.S. Census Bureau employment estimates from 1990.

Source: U.S. Department of Commerce, Bureau of the Census, 1990, 1994.

Transportation

In 1971, the Intermodal Surface Transportation Efficiency Act authorized funding for planning and environmental impact analysis regarding the construction of a new interstate highway connecting Shreveport, Louisiana, and Kansas City, Missouri. The proposed U.S. 71 improvement project is planned to be a four lane, fully controlled access highway facility. The first section of this new facility, Texarkana to DeQueen, Arkansas, is presently undergoing final planning. All routing alternatives under consideration would cross the refuge; three of the alternatives would cross at locations where no highway currently exists.

The other alternative uses the existing U.S. 71 alignment and minimizes impacts to the refuge and wetlands. The Ecological Services Division of the Service recommended, prior to the establishment of the refuge, that the U.S. 71 alignment be selected as the preferred alternative, since it minimizes wetland impacts. The Service's position remains unchanged and, in fact, is reinforced due to the establishment of the refuge. Construction of a new highway across the refuge's forested wetlands, where no right-of-way currently exists, would impact many refuge resources.

In light of the Service's previous recommendations and reduced impacts to refuge resources, the Service establishes a joint development area for a travel corridor utilizing the existing U.S. 71 alignment across the refuge for this project (Arkansas Highway and Transportation Department Project Number 30108). The Draft Environmental Impact Statement for this project states that the Arkansas Highway and Transportation Department will seek establishment of this joint development corridor through coordination and consultation with the Service. This document also states that total right-of-way requirements for construction varies from 300 to 500 feet wide. The establishment of this corridor for potential development does not negate requirements for development of appropriate mitigation features due to impacts of construction on wetlands and refuge resources nor does it eliminate normal Service right-of-way, special use permit, or Archaeological Resource Protection Act permit requirements. It does, however, simplify the evaluation process for complying with the Section 4 (f) requirements for this relocation project.

Recreation Use

The refuge, although largely undeveloped, is a popular destination for outdoor enthusiasts and receives approximately 12,000 visits each year. Access to the refuge is gained either from the Cossatot or Little rivers or via a system of logging roads built by Weyerhaeuser, the previous owner. Millwood Lake offers the nearest boat access to both the Cossatot and Little rivers. Some of the existing timber roads have been left open to the public providing vehicle access throughout the refuge. In addition, a system of all-terrain vehicle trails was developed, some for year-round use and others in conjunction with hunting seasons.

Hunting and fishing are the primary wildlife-dependent recreation activities occurring on the refuge. The entire refuge is currently open to both in accordance with state seasons. Although the refuge does not now support a large white-tailed deer population, deer hunting still remains a popular activity along with squirrel hunting. Some waterfowl hunting occurs, but not in significant numbers. Due to the lack of boat access, bank and pond fishing is the primary means of pursuing recreational fishing on the refuge.

To a lesser extent, wildlife observation and camping are two other wildlife-dependent recreation activities that occur on the refuge. There is some use of the refuge as a place to take a drive and to observe wildlife and nature. Camping is permitted on the refuge in designated areas throughout the year, in conjunction with a wildlife-dependent recreation activity.

Cultural Environment

Unlike other portions of Arkansas, Sevier and Little River counties have received little attention from archaeologists and historians. Information on prehistoric and early historic Native American cultures is drawn from immediately adjacent areas, such as the Great Bend, the Ouachita Valley, and Little River regions of southwest Arkansas, northwest Louisiana, and eastern Oklahoma, where a number of archaeological investigations has occurred. Documentation of the historic land use of the refuge seems to be limited to 19th and early 20th century farmsteads and logging.

Paleoindian Period (ca. 9500-7000 B.C.)

The earliest peoples in southwest and south-central Arkansas are represented by surface finds of Clovis or fluted lanceolate projectile points. The points, dated elsewhere to ca. 9500-8000 B.C., are typically found on cleared uplands and terraces. No site in Arkansas has produced in-situ Clovis deposits. Many of these points are manufactured of novaculite from the Ouachita Mountains (Jeter et al., 1989).

The late Pleistocene record is better known for the adjacent parts of Texas and Louisiana. Bones of horse, mastodon, mammoth, bison, peccary, antelope, coyote, armadillo, giant beaver, and small mammals have been recovered from deposits preserved beneath recent alluvium of the Red River to the south. The deposits contain species adapted to the southern plains or the southeastern woodlands (Hemmings 1982a).

The Dalton Horizon dates to ca. 8500-7500 B.C., and is well represented in the region and Arkansas in general. The horizon was originally defined in the 1930s-40s by Judge S. P. Dalton in Jefferson County, Missouri. This point style is found throughout the southeast and midwest. Excavations at the Rodgers Shelter in Missouri, the Brand and Sloan sites in northeast Arkansas, and deeply stratified sites in the Little Tennessee River Valley clarified the chronological position of the horizon, the nature of its technology, and the adaptation of the Dalton peoples to an evolving and changing environment.

Between 9000-8000 B.C., the region's boreal forests were in transition to ones dominated by deciduous species. The Dalton peoples lived in substantially different environments from those of the earlier Clovis or fluted point groups and subsequent Archaic societies. By 8000 B.C., the Lower Mississippi Valley was covered by cypress-gum forests with mixed hardwoods along the valley margins. Much of Arkansas was covered by oak-chestnut forests.

Goodyear (1974: 19-76) and Morse and Morse (1983: 71-79) have described the Dalton toolkit in some detail. The Dalton point, which functioned primarily as a hafted knife, was heavily recycled for use as a drill, a perforator, or a scraper. Other tools included the Dalton adz, a series of unifacial tools, pieces esquilles, cobble tools, and abraders. The majority of the recorded Dalton sites are small hunting/butchering camps. Three larger base camps have been excavated in northeast Arkansas--Brand, Sloan, and Lace sites.

Information on Dalton subsistence is quite limited and mostly derived from an analysis of their tools. White-tailed deer seems to have been the predominant game species hunted. Two Missouri sites with Dalton components have yielded bones of various terrestrial and aquatic species, hickory nuts, black walnuts, and acorns. A hackberry seed and a persimmon seed were found in Dalton contents in Missouri and Alabama respectively. No extinct Pleistocene animals have been found in association with Dalton materials (Jeter et al., 1989; Goodyear 1982).

The San Patrice Horizon, dated to ca. 8000-7000 B.C., appears to be contemporaneous and possibly related to the Dalton Horizon. Its complex of points and associated tool types are found in northwest Louisiana and the adjacent portions of Arkansas and Texas. The rest of the complex's toolkit resembles that associated with the Dalton Horizon.

Sites with San Patrice components have been found in two settings--on the margins of upland terraces overlooking stream valleys or lakes and along small streams dissecting uplands, well away from major water sources. The region was near the edge of the newly established oak-chestnut forest and western flank of the oak-hickory-southern pine forest of the Coastal Plain. The oak-savannah vegetative community was spreading along the western edge of the region.

The major drainage transecting the region is the Red River and its tributaries. The river's geological history and meander sequence are poorly understood before 3500 B.C. San Patrice sites, like other later archaeological sites, may have been destroyed or buried by the river's meandering and alluvation (Jeter et al., 1989; Pearson 1982).

Archaic Period (ca. 7000-4000 B.C.)

During this period, southwest Arkansas appeared to have more in common with events occurring on the plains just to the west rather than elsewhere in Arkansas and the Lower Mississippi Valley. Corner-notched points associated with the Early Archaic in the southeastern United States, such as Palmer Corner-Notched and Kirk Corner-Notched, are not found here. Scottsbluff-like and Eden-like points and Cody knives are found in southwest Arkansas and northwest Louisiana. These artifact types may represent an intrusion into the area from the nearby Plains where similar points are dated to ca. 7000-6000 B.C. All of these finds to date have been isolated surface finds and do not come from excavated sites. Information concerning the chronological placement and cultural history is therefore lacking.

Evidence for Middle Archaic or post-Scottsbluff cultures is sparse, except for the Tom's Brook Phase seen in the Ouachita Valley and in eastern Oklahoma. This phase is dated to ca. 5000-4000 B.C., and defined upon materials recovered from the Cooper site in the Middle Ouachita area and the Tom's Brook site in northwest Arkansas. The assemblage is also characterized by notched pebbles (possible netsinkers) and stemmed scrapers. Tom's Brook components found in the Felsenthal uplands contained grinding stones and scrapers, but not the notched pebbles. In south-central Arkansas, side-notched Big Sandy-like side notched points were found at a number of sites that also yielded Tom's Brook materials. The points, netsinkers, and grinding stones indirectly suggest that hunting, fishing, and wild plant food processing were important (Jeter et al., 1989; Sabo et al., 1990).

The Late Archaic is characterized by a number of poorly documented lithic horizons such as the Williams Point-Big Creek Point Horizon. Late Archaic sites are found on the outer fringes of the pre-1000 B.C. meander belt remnant of the Red River; on adjacent Pleistocene terrace surfaces, and the uplands. It has been suggested that Late Archaic peoples engaged in some sort of specialized forest efficiency economy represented by broad bladed points, groundstone tools, and plant processing equipment (Hemmings 1982b).

Fourche Maline 1-7 (ca. 800 B.C. - 900 A.D.)

Fourche Maline, a distinctive local culture, appeared on the Red River floodplain at the end of the Archaic Period prior to the introduction of ceramics (Hemmings 1982b). This culture spanned a 1500-year period from the Late Archaic through Caddoan periods. It was originally based on 1930s WPA excavations in eastern Oklahoma along the Fourche Maline Creek which yielded pre-Caddoan Woodland ceramics mixed with Late Archaic materials. Schambach has divided Fourche Maline into seven subperiods correlated to the Lower Mississippi Valley sequence. Diagnostic artifacts include Gary points and several variants, Williams Plain and Cooper Boneware Plain ceramics, Poole pipes, and double-bitted flake adzes. Fourche Maline sites are evenly distributed throughout southwest Arkansas and range in size from tiny hill country components to small and medium sized lowland villages of 2-20 acres. Subsistence patterns are virtually unknown despite the use of flotation at several Fourche Maline sites. Evidence for cultigens, such as maize, has not been found. Stone grinding equipment, often attributed to wild plant food processing, is found in large quantities. Similar artifacts are not seen on later Caddoan period sites (Jeter et al., 1989).

Caddo I-V (ca. 900-1800 A.D.)

The Fourche Maline-Caddoan transition occurred rapidly over western Arkansas, northwest Louisiana, and eastern Oklahoma and Texas. The Caddoan culture has often been seen as an outlier of the Mississippian tradition and suggested as ancestral to it (Jeter et al., 1989). The central Caddo subarea encompassed southwest Arkansas, northwest Louisiana, and extreme southeast Oklahoma. The Great Bend region appears to be the Caddoan heartland with early important sites, such as Crenshaw, Bowman, and the ceremonial center of Battle Mound. Caddoan communities were dispersed throughout major and minor stream valleys of the Trans-Mississippian South. The largest communities and more important civic centers were primarily along the Red, Arkansas, Little and Ouachita rivers.

Caddoan communities were hierarchically arranged around a civic ceremonial center with platform and burial mounds, towns with political and religious compounds, associated but linearly dispersed farmsteads, small isolated hamlets, and specialized processing and/or procurement locales. Ties with towns were through exchanges of economic goods and participation in sociopolitical and ceremonial activities. Ceremonial centers also facilitated redistribution of goods, labor, and food resources when necessary (Perttula 1997). The dispersed towns consisted of small farmsteads, each with one or two houses, several open-sided bark or brush-covered shelters, and storage platforms with beehive-shaped thatched roofs. This arrangement represented an efficient strategy for exploiting critical resources in a linear meander belt zone (Hemmings 1982b).

The 1691-92 Teran map illustrated this pattern showing 25 clusters of buildings, of which 23 appear to be farmsteads dispersed along both sides of Red River and around two oxbow lakes. At the western end was a ceremonial center represented by a platform mound with a structure on its top and a brush shelter at the base. Photographs (1868-1872) by Soule showed a Caddo refugee camp in Oklahoma which matched the Teran map farmsteads in most details, including beehive-shaped storage platforms (Schambach 1982).

Within the Upper Arkansas Valley region, Brown, Bell, and Wyckoff defined the following mound types and hierarchy of centers:

1. Low conical mounds over a dismantled structure;
2. Accretional burial mounds;
3. Pyramidal mounds lacking surface structures; and
4. Complex substructure mound with platforms (as cited in Perttula 1997).

Caddo V is chiefly known from documents and not from archaeological evidence. Caddoan groups maintained contact with Spanish and French outposts after 1690 A.D. Five villages were described in 18th and 19th French and Spanish records--Nanatchshoho, Upper Natchitoches, and Upper Nasoni villages in Bowie County, Texas; Upper Kadohadacho village in Little River County, Arkansas; and Lower Kadohadacho village in Lafayette County, Arkansas (Perttula 1997; Kelley 1994). Rosebrough Lake site and Hatchel-Mitchell-Moores complex were linked with the Upper Nasoni village illustrated on the Teran map and should possibly be placed in the Little River Phase (Schambach 1982). The Kadohadacho or "real chiefs" and four other tribal groups were near the Great Bend. The Kadohadacho was the preeminent group in the confederacy of Red River tribes which numbered over 2000 individuals at the beginning of the 18th century, but declined precipitously in the next few decades. Smallpox and measles epidemics and Osage raids severely reduced the Caddoan population and forced the abandonment of some settlements. By 1790, the surviving Great Bend Caddos migrated south into northwest Louisiana. Nicholas King's 1806 map showed deserted "Old Caddo Villages" above and below the Great Bend (Hemmings 1982b). Only certain Caddoan communities continued into the ethnographically recorded historic period. Areas of settlement contracted in space, but local amalgamation and patterns of valley abandonment initiated during earlier episodes of European contact and interaction were already more or less established by time of direct European contact (Perttula 1991). The Caddoan population dropped from an estimated 200,000 individuals in ca. 1520 A.D. to 8,500 individuals in ca. 1680 A.D., as a result of acute epidemic diseases introduced by Europeans. Many, if not all, of these epidemics occurred before any substantial recorded ethnographic descriptions (Perttula 1991 & 1997).

Large portions of the Caddoan area along major streams, such as the Arkansas, Red, and Ouachita rivers, were apparently abandoned by the time of European contact ca. 1680 A.D. The abandonment involved movement of groups as well as coalescence with other Caddoan groups that lived mainly in major riverine settlements along Red River. In east Texas, the impacts of depopulation and abandonment were less among the rural Western Caddoan communities. These communities were even more scattered than previously. Many small river valleys were unoccupied or had smaller overall population. Even after ca. 1700 A.D., Caddoan populations in East Texas were larger than the Kadohadacho and the Natchitoches on the Red River (Perttula 1991). Between 1788-1790, the Caddoan occupation of the Great Bend region ended. Due to raids by Osages, some Caddos moved south into Louisiana and others moved temporarily east toward the Mississippi Valley. When the Freeman-Custis expedition reached the area in 1806, it found only ruins of abandoned villages (Jeter et al., 1989; Schambach 1992).

The 18th century Kadohadacho and allied groups were active in intertribal and European trade specializing in osage orange wood, salt, horses, and furs. Interregional exchange and contact were well developed between Caddoan polities and horticulturists living in the southwestern United States, the southern Plains, and the Lower Mississippi Valley. The

key to this extensive interaction between hunter-gatherers and farmers was the exchange of salt and horticultural and game animal products (Perttula 1997).

The United States established several frontier factories or trading posts in the early 19th century to control both Native American and Euro-American trade. The Sulphur-Fork Factory was established in 1818 on the Red River just below the mouth of the Sulphur River. It operated until the abolition of the factory system in 1822. Its factory dealt with local Caddos and Coushattas and transient bands of Choctaws, Delawares, Creeks, Alabamas, Chickasaws, Shawnees, and Quapaws. Business was initially successful with 30,000 deer skins and 2,329 other pelts sent to Natchitoches and New Orleans in 1818-1819. The factory became the Caddo Indian Agency in 1821 with a small military attachment commanded by Captain George Gray. The agency was relocated south to Caddo Prairie in 1825. Systematic exploration, land surveys, and settlement occurred throughout the middle Red River Valley at this time.

By 1835, the Kadohadacho and allied groups numbered around 500. Caddoan lands were formally ceded to the United States under the Caddo Treaty of 1835, and these groups were forced to move to western Oklahoma in 1859 (Hemmings 1982b; Perttula 1997).

Other Native American groups, such as the Cherokees, Creeks, and Choctaws, also ceded title to their traditional homelands and were forcibly removed to the Indian Territory in Oklahoma in the early 19th century. Arkansas was one stop on their arduous journeys west. In the late 17th, early 19th centuries, the Quapaws lived in four villages near the confluence of the Arkansas and Mississippi rivers. In 1818, the group claimed ownership of the land between the Arkansas and Red rivers for a distance several hundred miles west of the Mississippi River. In 1825, the Quapaws were forced to settle on the Red River in northwest Louisiana among Caddoan Indians, but no lands were designated as belonging to them. The Arkansas lands which they lost were reserved for settlement by other Native Americans who were being moved west of the Mississippi River. Between 1828-1830, several Quapaw bands returned to Arkansas. These bands were moved in 1834 to reserve lands in the Indian Territory (Sabo et al., 1990).

Euro-American Herders-Hunters

Large herds of cattle, horses, and swine were introduced to northeast Louisiana and western Arkansas during the early 19th century. This was a highly mobile lifestyle; the participants traveled light and frequently changed residences to be near areas with abundant wild game. They subsisted primarily on wild meats. Corn was raised for the horses. Skins of beaver, otter, raccoon, deer, and bear were processed in order to trade for salt, iron pots, axes, blankets, knives, rifles, and other staples. Many items were obtained from commercial traders who regularly plied the rivers to selected spots where the herders-hunters could barter their hard-won furs, honey, bear's bacon, and buffalo-beef. The economy was based on scheduled seasonal hunting, trapping, livestock raising, cottage crafts, and limited gardening. During the summer, the men tended the livestock and women engaged in gardening. Cattle was taken to market in the early fall; some livestock was also slaughtered for personal consumption. The late fall and winter months were devoted to hunting and trapping. Men worked out of temporary camps scattered throughout the woods. Women and children remained at home where women tended to crafts, other maintenance activities, and the few heads of livestock which were kept to sire next year's herds. In spring or early summer, herds were turned out to graze in the uplands and garden crops were planted.

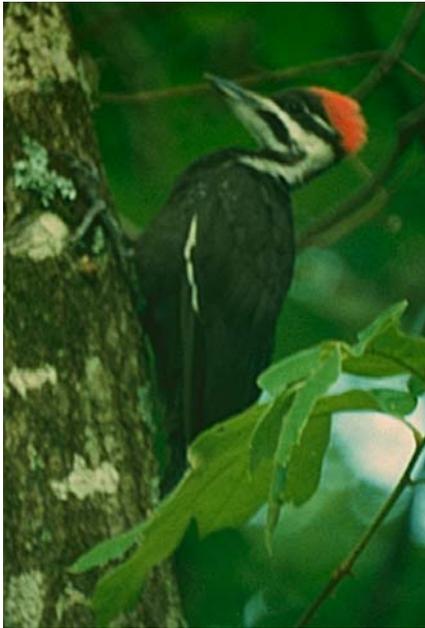
In the first quarter of the 19th century, there was a shift from hunting-herding to small scale farming. Public land surveys in 1815 opened up large tracts of potentially arable land in Arkansas. The farmsteads were typically small ranging from 5-20 acres. Primary crops were cotton and corn. Farm structures included pen-type cabin, later added to form double pen or dogtrot house, log and stone springhouses, barns, corncribs, well houses, privies, poultry house, pens for livestock (cattle and swine), and a smokehouse. Agricultural fields and pastures irregularly arranged and followed topographic features and zones of fertile agricultural soils (Jeter et al., 1989). As noted in the Socioeconomic section, fruits such as strawberries, melons, cantaloupes, and peaches, became the dominant cash crop of Sevier County in the early 20th century.

Salt Industry

Like the Caddos earlier, production of salt fueled the early frontier economy in Sevier County. Use of Salt Lake or Salt Slough, located in the western portion of the county and the Rolling Fork River, may have begun as early as the 1810s with the arrival of Joseph McKean. By the 1830s, a handful of individuals operated salt works at sites leased from the territorial government. Salt works were operated by Greene Orr at Rolling Fork Lick, later known as the Hamilton Salt Works, Robert Hamilton at Salt Lake Works, and John Clark and Benjamin Patton as partners of works on both the Saline and Rolling Fork rivers. The salt works declined in economic importance after the 1860s due to the construction of the railroad, cheaper salt production in the east, and lack of access to navigable streams. By the early 20th century, the works were abandoned (Johnson 1994).

Logging Industry

The post-Civil War industrial development in the midwest and the north spurred the need for many of the untapped natural resources, such as timber, coal, and iron, of the south. Investors purchased substantial tracts of land and constructed their own mills and company towns (Jeter et al., 1989). DeQueen's 1900 census documented the importance of the logging industry in Sevier County. A number of residents were listed as loggers (timbermen, haulers, lumbermen), laborers in the saw, planing, and stave mills, sanders, saw filers, tie makers, administrative staff of the mills, and timber inspectors. Other important pursuits included brick manufacture, the railroad, agriculture, black smithing, and mercantile (DeQueen 1987).



Pileated woodpecker
 Photo by Nick Milam

V. Environmental Consequences

While the previous section defined the objectives for each alternative, this section addresses the potential environmental effects of implementing these objectives. The planning team selected the following impact topics for analysis: Habitat and Wildlife Resources; Water Resources; Cultural Resources; Wildlife-Dependent Recreation and Environmental Education; Socioeconomics, and Community Involvement. These topics were chosen based on the important issues and concerns raised at the public scoping meeting and the planning team meetings. The effects of the alternatives on the impact topics are summarized in Table 10.

Alternative 1. Custodial Management (No Action Alternative)

Effects on Habitat and Wildlife Resources

Under this alternative, nature would “take its course” on all refuge lands. Due to the locally altered hydrology and abundant beaver, additional acres of forests would be replaced by beaver ponds, marshes, or early successional stage bottomland forest communities. Over time (120-150 years), the 6,000 acres of pine plantations could be expected to die out and be replaced by open water, bottomland hardwood forests, or marsh vegetation. No effort would be made to accelerate this restoration. On other areas of the refuge, bottomland hardwoods, cypress swamps, and riparian forests would mature.

Waterfowl. Waterfowl would benefit from the elimination of hunting and other human disturbance. With little or no management to control the beaver population, an increase in impounded water would be expected, providing additional short-term winter habitat for waterfowl. Seasonal shallow flooding of bottomland hardwoods provides acorns and other food sources for wintering waterfowl (Baldassarre and Bolen 1994). However, a significant loss of mast-producing hardwood timber would result from prolonged inundation combined with girdling of trees by beavers.

The net long-term effects of these degraded wetlands would likely be a substantial decrease in waterfowl numbers due to an overall reduction in habitat quality.

Neotropical Migratory Birds. Generally speaking, a passive hands-off management approach is not beneficial to bottomland hardwood bird species. With no management, the habitats in Pond Creek refuge which have been degraded by conversion to monocultural pine would take many years to revert to a productive hardwood stand. As existing hardwood stands mature, stand crown closure could be expected to increase across time resulting in partial or complete loss of mid-story and understory components. As a result, some priority bird species diversity and utilization rates would likely decline. This alternative would have a negative impact on most species of neotropical migratory birds that utilize the area.

Other Birds. Shorebirds, wading birds, and raptors would benefit from the elimination of human disturbance. Colonial nesting sites should increase with increased beaver impoundments. Wild turkeys should respond favorably to reduced disturbance and the elimination of unregulated hunting and should increase in numbers during favorable nesting years. The possible reduction in waterfowl numbers may have a negative effect on the food supply of wintering bald eagles.

Threatened Species and Species of Management Concern. Federally listed species and species of management concern would receive added protection with the removal of all public use. One species of management concern, the Rafinesque's big-eared bat, would benefit from the increase in old growth stems and the resulting increase in large, hollow trees.

However, under this alternative, no active management would be

undertaken to protect and enhance the habitats of listed species, which would ultimately have a negative impact on these species.



Red-headed woodpecker

Photo by Nick Milam

Resident Wildlife. The white-tailed deer population is currently thought to be well below carrying capacity on the refuge. With the removal of recreational activities, including hunting, and the absence of natural predators, numbers of deer would undoubtedly increase rapidly to an undesirably high level. Herd health would decline as deer exceed range capacities, and habitat damage would result from overbrowsing. Small mammal population levels are primarily dictated by food availability rather than hunting pressure. With no active forest management and an unregulated deer herd, dense understory vegetation would be reduced. Food and cover for many

resident wildlife species would be diminished, resulting in a moderately negative impact overall.

Fish. No attempt to identify and manage fisheries resources would be made under this alternative. Fishing would not be allowed on any of the refuge waters. With no management and the lack of fishing pressure, an imbalance toward the older age classes would be expected.

Invertebrates. No attempt to identify invertebrates would be made under this alternative. Invertebrate populations would fluctuate with environmental changes.

Effects on Water Resources

The impacts of localized alterations of hydrology caused by 40 plus miles of ditched, raised-bed roads and an over-population of beaver would continue to affect the refuge's forest communities. Eventually (100+ years), the forest communities would adapt to the new conditions that would reflect a permanent increase in open water, cypress swamps, beaver ponds, and marsh habitat and a decrease in the existing mixed species hardwood types present.

The refuge would serve the wetland functions of restraining flood flows and filtering water as well as helping protect the regional aquifer.

Effects on Cultural Resources

Under this alternative, any significant historic and cultural resources present on lands purchased by the Service would receive protection under federal historic preservation laws. The specific level of protection cannot be determined, as none of these lands have been comprehensively surveyed. The Service's presence would be limited and looting and site vandalism may continue unabated.

Effects on Wildlife-Dependent Recreation and Environmental Education

Under the custodial management (no action) alternative, the refuge would be closed to recreation activities. There would be no facilities developed or programs available. This would result in negative reactions and attitudes from the local community.



Oxbow Lake

USFWS Photo © Weyerhaeuser Company

Effects on Socioeconomic Environment

Economy and Employment. The refuge would be closed to all recreation activities under the custodial management alternative. Although the new refuge was previously under a different owner, recreational use of the land has been long standing. The loss of the refuge as a recreational area for local community members could negatively impact segments of the local economy, especially those businesses supporting hunting and fishing activities. The most significant possible impact on the socioeconomic environment would be increased conflict from user

groups on the refuge accustomed to using the area. No significant changes in population or employment opportunities would be expected under this alternative.

Land Use and Agricultural Production. Hog and poultry production has increased dramatically over the past few years and some adjacent landowners are concerned that refuge management would impact hog and poultry operations. Although this alternative would not impact agricultural production, the suspension of hydrological restoration activities would negatively impact water quality in the area from potential increases in runoff from hog and poultry production. Adjacent landowners would also suffer negative effects from the suspension of hydrological restoration and beaver control activities.

Effects on Community Involvement

Under this alternative, no partnerships would be established in conjunction with the refuge. Relationships with the public would be limited to land in-holders and adjacent landowners. Persons owning in-holdings would be permitted access to their property. Information regarding easement and access would be explained in meetings and in written material. The Service would establish reporting procedures for neighboring landowners regarding damage from beaver activities on the refuge.

Alternative 2. Minimal Management

Effects on Habitat and Wildlife Resources

Under this alternative, nature would take its course on 25,000 acres of refuge lands, except where habitat manipulation is absolutely necessary for the maintenance of federally threatened or endangered species. The bottomland hardwoods, cypress swamps, and riparian forests would mature. Dense young forests and shrub habitats would decrease. Remediation work would relieve altered hydrologic impacts on forest communities along 25 percent of the existing road system open to public use (about 6 - 8 miles). The 2,000 acres of pine plantation associated with these remediated roads would be converted to bottomland hardwoods. Over time (120-150 years), the remaining 4,000 acres of pine plantations could be expected to die out and be replaced by bottomland hardwood forests except where beaver impoundment or unremediated locally altered hydrology maintains open water or marsh vegetation. No effort would be made to accelerate conversion of these remaining pine plantations to bottomland hardwood forests.

Waterfowl. Under this alternative, minimal improvement in hydrology along major roads would not affect waterfowl numbers. Hunting and other wildlife-dependent recreation would have a negligible impact on waterfowl due to minimal activity.

Neotropical Migratory Birds. Little or no impacts different from those described under Alternative 1 above would be realized by neotropical migratory birds since management and habitat alterations would be minimal.

Other Birds. Wading bird and colonial nesting habitats would increase slightly due to beaver activity, but the increased disturbance factor from wildlife recreation would offset this minor improvement in habitat. The net result would be a negligible impact to wetland-dependent birds. Turkey numbers should increase slowly as the majority of the forested lands undergo vegetative succession to a mature timber stand with an open understory.

Threatened Species and Species of Management Concern. Under this alternative, efforts would be made to protect the habitat of federally listed species. The minimal recreational activities proposed under this alternative should not appreciably affect these threatened species or species of management concern. The absence of specific management and research could result in a negligible impact to these species of concern.

Resident Wildlife. Hunting would be allowed for population control and to prevent habitat degradation caused by overpopulation of resident wildlife, particularly white-tailed deer and raccoon. However, since no significant amount of habitat would be actively restored or enhanced, this alternative would have little or no impact to resident wildlife.

Fish. The fisheries management program would consist of inventory activities for threatened or endangered species only. Fishing opportunities would only be allowed in waters accessible by boat or by the 6 -8 miles of roads open to public access. This alternative is expected to have limited effect on population levels and fish population structure.

Invertebrates. Management activities on invertebrates would consist of identifying and inventorying threatened or endangered species only.

Effects on Water Resources

Localized alterations of hydrology would be partially remediated. Approximately 6 - 8 miles of ditched, raised-bed roads would be modified to allow normal hydrologic flows and beaver would be controlled as necessary to maintain water flows at these road crossings. Eventually, the forest communities would adapt to new conditions through changes to more water tolerant species compositions which generally provide less desirable wildlife habitat conditions. Increases in open water, beaver ponds, and marsh habitat would result.

The refuge would serve the wetland functions of restraining flood waters and filtering water as well as helping protect the regional aquifer.

Effects on Cultural Resources

Like Alternative 1, land acquisition by the Service would provide some degree of protection to significant archaeological and historic resources. Management actions to improve habitat for threatened and endangered species would require review by the Regional Archaeologist and consultation with the Arkansas State Historic Preservation Office as mandated by Section 106 of the National Historic Preservation Act.

Effects on Wildlife-Dependent Recreation and Environmental Education

Hunting. Hunting would be permitted only as needed to maintain wildlife populations within carrying capacity levels. This alternative would result in a significant reduction in hunting opportunities available to the public.

Fishing. Fishing would be limited to those refuge waters that are directly accessible by boat from the Little River or from stream banks along opened gravel roads. Fishing would fall under state seasons. Fishing opportunities would be reduced substantially under this alternative.

Wildlife Observation. Wildlife observation opportunities would be limited along open roads. No new facilities would be developed to promote wildlife observation and photography. Some access to these activities would be seasonally closed.

Education. Very little environmental education would result. No new facilities or access would be developed to carry out environmental education or interpretation programs. Only hunting and fishing brochures would be published.

Camping. Camping opportunities would be limited; camping would only be permitted during scheduled hunts.

Recreation on Wildlife. With minimal recreation activities occurring on the refuge, disturbance to wildlife due to visitor activities would be reduced. There would be seasonal fluctuations in disturbance, with greater disturbance during hunting seasons. With reduced access and facilities, a smaller portion of the refuge would be effected by visitor activity.

Conflicts Between Users. There would be limited conflicts between users with reduced recreation opportunities; however, potential conflicts could occur due to less access and fewer facilities. Some uses may need to be seasonal.

Effects on Socioeconomic Environment

Economy and Employment. In contrast to the Custodial Management Alternative, hunting and fishing opportunities would be increased thereby creating very limited opportunities for individuals involved in recreation

support enterprises such as hunting and fishing license sales, bait shops, and hunter supplies. In general, some positive impact on the socioeconomic environment would be expected.

Land Use and Agricultural Production. Land use would be minimally impacted as adjacent landowners would benefit from some active beaver control and minimal hydrological improvement programs. Agricultural production would not be impacted.

Effects on Community Involvement

No partnerships would be established regarding management and operation of the refuge. The Service would respond to concerns of adjacent landowners and in-holding owners by providing information concerning access to their property and removal of beaver dams affecting their property.

Alternative 3. Balanced Management (Preferred Alternative)

Effects on Habitat and Wildlife Resources

Twenty-seven thousand acres of refuge lands would be managed to enhance and maintain waterfowl and migratory nongame birds, threatened and endangered species, species with viability concerns, and resident wildlife. Locally altered hydrology would be restored and mature bottomland forests protected from unacceptable loss and fragmentation. The 6,000 acres of pine plantations would be liquidated as they mature. A large net increase in bottomland hardwood forest habitat and decrease in fragmentation would result. The bulk of the bottomland hardwood, cypress swamp, and riparian forests would mature, although species composition and forest structure could be manipulated to enhance specific habitat types.

Waterfowl. This alternative would increase waterfowl production and use by enhancing the quality of wetland habitats. Availability of food for wintering waterfowl would be increased by restoring hydrology and converting pine plantations to native bottomland hardwoods. Nesting habitat for wood ducks would also be improved through the implementation of an artificial nest box program and the preservation of trees containing natural cavities. Additional benefits would be provided to waterfowl by the construction and management of seasonally flooded moist soil units. Waterfowl hunting would be allowed under this alternative, but would remain consistent with sound biological principles. Adequate waterfowl sanctuary areas would be established to provide high quality, undisturbed habitat during waterfowl hunting seasons.

Neotropical Migratory Birds. Aggressive, hands-on management of refuge lands would benefit neotropical birds by providing quality nesting and feeding habitats. Forest management practices, such as conversion of pine plantations to native bottomland hardwoods, selective timber harvests to promote increased hard and soft mast production, and preservation of old-growth and streamside zones would all benefit forest-dwelling migratory birds. This alternative would provide a moderate positive impact to this bird group.

Other Birds. Existing colonial nesting sites would be protected and enhanced for wading birds such as egrets and herons. Human disturbance in these areas would be low during the nesting season since the areas in question are not popular locations for recreational activities. Access roads and trails would be routed away from the rookeries. Wild turkeys and resident songbirds should benefit from habitat management practices under this balanced alternative.

Threatened Species and Species of Management Concern. Under this alternative, federally designated threatened species and species of management concern would be identified and their habitats preserved, restored, and enhanced through management actions. Increased surveillance and law enforcement for bald eagles and other species would provide them with added protection. Also, active wetland management that results in increased waterfowl populations should provide additional food for wintering bald eagles. A moderate positive impact on threatened species and species of management concern would result from this alternative.

Resident Wildlife. This alternative provides the best opportunities to actively manage for resident wildlife and their habitats while providing high quality wildlife-dependent recreational activities. Restoration of hydrology and bottomland hardwood habitat through removal of pine plantation areas would provide quality habitat more quickly than the previous alternatives. Harvest and habitat management would benefit white-tailed deer as well as other wildlife by providing adequate food and cover. Increased hunting and other recreational activities would have minor impacts on non-hunted wildlife as these activities would not exceed wildlife capability to tolerate human disturbance. An overall moderate positive impact would be realized under this balanced alternative.

Fish. Under this alternative, a fisheries management program would be developed and initiated to identify fish species that occur in the area and to improve fisheries resources and improve aquatic habitats. Providing year round access to most refuge waters would enhance fishing opportunities.

Invertebrates. Management activities would consist of identifying and inventorying invertebrates. Threatened or endangered species of invertebrates that are found on the refuge would be protected.

Effects on Water Resources

Locally altered hydrology would be restored along all ditched, raised-bed roads and beaver controlled as necessary. Monitoring of forest communities and research into regional hydrological alterations and possible remediation would be explored. Overall, this alternative would have a minor effect on water resources.

The refuge would serve the wetland functions of restraining and filtering flood water, as well as helping protect the regional aquifer.

Effects on Cultural Resources

Historic and archaeological sites would be protected under federal ownership as defined in the National Historic Preservation Act of 1966, as amended through 1992 (P.L. 89-665); the Archaeological Resources Protection Act of 1979 (P.L. 96-95); the Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601); and the implementing regulations authored by the Advisory Council on Historic Preservation; the Department of the Interior; and the National Park Service.

A review of the State Site Files located at the Arkansas Archaeological Survey has provided preliminary information on the known or potential archaeological sites and historic structures within the proposed acquisition boundaries. Such information would facilitate the Service's planning for management of cultural resources after land acquisition. A comprehensive refuge-wide archaeological survey is recommended so that the Service's management options can be fully realized in a cost-effective manner. The survey would provide a site predictive model based upon the region's

cultural history, known site distribution, oral history interviews, historic documents, historic land use patterns, topography, geomorphology, soils, hydrology, and vegetative patterns.

As delineated in Section 106 of the National Historic Preservation Act, the Arkansas Historic Preservation Office would be asked to review and comment on any future management activities that may affect both recorded and unrecorded cultural resources.

Effects on Wildlife-Dependent Recreation and Environmental Education

Hunting. Restoration of bottomland hardwood habitat would be expected over time to result in increasing numbers of big game, small game, and waterfowl numbers and the resulting hunting opportunities. Habitat restoration, coupled with the application of sound wildlife management programs, would be expected to both increase and maintain wildlife populations and produce high quality hunting opportunities.

Fishing. Quality fishing opportunities would be provided and maintained within the principles of sound fishery management programs and policies. Fishing would be within state seasons.

Wildlife Observation. Habitat restoration would be expected over time to increase the numbers of animal and plant species. To take advantage of higher wildlife numbers, selected high quality wildlife observation sites (e.g., the use of foot-only trails, observation platforms, and viewing/photography blinds) would be developed for the public to experience a diversity of plant and animal species.

Education. Environmental education and interpretation would be provided both on and off the refuge to support and provide effective wildlife and ecosystem based information to the public. Partnerships with local schools to incorporate environmental education as part of the curriculum, using the refuge as a tool, would be developed. On-site interpretive programs using self-guided trails and tour routes with interpretive panels or brochures would be developed primarily in conjunction with wildlife observation and photography programs. Overall, education programs would be used to increase public awareness and demonstrate best management practices.

Camping. This alternative would have a relatively minor impact on the number of camping opportunities on the refuge in the foreseeable future. Year-round camping opportunities would be restricted to designated sites to support other wildlife-dependent activities (e.g., hunting, fishing, wildlife observation, and photography). These opportunities could increase or decrease over time due to changes in visitation levels and programs.

Recreation on Wildlife. Some recreation activities would have an unavoidable affect on some wildlife. There would be disturbance created from hunting and fishing activities and from visitors using trails and roads. Implementation of carefully designed refuge hunting seasons and public use regulations, routing of trails and roads along with time and space zoning would minimize these impacts. These effects would be minimal and would not result in cumulative wildlife population changes.

Conflicts between Users. During certain times of the year, particularly during the hunting season, there could be conflicts between hunters and other segments of the public interested in using the refuge to observe or photograph wildlife. This could require closing the refuge to some uses during certain seasons, or greatly restrict use.

Effects on Socioeconomic Environment

Economy and Employment. The optimum quality hunting and fishing opportunities provided under this alternative could potentially increase seasonal employment opportunities for individuals in the recreational and service sectors including hotels, bait shops, outdoor shops, service stations, and restaurants. Initially, much of this economic impact would be derived from traditional, consumptive recreationists such as hunters and anglers. However, as the refuge becomes more widely known and as wildlife observation facilities and programs expand, revenues from these nonconsumptive uses would increase. Research suggests that users interested in certain wildlife observation and photography are likely to spend more time and money in host areas than traditional wildlife enthusiasts. These types of users are often interested in shopping, bed and breakfast facilities, and historical tours. Although most of these opportunities are seasonal, the overall impact would be a positive increase in economic activity in the area especially if new hotels, bed and breakfast inns, and tourist facilities are developed.

Employment opportunities in the forestry sector, including contract logging, tree planting, and transportation jobs, could also increase as the existing pine plantations are converted to hardwood. These opportunities could be sustainable over the next several years if the pine resource is harvested as it becomes economically merchantable. Local sawmills might also benefit from increased harvests from the pine resources of the refuge. These opportunities would end as the remaining pine plantations were harvested and replaced with native hardwoods.

Land Use and Agricultural Production. Agricultural production should not be adversely affected under this management regime unless stricter water quality guidelines were implemented by the responsible state agencies now that the area is a national wildlife refuge. Grazing permits are not part of the proposed action on the refuge and would therefore not impact livestock production.

Effects on Community Involvement

Partnerships would be established with neighboring landowners. In the community, partnerships would be developed with organizations and groups to address a range of issues and concerns, but with the primary goal to enhance the ecological well-being of the area and increase environmental awareness. This may include such areas as habitat improvement and environmental education. Partnerships with schools and community organizations to raise environmental awareness through environmental education programs should have long lasting effects.

Mitigation Measures

Described below are the measures used to mitigate and minimize potential adverse effects.

Wildlife Disturbance. Disturbance to wildlife at some level is an unavoidable consequence of any public use program, regardless of the activity involved. Obviously, some activities innately have the potential to be more disturbing than others. All preferred alternative public use activities contained in this document have been carefully planned to avoid unacceptable levels of impact.

As currently proposed, the known and anticipated level of disturbance of the preferred alternative is considered minimal and well within the tolerance level of known wildlife species and populations present in the area. Implementation of the proposed public use program would take place through carefully controlled time and space zoning such as establishment of waterfowl sanctuary areas, establishment of protection zones around key

sites such as rookeries and eagle nests (if necessary), seasonal closure of most all-terrain vehicle trails, and routing of roads and trails to avoid direct contact with sensitive areas such as rookeries, etc. All hunting activities (season lengths, bag limits, number of hunters) would be conducted within the constraints of sound biological principles and refuge specific regulations established to restrict illegal or non-conforming activities. Monitoring activities through wildlife inventories and assessments of public use levels and activities would be utilized, and public use programs would be adjusted as needed to limit disturbance to acceptable levels.

User Group Conflicts. As public use levels expand across time, some conflicts between user groups may occur. Programs would be adjusted as needed to eliminate or minimize this problem and provide quality wildlife-dependent recreational opportunities. Experience has proven that time and space zoning, i.e., establishment of separate use areas, use periods and restricting numbers of users, are effective tools in eliminating conflicts between user groups, if necessary.

Effects on Adjacent Landowners. Implementation of the proposed action would not impact adjacent or in-holding landowners. Essential access to private property would be allowed through issuance of special use permits. Future land acquisition would occur on a willing seller basis only and at fair market values. The Environmental Consequences section of this Environmental Assessment states that if restoration activities include fencing stream banks, livestock owners would be forced to develop alternative water sources. Since all utilization of refuge lands by domestic livestock is already prohibited, on-refuge hydrology restoration activities would not impact adjacent livestock owners. The preferred alternative contains no provisions or proposals to pursue off-refuge stream bank riparian zone protection measures such as fencing other than on a volunteer/partnership basis if water quality sampling indicates a need to do so.

At several locations within the comprehensive plan, reference is made to the need for conducting water quality sampling and monitoring activities to document current conditions and seek to improve quality, if necessary. Existing state water quality criteria and use classifications are adequate to achieve desired on-refuge conditions, thus implementation of the preferred alternative would not impact adjacent landowners or users beyond the constraints already implemented under existing state standards and laws.

Land Ownership and Site Development. Proposed land acquisition efforts by the Service would result in changes in land and recreational use patterns, since all uses on national wildlife refuges must meet compatibility standards. Land ownership by the Service also precludes any future economic development by the private sector on these lands.

Potential development of access roads, dikes, control structures, and visitor parking areas could lead to minor short-term negative impacts on plants, soil, and some wildlife species. When site development activities are proposed, each activity would be given the appropriate National Environmental Policy Act consideration during pre-construction planning. At that time, any required mitigation activities, if necessary, would be incorporated into the specific project to reduce the level of impacts to the human environment and to protect fish and wildlife and their habitats.

As indicated earlier, one of the direct effects of site development is increased public use; this increased use may lead to increased littering, noise, and vehicle traffic. While funding and personnel resources by the Service would be allocated to minimize these indirect effects, such allocations would make these resources unavailable for other programs.

Alternative 4. Resource Management

Effects on Habitat and Wildlife Resources

Twenty-seven thousand acres of refuge lands would be intensively managed to maximize wildlife populations and enhance threatened and endangered species habitat. Additional high quality habitat for waterfowl would be created. Special efforts would be made to liquidate 6,000 acres of pine plantations within three years by clearing and replanting with bottomland hardwood species. Locally altered hydrology would be restored and beaver populations reduced. The net increase in bottomland hardwoods would be partially offset by increased habitat creation for waterfowl. The bottomland hardwood, cypress swamp, and riparian forests would be manipulated as necessary to maximize wildlife populations. Less mature forests and continued fragmentation would be expected.

Waterfowl. High quality habitat for waterfowl would be provided through the construction of up to 2,000 acres of impoundment units. Hunting would be allowed at a minimal level similar to Alternative 2 and the entire refuge seasonally closed to public use during peak waterfowl periods (December - February). An abundance of waterfowl sanctuaries would be established throughout the refuge, which would have a major positive impact on waterfowl populations.

Neotropical Migratory Birds. A special effort would be made to accelerate the restoration of bottomland hardwoods by converting pine plantations and restoring hydrology. This, along with other management practices, would maximize use of the refuge by neotropical migratory birds.

Other Birds. Wading birds, shorebirds, and raptors would also derive major benefit from this alternative due to the emphasis on management with minimal recreational activities.

Threatened Species and Species of Management Concern. Threatened species and species of management concern would benefit from habitat protection, restoration, and management activities proposed for this alternative. In addition, funding would be provided for research on species of concern.

Resident Wildlife. The accelerated restoration of bottomland hardwoods would benefit all resident wildlife. An emphasis on resource management, coupled with reduced human disturbance from recreational activities, would result in a major positive impact on this group.

Fish. Development and implementation of a fisheries management plan would result in an increased fish population on the refuge. However, in comparison to other alternatives, fishing opportunities would be limited to those areas accessible by boat from the Little River or existing gravel roads.

Invertebrates. Invertebrate species would be identified and inventoried. A plan would be developed to monitor indicator species of invertebrate populations. Recreational opportunities would be closed in areas of sensitive species.

Effects on Water Resources

Hydrology on refuge lands would be managed to maximize wildlife populations. Increased manipulation of water flows through the construction of dams and weirs would be expected. A return to a more natural hydrologic system would not occur. The refuge would serve the wetland functions of restraining and filtering flood waters, as well as helping protect the regional aquifer.

Effects on Cultural Resources

Under this alternative, intensive resource management to maximize wildlife populations and promote optimal habitat conditions would pose the most serious threat to any significant archaeological and historic resources present within the acquisition boundaries. Prior to the implementation of any resource management plans, a comprehensive refuge-wide archaeological survey is recommended. The survey would serve as a tool to avoid the majority of adverse impacts to significant cultural resources. The Service would be required to fund and conduct mitigation of those sites which cannot be avoided. Consultation and input from the Arkansas State Historic Preservation Office is required under Section 106 of the National Historic Preservation Act. Any recommendations concerning archaeological investigations and resource management made by the Arkansas Archaeological Survey would be noted.

Effects on Wildlife-Dependent Recreation and Environmental Education

Hunting. Hunting for big game and small game would be permitted only as needed to manage wildlife populations to meet refuge goals and objectives. Management activities would be based on sound biological principles. Waterfowl hunting would be closed in order to minimize disturbance and maximize population levels. Hunting opportunities would be reduced substantially compared to Alternative 3.

Fishing. Access for fishing would be permitted in refuge waters accessible by boat from Little River and from stream banks along refuge roads designated as open to the public. Fishing opportunities would be reduced substantially compared to Alternative 3.

Wildlife Observation. This alternative would have a relatively minor effect on the provision of opportunities for wildlife observation and photography. These opportunities would be limited to reduce disturbance to wildlife and refuge management programs. Foot-only trails and auto tour routes would be self-guided and possibly available only on a seasonal basis.

Education. Meeting only the minimum requirements of the Service, this alternative would provide limited environmental education and interpretive benefits to the community. These minimum requirements would involve teacher assistance in school, identifying the primary resource issues, and conveying that information to the public via brochures, kiosks, and public outreach.

Camping. This alternative would have a relatively minor impact on the number of camping opportunities on the refuge in the foreseeable future. Year-round camping opportunities would be restricted to designated sites to support other wildlife-dependent activities (e.g., hunting, fishing, wildlife observation, and photography). These opportunities could increase or decrease over time due to changes in visitation levels and programs.

Recreation on Wildlife. With reduced facilities, access, and seasonal programs, the impact on wildlife and its habitat would be very limited throughout most of the year. Seasonal fluctuations could be expected, especially during hunting season and high fishing activity.

Conflicts Between Users. With limited recreation programs and emphasis on resource management, conflicts between users should be significantly reduced. However, care would need to be given in management of access, both seasonally and by activity, to minimize conflicts between diverse user groups.

Effects on Socioeconomic Environment

Economy and Employment. Although hunting and fishing would be allowed under this management regime, it would be permitted only as needed to maintain wildlife populations within carrying capacity on the refuge. Wildlife observation and photography would be permitted only on a very limited basis. These somewhat limited recreation opportunities would create very little economic gains for individuals involved in recreational support enterprises such as hunting and fishing license sales, bait shops, and hunter supplies. In general, some positive impact on the socioeconomic environment would be expected but only on a seasonal basis and dependent upon wildlife management goals of the refuge; for example, harvest levels could vary based on population control parameters.

Employment opportunities in the forestry sector including contract logging, tree planting, and transportation jobs, would temporarily increase as the existing pine plantation resource is liquidated over a 3-year time period. Local sawmills might also temporarily benefit from the increased harvests from the pine resource of the refuge. These effects would be very short-lived, however, and limited. If the annual payment to the county via the Refuge Revenue Sharing Act were based on timber harvest revenues, the county would experience a brief one-time inflow of revenues. Area timber markets and prices could fall as the refuge timber was unloaded on the market.

Land Use and Agricultural Production. Agricultural production would not be adversely affected under this management regime unless stricter water quality guidelines were implemented.

Effects on Community Involvement

Partnerships would be established with groups and organizations that could assist with funds and expertise in improving refuge habitat. Technical assistance, expertise, and funds would be provided to landowners with in-holdings and to neighboring landowners regarding methods to improve habitats on their lands.

Effects Common to Alternatives

Health and Safety Effects

The alternatives would not have a significant effect on health and safety. The only potential safety problems are perhaps motorized vehicle accidents occurring on roads and trails, and accidents occurring during the hunting season where other user groups might be affected. As previously indicated, time and space zoning has been used successfully on other refuges to minimize the possibility of potential conflicts between hunters and other user groups.

Regulatory Effects

As indicated in the Background Section of the Comprehensive Conservation Plan and Appendix E, the Service must comply with a number of federal laws, administrative orders, and policy in the development and implementation of management actions and programs. Among these mandates are the Endangered Species Act of 1973; the Historic Preservation Act; and compliance with Executive Orders 11990 (Protection of Wetlands) and 11988 (Floodplain Management). Implementation of the alternatives would not lead to a violation of these or other mandates.

Uncertainty of and Future Action Effects

In general, a component of the alternatives is inventorying and monitoring of fish and wildlife populations on the refuge. Once this information is known, the Service would develop detailed step-down management plans to manage wildlife populations based on the application of sound fish and wildlife management principles and concepts. Therefore, the alternatives would not present highly uncertain environmental risks to the human environment. Further, the alternatives would not establish a precedent for future actions with significant effects.

Cumulative Effects

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects could result from individually minor actions, they could be viewed, as a whole, to be significant over time.

Implementation of the alternatives includes actions relating to site development, habitat and populations management, land acquisition, and recreation use programs. These actions would have both direct and indirect affects (e.g., site development results in increased public use, which increases littering, noise, and vehicular traffic); however, the cumulative effects of these actions over the 15-year planning period would not be significant.

Controversy Over Effects

As indicated in the description of the refuge environment, some wildlife populations (beaver, raccoon) are at high levels and these species are causing strong negative impacts on bottomland hardwoods and other wildlife species. Hunting and trapping programs are the only effective means of addressing these problems. The biological justification for these programs is indicated in the Comprehensive Conservation Plan and Compatibility Determination.

One issue for which there may be some controversy is the possible effect of incidental take associated with hunting and trapping programs. While some segments of the public may hold strong negative views about any consumptive use program (where taking of wildlife is involved), the proposed programs are priority public uses and are essential tools for population management. To minimize the possibility of long-term negative impacts to non-target species populations or to other refuge users, the proposed programs would be conducted under relatively controlled conditions with regulations and monitoring programs in place. As has been stated in the Comprehensive Conservation Plan, the refuge public use program, including hunting and trapping, will be adjusted as needed to minimize any long-term population impacts. Therefore, the long-term effects are not expected to be extremely controversial.

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Table 10. The environmental consequences of the alternatives

Impact Topic	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
Habitat and Wildlife Resources <i>Waterfowl</i>	Long-term waterfowl decreases due to reduction in habitat quality; minor benefits due to elimination of disturbance. Moderate negative impacts.	Long-term habitat losses would result in moderate negative impacts.	Waterfowl would increase due to increased and improved habitat.	Creation of impoundment units and sanctuaries on the refuge would have a positive impact on waterfowl.
<i>Neotropical Birds</i>	A passive management approach would have a substantial negative impact on species diversity and use rates.	Same as Alternative 1.	Positive impact would result due to habitat management.	Accelerated restoration of habitat would maximize bird use of the refuge.
<i>Other Birds</i>	Elimination of all disturbance would provide minor benefits to shorebirds, wading birds, and raptors. Nesting habitat for colonial birds should increase due to beaver dams.	Same as Alternative 1.	Positive benefit for colonial nesting birds (egrets, herons), wild turkey, and resident song birds due to protection and habitat management.	Positive benefits for wading birds, shorebirds, and raptors due to management and minimal recreation activities.
<i>Threatened Species and Species of Management Concern</i>	Federally listed species and species of management concern would receive added protection with removal of all public use. Lack of active management would negatively affect listed species. Rafinesque's big-eared bat could benefit from increase in old growth trees.	Absence of management and research would have a negligible effect on species of management concern. The limited recreation use would also have a negligible effect.	A moderate positive impact would be expected from active habitat management. Bald eagles and other listed species would benefit from law enforcement. Increase in waterfowl due to habitat management would provide food for wintering bald eagles.	Habitat protection, restoration, and management activities, coupled with research, would provide maximum benefits for species of management concern.
<i>Resident Wildlife</i>	Elimination of hunting would negatively affect deer as larger numbers exceed range capacity. With no active forest management, food and cover for many resident species would be reduced, resulting in a moderate negative impact to population levels.	Carrying capacities and population levels would reduce across time; hunting would control population levels; overall minor to moderate negative impact.	An overall positive impact would be expected. Active habitat management would provide increased food and cover for resident wildlife. Increases in resident wildlife would provide high quality wildlife-dependent activities. Increased disturbance from hunting and other recreational activities would have minor impacts on nongame species.	Accelerated habitat restoration would benefit all resident wildlife. Emphasis on resource management, coupled with reduced human disturbance from recreation activities, would result in positive impacts.

Table 10. The environmental consequences of the alternatives *(continued)*

Impact Topic	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
Habitat and Wildlife Resources <i>Fish</i>	With no management and the lack of fishing pressure, an imbalance toward the older age classes would be expected.	Limited fishing opportunities would not benefit fish population structure; threatened and endangered inventories would assist in management of listed species, if present.	A comprehensive inventory of fish species and habitat improvements would be expected to increase fish populations; moderate positive impact.	Development and implementation of a fishery management plan would result in greater benefits to fish populations. Moderate positive impact.
<i>Invertebrates</i>	No inventory of invertebrates would be conducted.	An inventory of invertebrates would be limited to threatened and endangered species only.	A comprehensive inventory of invertebrates would provide the foundation for protecting threatened and endangered species.	Based on a comprehensive inventory of invertebrates, a monitoring plan would be developed.
Water Resources	Altered hydrology caused by large beaver numbers and inadequate drainage associated with the road system would cause a major loss of hardwood forests; major negative impact.	Modification of 6-8 miles of ditched, raised-bed roads coupled with appropriate beaver control would partially restore normal flow patterns. Increases in open water, beaver ponds, and marsh habitat would occur following a major loss of hardwood forests across 25,000 acres; major negative impact.	Improvements along all raised-bed roads coupled with appropriate beaver control would result in moderate improvements in hydrology. Research on regional hydrological alterations, possible remediation, and the potential effects on forest communities would be explored.	Hydrology would be managed to maximize wildlife populations. This would involve construction of dams and weirs which would prevent a return to a more natural hydrologic system and result in moderate negative impacts.
Cultural Resources	Significant historic and cultural resources would receive protection under federal laws. Due to limited presence of the Service, vandalism could continue unchecked.	Significant historic and cultural resources would receive protection under federal laws. Proposed habitat improvements for threatened and endangered species require review by the Service Archaeologist and State Historic Preservation Office.	In addition to Alternative 2, comprehensive archaeological survey would provide basic information to protect cultural resources.	Resource management actions to maximize wildlife populations would, without identification and protection of historic and cultural resources, pose a serious threat to these resources. Archaeological surveys would provide a basis for avoiding adverse impacts and mitigating avoidable impacts.

Environmental Assessment

Table 10. The environmental consequences of the alternatives (continued)

Impact Topic	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
Wildlife-Dependent Recreation and Education <i>Hunting</i>	All hunting would be closed; major negative impact.	Since hunting would only be permitted as need to maintain wildlife populations within carrying capacity, a significant reduction in hunting opportunities would occur; moderate negative impact.	Habitat restoration, coupled with an application of sound wildlife management programs, would both increase and maintain wildlife populations and provide high quality hunting opportunities; moderate positive impact.	Hunting opportunities would be substantially reduced compared to Alternative 3. Big and small game hunting would only be permitted as needed to achieve population objectives. Waterfowl hunting would be closed to minimize disturbance and maximize population levels; moderate negative impact.
<i>Fishing</i>	All fishing would be closed; major negative impact.	Since fishing would be limited to those waters that are directly accessible by boat from the Little River or from stream banks along gravel roads open to the public, fishing opportunities would be substantially reduced; moderate negative impact.	Quality fishing opportunities would be provided and maintained using sound fishery management programs and policies. With appropriate access developed throughout the majority of the refuge, an increase in fishing opportunities would be expected; moderate positive impact.	Same as Alternative 2.
<i>Wildlife Observation</i>	All wildlife observation would be closed; negative impact.	Opportunities to observe wildlife would be limited along a few open roads; no facilities would be provided. Moderate negative impact.	Through the development of sites (e.g, foot-only trails, observation platforms, blinds), wildlife observation opportunities would increase. Moderate positive impact.	Wildlife observation and photography would be limited; only self-guided foot and auto trails would be provided on a seasonal basis. Minimal negative impact.
<i>Environmental Education</i>	Negative impact. The refuge would not develop and implement environmental education programs.	Very few environmental education and interpretive benefits would be generated by this alternative; educational efforts limited to regulatory brochures. Minor to moderate negative impact.	Environmental education and interpretive benefits would be generated both on and off the refuge. Partnerships with local schools would seek to integrate environmental education. Moderate positive impacts.	Meeting only the minimum requirements of the Service, this alternative would only provide limited environmental benefits to the community.
<i>Camping</i>	All camping would be closed.	Camping opportunities restricted; activity would only be permitted during scheduled hunts. Moderate negative impact.	Camping would be provided at levels needed to support on-refuge wildlife-dependent recreational activities; activity restricted to designated sites. Minor negative to moderate positive impacts.	Same as Alternative 2.

Table 10. The environmental consequences of the alternatives *(continued)*

Impact Topic	Alternative # 1 <i>Custodial Mg't.</i>	Alternative # 2 <i>Minimal Mg't.</i>	Alternative # 3 <i>Balanced Mg't.</i>	Alternative # 4 <i>Resource Mg't.</i>
Wildlife-Dependent Recreation and Education <i>Effects of Recreation on Wildlife</i>	No impact would occur since no wildlife-dependent recreational activities would be offered.	With minimal recreation activities occurring on the refuge due to reduced access and facilities, wildlife disturbance would be reduced; minor positive impact.	Some disturbance to wildlife due to wildlife-dependent recreation activities is unavoidable, but effects would be minimal. Carefully designed public use regulations, coupled with temporal and spacial zoning, would minimize these adverse effects. Minor negative impacts.	With reduced facilities, access, and seasonal programs, disturbance would be negligible.
<i>Conflicts between Users</i>	No impact	With reduced recreation opportunities, there should be few conflicts between user groups. However, reduced access and facilities opportunities could serve to generate conflicts. Possible minor negative impacts.	At certain times of the year there may be conflicts between user groups. Time and spatial zoning would be used to minimize these conflicts; negligible to minor negative impacts.	Same as Alternative 2.
Socioeconomic Environment	The loss of the refuge as a recreational area would have a moderate negative effect on the local economy, particularly businesses supporting hunting and fishing activities.	Hunting and fishing opportunities, although limited, would possibly generate a small positive impact on the local economy.	A moderate positive economic impact (employment, expenditures) would be expected due to increased public use and forest management programs.	Since limited wildlife-dependent recreation opportunities would be provided, only small, seasonal gains on the local economy might occur. A short-term increase in employment could occur in the forestry sector due to the liquidation of pine plantations.
Community Involvement	No partnerships would be established. Relationships with the public would be limited to land in-holders and adjacent landowners. Information regarding easements and access would be provided through meetings and written material.	With no partnerships being established, the Service would respond to concerns of adjacent landowners and in-holding landowners by providing information concerning access and removal of beaver dams.	Partnerships established with both landowners and community organizations would have a positive impact on habitat restoration, populations management, and the enhancement of wildlife-dependent recreation and environmental education opportunities.	Partnerships with community organizations would result in positive benefits to wildlife habitat on the refuge. Positive benefits to habitat on private lands could be expected with the provision of technical assistance and funding to landowners, both inside and outside the refuge.

VI. Consultation and Coordination

A planning team, composed of representatives from the Service, the Arkansas Cooperative Extension Service, the Arkansas Game and Fish Commission, the Arkansas Department of Parks and Recreation, Corps of Engineers, The Nature Conservancy, and several citizens from the local community, was formed to prepare the comprehensive conservation plan for Pond Creek National Wildlife Refuge. The inclusion of community members on the planning team not only “anchored” the refuge in the community, but also stimulated the creation of partnerships as one of the major goals of the refuge as well.

The planning team met on three occasions (May 20-22, September 3-5, and November 4-5, 1997), to develop a vision statement, goals, objectives, strategies and alternatives for the new refuge. Selected team members were also involved in writing the various sections of the plan.

The team conducted a public scoping meeting on June 26, 1997, to determine the important issues and concerns. Based on the issues and concerns generated at this meeting and the team’s knowledge of the refuge environment, this plan was prepared for public review and consideration. Mr. Randy Frazier, Superintendent of Pinnacle Mountain State Park in Roland, Arkansas, served as the facilitator for the planning team and the public scoping meeting.

A public meeting regarding the proposed plan was held on June 3, 1999, at the Elementary School in Horatio, Arkansas. The planning team discussed the public comments on June 4, 1999. After a 6-week comment period, ending June 30, 1999, the comments were summarized and the Service’s response to these comments is identified in Appendix E (a).

The planning team members were:

Mike Burns, Agriculture/Water Quality Coordinator, Arkansas Cooperative Extension Service, Hope, Arkansas.

Jim Clark, Visual Information Specialist, U.S. Fish and Wildlife Service, Division of Refuges and Wildlife, Southeast Regional Office, Atlanta, Georgia.

Tom Edwards, Wildlife and Habitat Management Biologist, U.S. Fish and Wildlife Service, Hazen, Arkansas.

Dave Erickson, Regional Planner, U.S. Fish and Wildlife Service, Division of Refuges and Wildlife, Southeast Regional Office, Atlanta, Georgia.

Garlin Griffin, local citizen, Horatio, Arkansas.

Jim Johnson, Refuge Manager, Felsenthal National Wildlife Refuge Complex, Crossett, Arkansas.

Rick Kanaski, Regional Archaeologist, Savannah Coastal Refuges, Savannah, Georgia

Larry King, Law Enforcement Officer, Felsenthal National Wildlife Refuge Complex, Crossett, Arkansas.

Richard Mattison, Landscape Architect, U.S. Fish and Wildlife Service, Division of Refuges and Wildlife, Southeast Regional Office, Atlanta, Georgia.

Evelyn Nelson, Editor, U.S. Fish and Wildlife Service, Division of Refuges and Wildlife, Southeast Regional Office, Atlanta, Georgia.

Griffin Park, Habitat Coordinator, District 4, Arkansas Game and Fish Commission, Perrytown, Arkansas.

Alan Smith, Park Manager, DeQueen and Gillhan Lakes, U.S. Corps of Engineers, DeQueen, Arkansas.

Donna Stanek, Outdoor Recreation Planner-Area I, U.S. Fish and Wildlife Service, Division of Refuges and Wildlife, Crossett, Arkansas.

Leslie Stanford, local citizen, Horatio, Arkansas.

The Honorable Dick Tallman, Sevier County Judge, Sevier County Court House, DeQueen, Arkansas.

Ralph Tyler, County Agent, Arkansas Cooperative Extension Service, DeQueen, Arkansas.

Tamara Walkingstick, Extension Specialist-Forestry, University of Arkansas, School of Forest Resources, Monticello, Arkansas.

Jim Wood, Writer/Editor, U.S. Fish and Wildlife Service, Division of Refuges and Wildlife, Southeast Regional Office, Atlanta, Georgia.

Doug Zollner, Director of Conservation Science, The Nature Conservancy, Little Rock, Arkansas.

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Summary of Public Scoping Comments

A public meeting was held June 26, 1997, at the Horatio Elementary School, Horatio, Arkansas, concerning the future management of Pond Creek National Wildlife Refuge. Fifty-six meeting participants were divided into six groups and facilitators recorded the comments on flip charts, according to pre-determined categories (e.g., hunting, fishing). The comments were then summarized for all participants. While the statements listed may not be identical in all cases to the comments given by participants, they do accurately reflect the intended meaning of those comments to the best ability of the planning team.

A. Public Use Management

- Fishing accessibility and fish contaminants
- Maintain fishing access to all ponds/lakes
- Desire all-terrain vehicle access to all ponds
- Provide 4-wheel drive access
- Reduce contaminants from hog and chicken operations

Camping Opportunities and Management

- Offer camping opportunities, both primitive and improved
- Limit camping length of stay
- Provide camping at remote fishing holes--Spring Lake, Red Lake, Little River, Gilliehand Shoals
- Control litter
- Retain traditional camping locations for deer camps

Hunting and Trapping Opportunities and Management

- Permit all kinds of hunting
- Increase turkey population
- Reduce hog population
- Permit use of dogs for hunting
- Maintain small game hunting
- Retain trapping opportunities
- Hunters should wear orange during the hunting season

Birdwatching Opportunities and Management

- Increase habitat for birds and animals
- Protect birds
- Allow birdwatching, but minimize conflicts with hunting
- Permit wildlife observation from vehicles/4-wheelers
- Provide opportunities to observe wildlife
- Designate driving and walking trails

Other Recreation Opportunities and Management

- Hiking should be permitted, but not during the hunting season
- Designate trails for hiking or all-terrain vehicles
- Provide opportunities for hiking and horseback riding
- Create horseback riding trail

All-Terrain Vehicle Trail Opportunities and Management

- Create accessibility
- Dinky line trail to access Little River
- Designate roads/trails for all-terrain vehicles using local input
- Gravel roads should be open for all-terrain vehicle use
- Use old logging roads for all-terrain vehicles
- Close some roads and convert to all-terrain vehicle trails
- Connect all-terrain vehicles to private property so that beaver can be trapped
- Provide access to trap beaver on private land
- Prohibit all-terrain vehicles on existing roads

Manage Trail Use

- Prohibit 4-wheel drive truck use on all-terrain vehicle trails
- Limit trail use (speed, traffic level, and group size)
- Prohibit all-terrain vehicle parties
- Exclude 2-wheelers and mud buggies
- Create special permits for use of all-terrain vehicles for hunting and trapping
- Permit needed for handicapped users
- Permit all-terrain vehicles to haul deer stands and haul out deer
- Permit the use of all-terrain vehicle trails for fishing and hunting access
- Allow seasonal use on designated trails; some trails should be open year round
- Restrict use of all-terrain vehicles

Accessibility

- Establish a public meeting to decide on road access
- Need access to lakes and river
- Establish no additional roads
- Provide as much access as possible, limiting road access as necessary
- Gravel roads should be open to provide accessibility for handicapped
- Establish one entry road--the middle one

B. Resource Management

Habitat Protection and Restoration

- Protect remaining oaks and holly
- Restore native hardwoods (oaks) from pine plantations
- Establish food plots
- Establish a balance between pine and hardwoods
- Protect old growth pine; eliminate pine plantations
- Solicit volunteers to assist in planting

Increasing Plant and Animal Diversity

- Restore large holly trees and sawtooth acorn trees
- Bring back native trees
- Achieve an optimum balance

Hydrology Restoration

- Get natural creeks flowing again
- Remove culverts from roads
- Maintain roads so that they are safe

Beaver Management

- Continuous control is necessary
- Obtain the assistance of local community in beaver control
- Consider financial incentives (bounty)
- Consider employing persons to control them
- Year round open season on beaver

C. Other Management Concerns

- Permit needed for use of firewood
- Free running dogs not allowed
- Control poaching

D. School Programs/Youth Camps/Adult Education

School Programs

- Additional education needed in schools
- Develop working knowledge of area
- Allow schools and other youth groups to use the refuge for educational purposes
- Teach hunting ethics
- Teach bird-watching

Youth Camps

- Construct an amphitheater and conduct evening programs
- Designate trails for horseback riding
- Provide trail rides for children (horses/all-terrain vehicles/bicycles/camping)

E. Refuge Neighbors

- Organize to influence decisions
- Continue to build relationships with neighbors
- Impressed with the dedication of refuge personnel

Flora and Fauna

Forest communities known to occur on Pond Creek National Wildlife Refuge

(The Nature Conservancy 1996)

Scientific Name	Common Name
<i>Salix nigra</i> shrubland	black willow shrub wetland
<i>Salix nigra</i> forest	black willow forest
<i>Planera aquatica</i> forest	water elm forest
<i>Liquidambar styraciflua</i> forest	sweetgum forest
<i>Quercus texana</i> forest	Nuttall's oak forest
<i>Quercus nigra-Ilex opaca</i> forest	water oak-American holly forest
<i>Pinus taeda-Quercus (alba/falcata/stelata)</i> forest	loblolly pine-oak forest
<i>Pinus taeda</i> plantation	loblolly plantation

High quality examples of plant communities considered rare in Arkansas

(Arkansas Natural Heritage Commission 1995)

Scientific Name	Common Name
<i>Quercus (phellos/pagoda/shumardii/texana)</i>	lowland oak-hickory forest
<i>Carya (laciniosa/illinoensis)</i>	
<i>Quercus michauxii-Quercus pagoda-Liquidambar, styraciflua</i>	lowland oak-sweetgum forest
<i>Pinus taeda-Quercus (nigra/phellos)</i>	lowland pine-oak forest
<i>Quercus lyrata-Carya aquatica</i>	overcup oak-bitter pecan forest
<i>Quercus phellos-Liquidambar styraciflua</i>	willow oak forest
<i>Taxodium distichum</i>	cypress swamps and channels
<i>Cephalanthus occidentalis</i> shrubland	shrub swamp
<i>Arundinaria gigantea-(Quercus/Celtis/Carya)</i>	forest canebrake
<i>Acer saccharinum-Ulmus americana</i>	riverfront forest
<i>Platanus occidentalis-Betula nigra</i>	river birch-sycamore riverfront forest

Plants known to occur on Pond Creek National Wildlife Refuge

(considered rare in Arkansas)

Scientific Name	Common Name
<i>Galium arkansanum</i>	Arkansas bedstraw
<i>Ranunculus flabellaris</i>	yellow water-crowfoot
<i>Sanicula smallii</i>	Small's sanicle
<i>Solidago ulmifolia</i> var. <i>microphylla</i>	elm-leaved goldenrod

Mussels known to occur on Pond Creek National Wildlife Refuge

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>
Unionoida/Unionidae	<i>Amblema plicata</i>	three ridge
	<i>Pyganodon grandis</i>	giant floater
	<i>Fusconaia flava</i>	pigtoe
	<i>Lampsilis hydiana</i>	Louisiana fatmucket
	<i>Potamilus purpuratus</i>	bleufer
	<i>Ptychobranhus occidentalis</i>	Ouachita kidneyshell
	<i>Quadrula cylindrica cylindrica</i>	rabbitsfoot
	<i>Toxolasma parvus</i>	liliput
Veneroida/Corbiculidae	<i>Corbicula fluminea</i>	Asian clam

Birds known to occur on Pond Creek National Wildlife Refuge

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>	<i>Resident Status</i>
Podicipediformes	<i>Podilymbus podiceps</i>	pied-billed grebe	W (Pr?)
Pelecaniformes/Phalacrocoracidae	<i>Phalacrocorax auritus</i>	double-crested cormorant	W
Pelecaniformes/Anhingidae	<i>Anhinga anhinga</i>	anhinga	M
Ciconiiformes/Ardidae	<i>Ardea herodias</i>	great blue heron	Pr
	<i>Casmerodius albus</i>	great white egret	Pr
	<i>Egretta thula</i>	snowy egret	B
	<i>Egretta caerulea</i>	little blue heron	Pr
	<i>Bubulcus ibis</i>	cattle egret	Pr
	<i>Butorides striatus</i>	green heron	B
	<i>Nycticorax nycticorax</i>	black-crowned night- heron	B
	<i>Nycticorax violaceus</i>	yellow-crowned night-heron	B
Ciconiiformes/Threskiornithidae	<i>Eudocimus albus</i>	white ibis	M (B?)
Anseriformes/Anatidae	<i>Aix sponsa</i>	wood duck	Pr
	<i>Lophodytes cucullatus</i>	hooded merganser	B
Falconiformes/Cathartidae	<i>Coragyps atratus</i>	black vulture	Pr
	<i>Carthartes aura</i>	turkey vulture	Pr
Falconiformes/Accipitridae	<i>Pandion haliaetus</i>	Osprey	W
	<i>Ictinia mississippiensis</i>	Mississippi kite	B
	<i>Haliaeetus leucocephalus</i>	bald eagle	W
	<i>Accipiter striatus</i>	sharp-shinned hawk	W
	<i>Accipiter cooperi</i>	Cooper's hawk	Pr
	<i>Buteo jamaicensis</i>	red-tailed hawk	Pr
	<i>Buteo lineatus</i>	red-shouldered hawk	Pr
	<i>Buteo platypterus</i>	broad-winged hawk	M
Falconiformes/Falconidae	<i>Falco sparverius</i>	American kestrel	Pr
Galliformes/Phasianidae	<i>Colinus virginianus</i>	northern bobwhite	Pr
	<i>Meleagris gallopavo</i>	wild turkey	Pr
Gruiformes/Rallidae	<i>Fulica americana</i>	American coot	W (B?)
	<i>Gallinula chloropus</i>	common moorhen	B
Charadriiformes/Charadriiformes	<i>Charadrius vociferus</i>	killdeer	Pr
Charadriiformes/Scolopacidae	<i>Actitis macularia</i>	spotted sandpiper	M
	<i>Gallinago gallinago</i>	common snipe	W
	<i>Scelopax minor</i>	American woodcock	W (Pr?)
Charadriiformes/Laridae	<i>Larus delawarensis</i>	ring-billed gull	M
Columbiformes	<i>Zenaida aurita</i>	mourning dove	Pr
Cuculiformes	<i>Coccyzus americanus</i>	yellow-billed cuckoo	B
Strigiformes/Strigidae	<i>Otus asio</i>	eastern screech owl	Pr
	<i>Bubo virginianus</i>	great horned owl	Pr
	<i>Strix varia</i>	barred owl	Pr
Caprimulgidae	<i>Caprimulgus carolinensis</i>	chuck-willis-widow	B
Apodiformes/Apodidae	<i>Chaetura pelagica</i>	chimney swift	B
Apodiformes/Trochilidae	<i>Archilochus colubris</i>	ruby-throated hummingbird	B
Coraciiformes	<i>Ceryle alcyon</i>	belted kingfisher	Pr
Piciformes/Picidae	<i>Colaptes auratus</i>	northern flicker	Pr
	<i>Melanerpes carolinus</i>	red-bellied woodpecker	Pr
	<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	Pr
	<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	W
	<i>Picoides pubescens</i>	downy woodpecker	Pr
	<i>Picoides villosus</i>	hairy woodpecker	Pr
	<i>Dryocopus pileatus</i>	pileated woodpecker	Pr

Birds known to occur on Pond Creek National Wildlife Refuge (*continued*)

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>	<i>Resident Status</i>
Passeriformes/Tyrannidae	<i>Contopus virens</i>	eastern wood-peewee	B
	<i>Contopus borealis</i>	olive-sided flycatcher	M
	<i>Empidonax vireescens</i>	Acadian flycatcher	B
	<i>Empidonax trailii</i>	willow flycatcher	M
	<i>Empidonax minimus</i>	least flycatcher	M
	<i>Saynoris phoebe</i>	eastern phoebe	Pr
	<i>Myiarchus crinitus</i>	great crested flycatcher	B
Passeriformes/Hirundinidae	<i>Progne subis</i>	purple martin	B
	<i>Tachycineta bicolor</i>	tree swallow	M
	<i>Stelgidopteryx serripennis</i>	northern rough-winged swallow	B
	<i>Riparia riparia</i>	bank swallow	M
	<i>Hirundo rustica</i>	barn swallow	B
Passeriformes/Corvidae	<i>Cyanocitta cristata</i>	blue jay	Pr
	<i>Corvus brachyrhynchos</i>	American crow	Pr
	<i>Corvus ossifragus</i>	fish crow	Pr
Passeriformes/Paridae	<i>Parus bicolor</i>	tufted titmouse	Pr
	<i>Parus carolinensis</i>	Carolina chickadee	Pr
Passeriformes/Sittidae	<i>Sitta carolinensis</i>	white-breasted nuthatch	Pr
Passeriformes/Certhiidae	<i>Certhia americana</i>	brown creeper	W
Passeriformes/Troglodytidae	<i>Thryothorus ludovicianus</i>	Carolina wren	Pr
	<i>Troglodytes troglodytes</i>	winter wren	W
	<i>Cistothorus platensis</i>	sedge wren	M (W?)
	<i>Cistothorus palustris</i>	marsh wren	M (W?)
Passeriformes/Muscicapidae	<i>Regulus calendula</i>	ruby-crowned kinglet	W
	<i>Poliophtila caerulea</i>	blue-gray gnatcatcher	B
	<i>Sialia sialis</i>	eastern bluebird	Pr
	<i>Turdus migratorius</i>	American robin	Pr
	<i>Catharus guttatus</i>	hermit thrush	W
	<i>Catharus ustulatus</i>	Swainsons thrush	M
	<i>Hylocichla mustelina</i>	wood thrush	B
Passeriformes/Mimidae	<i>Mimus polyglottos</i>	northern mockingbird	Pr
	<i>Toxostoma rufum</i>	brown thrasher	Pr
	<i>Dumetella carolinensis</i>	gray catbird	M (W?)
Passeriformes/Motacillidae	<i>Anthus spinoletta</i>	water pipit	M (W?)
Passeriformes/Bombycillidae	<i>Bombycilla cedrorum</i>	cedar waxwing	W
Passeriformes/Laniidae	<i>Lanius ludovicianus</i>	Loggerhead shrike	W (Pr?)
Passeriformes/Sturnidae	<i>Sturnus vulgaris</i>	European starling	Pr
Passeriformes/Vireonidae	<i>Vireo flavifrons</i>	yellow-throated vireo	B
	<i>Vireo griseus</i>	white-eyed vireo	B
	<i>Vireo solitarius</i>	solitary vireo	M
	<i>Vireo olivaceus</i>	red-eyed vireo	B

Birds known to occur on Pond Creek National Wildlife Refuge (continued)

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>	<i>Resident Status</i>
Passeriformes/Emberizidae	<i>Vermivora pinus</i>	blue-winged warbler	M
	<i>Vermivora peregrina</i>	Tennessee warbler	M
	<i>Vermivora chrysoptera</i>	organe-crowned warbler	W
	<i>Parula americana</i>	northern parula	B
	<i>Dendroica petechia</i>	yellow warbler	M
	<i>Dendroica coronata</i>	yellow-rumped warbler	W
	<i>Dendroica dominica</i>	yellow-throated warbler	B
	<i>Dendroica pinus</i>	pine warbler	Pr
	<i>Dendroica pensylvanica</i>	chestnut-sided warbler	M
	<i>Dendroica virens</i>	black-throated green warbler	M
	<i>Dendroica discolor</i>	prairie warbler	B
	<i>Mniotilta varia</i>	black and white warbler	B
	<i>Setophaga ruticilla</i>	American redstart	M(B?)
	<i>Protonotaria citrea</i>	prothonotary warbler	B
	<i>Limnothlypis swainsonii</i>	Swainsons warbler	B
	<i>Seiurus motacilla</i>	Louisiana waterthrush	B
	<i>Oporornis formosus</i>	Kentucky warbler	B
	<i>Geothlypis trichas</i>	common yellowthroat	B
	<i>Wilsonia citrina</i>	hooded warbler	B
	<i>Icteria virens</i>	yellow-breasted chat	B
	<i>Piranga rubra</i>	summer tanager	B
	<i>Piranga olivacea</i>	scarlet tanager	M
	<i>Cardinalis cardinalis</i>	northern cardinal	Pr
	<i>Pheucticus ludovicianus</i>	rose-breasted grosbeak	M
	<i>Guiraca caerulea</i>	blue grosbeak	B
	<i>Passerina amoena</i>	indigo bunting	B
	<i>Pipilo erythrophthalmus</i>	eastern towhee	Pr
	<i>Passerculus sandwichensis</i>	savannah sparrow	W
	<i>Melospiza melodia</i>	song sparrow	W
	<i>Melospiza georgina</i>	swamp sparrow	W
	<i>Melospiza lincolni</i>	Lincolns sparrow	M ?)
	<i>Passerella iliaca</i>	fox sparrow	W
	<i>Zonotrichia albicollis</i>	white-throated sparrow	W
	<i>Junco hyemalis</i>	northern junco	W
	<i>Sturnella magna</i>	eastern meadowlark	Pr
	<i>Agelaius phoeniceus</i>	red-winged blackbird	Pr
	<i>Quiscalus quiscula</i>	common grackle	Pr
	<i>Euphagus carolinus</i>	rusty blackbird	W
	<i>Molothrus aster</i>	brown-headed cowbird	Pr
	<i>Icterus spurius</i>	orchard oriole	B
	<i>Icterus galbula</i>	Baltimore oriole	B
	Passeriformes/Fringillidae	<i>Carduelis tristis</i>	American goldfinch

Pr = permanent resident
 B = breeding
 W = wintering
 M = migrant

Mammals known to occur on Pond Creek National Wildlife Refuge

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>
Marsupialia	<i>Didelphis virginiana virginiana</i>	Virginia opossum
Chiroptera/Vespertilionidae	<i>Lasiurus borealis</i>	red bat
	<i>Plecotus rafinesquii</i>	Raffinesques big-eared bat
Edentata	<i>Dasyurus novemcinctus</i>	nine-banded armadillo
Lagomorpha	<i>Sylvilagus floridanus alacer</i>	eastern cottontail
Rodentia/Sciuridae	<i>Sciurus carolinensis carolinensis</i>	eastern gray squirrel
	<i>Glaucomys volans saturatus</i>	southern flying squirrel
Rodentia/Castoridae	<i>Castor canadensis</i>	American beaver
Carnivora/Procyonidae	<i>Procyon lotor hirtus</i>	raccoon
Carnivora/Mustelidae	<i>Mustela vison</i>	mink
	<i>Mephitis mephitis mesomelas</i>	striped skunk
	<i>Lutra canadensis lataxina</i>	river otter
Carnivora/Canidae	<i>Canis latrans frustror</i>	coyote
	<i>Canis familiaris</i>	feral dog
	<i>Vulpes vulpes fulva</i>	red fox
	<i>Urocyon cinereoagenteus</i>	gray fox
Artiodactyla/Suidae	<i>Sus scrofa</i>	feral pig
Artiodactyla/Cervidae	<i>Odocoileus virginianus</i>	white-tailed deer

Reptiles known to occur on Pond Creek National Wildlife Refuge

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>
Crocodylia/crocodylidae	<i>Alligator mississippiensis</i>	American alligator
Testudines/Chelydridae	<i>Macrolemys temminckii</i>	alligator snapping turtle
	<i>Chelydra serpentina serpentina</i>	common snapping turtle
Testudines/Kinostrenonidae	<i>Kinostrenon subrubrum hippocrepis</i>	Mississippi mud turtle
	<i>Sternotherus carinatus</i>	razorback musk turtle
Testudines/Emydidae	<i>Chrysemys picta dorsalis</i>	southern painted turtle
	<i>Graptemys pseudogeographica ouachitensis</i>	Ouachita map turtle
	<i>Trachemys scripta elegans</i>	red-eared slider
	<i>Terrepenne carolina triunguis</i>	three-toed box turtle
Squamata/Scincidae	<i>Scincella lateralis</i>	ground skink
	<i>Eumeces inexpectus</i>	five-lined skink
Squamata/Iguanidae	<i>Anolis carolinensis</i>	green anole
	<i>Sceloporus undulatus hyacinthinus</i>	northern fence lizard
	<i>Nerodia sipedon pleuralis</i>	midland water snake
	<i>Nerodia fasciata confluens</i>	broad-banded water snake
	<i>Nerodia erythogaster flavigaster</i>	yellowbelly water snake
	<i>Ophreodryas aestivus</i>	rough green snake
	<i>Storeria dekayi wrightorum</i>	midland brown snake
	<i>Thamnophis proximus proximus</i>	western ribbon snake
	<i>Elaphane obsoleta obsoleta</i>	black rat snake
	<i>Lampropeltis getulus holbrooki</i>	speckled kingsnake
	<i>Masticophis flagellum flagellum</i>	eastern coachwhip
Squamata/Viperidae	<i>Agkistrodon contortrix contortrix</i>	southern copperhead
	<i>Agkistrodon piscivorus leucostoma</i>	western cottonmouth

APPENDIX B - Flora and Fauna Lists

Fish known to occur or possibly occur on Pond Creek National Wildlife Refuge

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>
Lepisosteidae/Gars	<i>Lepisosteus oculatus</i>	spotted gar
	<i>Lepisosteus osseus</i>	longnose gar
	<i>Lepisosteus platostomus</i>	shortnose gar
	<i>Lepisosteus spatula</i>	alligator gar (rare)
Amiidae/Bowfin	<i>Amia calva</i>	bowfin
Clupeidae/Herring	<i>Alosa chrysochloris</i>	skipjack herring (rare)
	<i>Dorosoma cepedianum</i>	gizzard shad
Esocidae/Pikes	<i>Esox americanus</i>	grass pickerel
Cyprinidae/Minnow	<i>Ctenopharyngodon idella</i>	grass carp (uncommon)
	<i>Cyprinella lutrensis</i>	red shiner
	<i>Cyprinella venusta</i>	blacktail shiner
	<i>Cyprinella whipplei</i>	Steelcolor shiner
	<i>Cyprinus carpio</i>	common carp
	<i>Hybognathus hayi</i>	cypress minnow (rare)
	<i>Hybognathus nuchalis</i>	Mississippi silvery minnow
	<i>Hybognathus placitus</i>	Plains minnow
	<i>Luxilus cornutus</i>	common shiner (uncommon)
	<i>Lythrurus umbratilis</i>	Redfin shiner
	<i>Notemigonus crysoleucas</i>	golden shiner
	<i>Notropis atherinoides</i>	emerald shiner
	<i>Notropis boops</i>	bigeye shiner
	<i>Notropis buchanani</i>	ghost shiner
	<i>Notropis rubellus</i>	rosyface shiner
	<i>Notropis volucellus</i>	mimic shiner
<i>Pimephales notatus</i>	bluntnose minnow	
<i>Pimephales vigilax</i>	bullhead minnow	
Catostomidae/Suckers	<i>Carpiodes carpio</i>	river carpsucker
	<i>Erimyzon oblongus</i>	creek chubsucker
	<i>Erimyzon succeta</i>	lake chubsucker
	<i>Ictiobus bubalus</i>	smallmouth buffalo
	<i>Minytrema melanops</i>	spotted sucker
	<i>Moxostoma duquesnei</i>	black redbhorse
	<i>Moxostoma erythrurum</i>	golden redbhorse
Ictaluridae/Bullhead Catfishes	<i>Ameiurus melas</i>	black bullhead
	<i>Ameiurus natalis</i>	yellow bullhead
	<i>Ictalurus furcatus</i>	blue catfish
	<i>Ictalurus punctatus</i>	channel catfish

Amphibians known to occur on Pond Creek National Wildlife Refuge

<i>Order/Family</i>	<i>Scientific Name</i>	<i>Common Name</i>
Caudata	<i>Ambystoma texanum</i>	smallmouth salamander
Anura/Bufo	<i>Bufo americanus charlesmithi</i>	dwarf American toad
	<i>Bufo woodhousii</i> subsp.?	Woodhouse's/Fowler's toad
Hylidae	<i>Acris crepitans crepitans</i>	northern cricket frog
	<i>Hyla cinerea</i>	green treefrog
	<i>Hyla chrysoscelis</i>	gray treefrog
Ranidae	<i>Pseudacris triseriata feriarum</i>	upland chorus frog
	<i>Pseudacris crucifer crucifer</i>	northern spring peeper
	<i>Rana utricularia</i>	southern leopard frog
	<i>Rana clamitans clamitans</i>	bronze frog

Butterflies known to occur on Pond Creek National Wildlife Refuge

Order/Family	Scientific Name	Common Name
Lepidoptera/Papilionidae	<i>Eurytides marcellus</i>	zebra swallowtail
	<i>Battus philenor</i>	pipevine swallowtail
	<i>Papilio cresspontes</i>	giant swallowtail
	<i>Papilio glaucus</i>	tiger swallowtail
	<i>Papilio polyxenes</i>	black swallowtail
Lepidoptera/Pieridae	<i>Pieris rapae</i>	cabbage white
	<i>Anthocharis midea</i>	falcate orange-tip
	<i>Colias philodice</i>	clouded sulphur
	<i>Colias eurytheme</i>	orange sulphur
	<i>Phoebis sennae</i>	cloudless sulphur
	<i>Eurema lisa</i>	little sulphur
Lepidoptera/Lycaenidae	<i>Feniseca tarquinius</i>	harvester
	<i>Calycopis cecropis</i>	red-banded hairstreak
	<i>Satyrrium calanus</i>	banded hairstreak
	<i>Everes comyntas</i>	eastern tailed-blue
	<i>Celastrina argiolus</i>	spring azure
Lepidoptera/Nymphalidae	<i>Libytheana carinenta</i>	American snout
	<i>Chlosyne nycteis</i>	silvery checkerspot
	<i>Pyciodes tharos</i>	pearl crescent
	<i>Polygonia interrogationis</i>	question mark
	<i>Polygonia comma</i>	hop merchant
	<i>Nymphalis antiopa</i>	mourning cloak
	<i>Vanessa atalanta</i>	red admiral
	<i>Vanessa cardui</i>	painted lady
	<i>Vanessa virginiensis</i>	American painted lady
	<i>Junonia coenia</i>	buckeye
	<i>Limenitis archippus</i>	viceroys
	<i>Limenitis arthemis</i>	red-spotted purple
	<i>Anaea andria</i>	goatweed emperor
	<i>Asterocampa celtis</i>	hackberry emperor
	<i>Asterocampa clyton</i>	tawny emperor
	<i>Danaus plexippus</i>	monarch
<i>Megisto cymela</i>	little woodsatry	

West Gulf Coast Plain Partners in Flight Bird Conservation Plan: Section 2 Avifaunal Analysis

Priority bird species for the West Gulf Coastal Plain: Entry criteria and selection rationale

Priority Entry Criteria ¹		Total PIF Priority Species Score	Concern Scores		Percent of BBS Population	Local Migratory Status ²	Geographical or Historical Notes
			Area Importance	Population Trend			
Ia.	Red-cockaded Woodpecker	32	5 ⁴	4 ⁴	8.1	R	
	Swallow-tailed Kite	29	3 ⁴	5 ⁴		E(LA,TX)	Widespread prior to 1900
	Southeast U.S. subsp.						
	Swainson's Warbler	29	5	3	32.1 ³	B	
	Bewick's Wren ^{4?} Eastern subsp.	28	2	5 ⁴		B(AR,OK)	Formerly common
Ib.	American Kestrel	27	44	44		R	
	Southeastern subsp.						
	Bachman's Sparrow	27	4 ⁴	3	10.1	D	
	Kentucky Warbler	26	5	5	18.4 ³	B	
	Cerulean Warbler	25	2	3	1.3 [?]	B(AR)	
	Prothonotary Warbler	24	3	5	6.2	B	
	Chuck-will's-widow	24	5	5	9.4	B	
	Brown-headed Nuthatch	24	5	2	13.8	R	
	Worm-eating Warbler	24	3	3	4.4	B	
	Hooded Warbler	24	5	4	20.2 ³	B	
	Scissor-tailed Flycatcher	23	3	4	4.1	B	
	Bell's Vireo	23	2	3		B	
	White-eyed Vireo	23	5	5	19.5 ³	B	
	Prairie Warbler	23	3	5	4.4	B	
	Orchard Oriole	22	5	5	7.6	B	
	Yellow-billed Cuckoo	22	5	5	9.4	B	
	Red-headed Woodpecker	22	4	5	3.2	D	
	Eastern Wood-Pewee	22	5	5	6.2	B	
	Louisiana Waterthrush	22	3	3	4.0	B	

¹Entry criteria:

- Ia. **Overall Highest Priority Species.** Species with total score 28-35. Ordered by total score. Consider deleting species with AI ≤ 2 confirmed to be of peripheral occurrence and not of local conservation interest, but retain species potentially undersampled by BBS or known to have greatly declined during this century.
- Ib. **Overall High Priority Species.** Species with total score 22-27. Ordered by total score. Consider deleting species with AI ≤ 2 confirmed to be of peripheral occurrence and not of local conservation interest, but retain species potentially undersampled by BBS or known to have greatly declined during this century.

² Local Migratory Status, codes adapted from Texas Partners in Flight as follows:

- A = Breeds in temperate or tropical areas outside of region, and winters in temperate or tropics outside of region (i.e., passage migrant).
- B = Breeds in temperate or tropical areas including the region, and winters exclusively in temperate or tropics outside the region (i.e., includes both breeding and transient populations).
- C = Breeds in temperate or tropical areas outside of region, and winters in both the region and in temperate or tropical areas beyond area (i.e., includes both transient and wintering populations).

- D = Breeds and winters in the region, with perhaps different populations involved, including populations moving through to winter beyond the region in temperate or tropical areas (*i.e.*, populations may be present throughout year, but may include a large number of passage migrants).
- E = Species reaching distributional limits within the region, either as short-distance or long-distance breeding migrants, but at population levels above peripheral status.
- F = Same as E except for wintering (non-breeding) migrants.
- R = Resident, generally non-migratory species (though there may be local movements).
- RP= Resident, non-migratory species, reaching distributional limits within the region, but at population levels above peripheral status.
- P = Pelagic, breeding grounds outside of region, but can occur during breeding season.
- PB* = *Post-breeding dispersal or non-breeding resident; species present during breeding season, but not known to be breeding in the region proper.*

³Highest percent of breeding population recorded in temperate North America; numbers in “ ” are likely projections; ? indicates species widespread outside of temperate North America and/or waterbirds poorly sampled by Breeding Bird Survey within physio. area.

⁴AI or PT score revised from what was derived by BBS data, or lack thereof, based on better local information.

Species suites for Pond Creek National Wildlife Refuge*

<i>PIF</i> Score	----- <i>Bottomland Forests</i> -----				<i>Pine Plantation</i>
	<i>Understory</i>	<i>Canopy</i>	<i>Midstory</i>	<i>Edge</i>	
29	Swainson's Warbler (drier)	Swallow-tailed Kite			
26	Kentucky Warbler (drier)	Cerulean Warbler			
24	Chuck-will's-widow (drier)		Prothonotary Warbler		Worm-eating Warbler (?)
	Hooded Warbler				
23	Bell's Vireo (willow thickets)			White-eyed Vireo	Prairie Warbler
22	Louisiana Waterthrush	Yellow-billed Cuckoo		Orchard Oriole	
		Red-headed Woodpecker			

* Species Suites, generated from Table 24, are as fairly discrete groups of species, and these groups are based on present and potential habitat conditions.

Cultural Resource Information

Fourche Maline 1-7 Phases within Southwest Arkansas.

<i>Culture</i>	<i>Phase</i>	<i>Region</i>	<i>Time</i>
FM1	----	Great Bend/Middle Ouachita	80-400 B.C.
FM2	Field Bayou	Great Bend	
	Lost Bayou	Middle Ouachita, Ouachita	500-100 B.C.
FM3	----	Middle Ouachita/Little Missouri	
FM3-4	Bellevue	Great Bend	100 B.C.-400 A.D.
FM4	Oak Grove	Middle Ouachita/Ouachita Mountains	200 B.C.-200 A.D.
FM5	----	Great Bend/Middle Ouachita	400-500 A.D.
FM6	Dutchman's Garden	Middle Ouachita	500-700 A.D.
	----	Ouachita Mountains/Little River/Little Missouri	500-700 A.D.
FM7	Crenshaw/Bowman 1	Great Bend	700-900 A.D.
	Old Martin	Little River	700-900 A.D.

Source: Jeter et al. (1989).

Diagnostic features of the Fourche Maline Culture.

Fourche Maline 1	Equated with the Terminal Late Archaic and early Tchefeunte culture of the Lower Mississippi Valley (LMV). To date, only the preceramic level at the Johnny Ford site (Great Bend region) identified as FM1. Site located on the margin of the Red River floodplain indicating a riverine or bottomland orientation. Gary points, major diagnostic marker for FM, found in probable association with Poverty Point items, such as Delhi points, steatite vessels, hematite plummets, and beads.
Fourche Maline 2	Seen as coeval with Tehula/Tchefeunte Period in the LMV. Diagnostic artifacts include Gary, var. Leflore, points, Cooper Boneware and Williams Plain ceramics, and double-bitted axes.
Field Bayou Phase	Identified at the Johnny Ford site and the nearby Cicero Young Mound. Diagnostic artifacts are Gary points, polished boatstones, pendants, and gorgets. Treatment of the dead as revealed by the excavation of 15 interments included cremation and the subsequent burial of the remains and heat-shattered artifacts. A circular structure with a large fire pit containing cremated human remains was observed at the Cicero Young Mound. The mound has been interpreted as a charnel house and crematory probably associated with the nearby Johnny Ford site.
Lost Bayou Phase	Identified at the Cooper site in the Middle Ouachita region. Associated with small amounts of Marksville ceramics. Sites attributed to the phase are substantial midden deposits in riverine alluvial bottomlands settings. Just how these deposits were formed are unresolved.
Fourche Maline 3	Coeval with LMV Early (Hopewell) Marksville. This period, like the following one, is poorly known. Many sites have been destroyed by land-leveling or intensive looting. Burial mounds, such as the Red Hill Mound, appeared and usually included a single cremation or flesh burial with offerings in a central tomb under it. The dominant burial mode during the Fourche Maline periods was flexed or extended interments in shallow graves scattered throughout village middens with few or no offerings.
Fourche Maline 4	Coeval with LMV Late Marksville (or non-Hopewellian Issaquena and northern plainware). Recent excavations at the Ferguson site, a Caddoan mound with extensive Fourche Maline middens, may provide some answers for the poorly known Fourche Maline 3-4 (report in progress).
Oak Hill Phase	Characterized by Williams Plain and Ouachita Ironware ceramics, locally produced ceramics with occasional Marksville-like designs, Gary, var. Camden, narrow points, and Poole pipes.

Diagnostic features of the Fourche Maline Culture. (*continued*)

Fourche Maline 5	Best known in the Middle Ouachita and the Great Bend regions. Key sites are Condray [Middle Ouachita], Shane's Mound and Shane's Village [Great Bend]. Diagnostic artifacts include by Williams Plain ceramics, Scallorn-like points, and late variants of the Gary point. Shane's Mound was constructed over a pit containing cremated human remains, Gary points, boatstone, and ornaments of animal and human bones. Midden burials found in the nearby village. Condray was a small hamlet of 3-4 houses. FM5-6 periods seen as contemporary with Baytown-Troyville groups of the LMV.
Fourche Maline 6	Best known in the Middle Ouachita, Ouachita Mountains, Little Missouri, and the Little River regions. Similar artifact assemblage as that of FM5, but Larto Red ceramics have been added. Key sites are Means [Ouachita Mountains], Allen's Field and Kirkham [Little Missouri], and Hutt [Little River]. Allen's Field was thought to be a small "farmstead."
Dutchman's Garden Phase	Based upon the analysis of materials from the Means site. One well-defined settlement type is an intense midden deposit located in alluvial bottomland settings. Other components of settlement systems have yet to be identified.
Fourche Maline 7	Ceramic assemblage dominated by clay or grog-tempered Williams Plain and grit-tempered LeFlore Plain. Gary points are absent from unmixed FM7 assemblages, but arrow points are common. Long-stemmed Crenshaw variety of Red River pipes were found in burials and other ceremonial contexts. Sites found in Great Bend, Little Missouri, and Little River regions of southwest Arkansas. Until quite recently southwest Arkansas sites and phases of this period attributed to Coles Creek culture. Schambach has suggested that so-called Coles Creek pottery were misclassified and none actually made by Coles Creek potters. He has also suggested that FM7 groups' LMV ties were to the northeast with Arkansas River lowland groups, such as the Plum Bayou Culture.
Crenshaw Phase	Associated with the Crenshaw site in the Great Bend region. Diagnostics ceramics included late varieties of Williams Plain, varieties of Coles Creek Incised (Chase, Keno, and Lonoke), and local variants of French Fork Incised. Bone temper used in about 25% of the ceramics. Red filming used on the pottery. Slightly later than Dutchman's Garden Phase. The Crenshaw site is a major FM village covering perhaps as much as 8 hectares and containing at least three mounds and four cemeteries; later represented largest FM mortuary complex in southwest Arkansas. Both mound and midden burials were found. Midden burials were mostly FM7, and most but not all the mound burials are Caddoan. Cemetery located near Mound B had a large group interment which may represent a high status FM precinct. Less formal burials were frequently seen in and beneath village refuse in other parts of the site. Grave offerings consisted of 1-2 pots placed near the individual's head. The pots were LeFlore Plain, Williams Plain, Coles Creek Incised, French Fork Incised, and Crockett Curvilinear Incised.
Old Martin Phase	Associated with the Old Martin site on the Little River. The site is a large FM7-Caddo I cemetery with over 67 graves - all of which essentially destroyed by looters.

Sources: Jeter et al. (1989); Schambach (1982).

Regional cultural sequences in the Caddoan Area near and adjacent to Pond Creek National Wildlife Refuge.

<i>Period</i>	<i>Time (A.D.)</i>	<i>Great Bend</i>	<i>Little River</i>	<i>Northwest Louisiana</i>
Caddo V	1800 1700	Chakanina		Little River/Lawton
Caddo IV	1600 1500	Belcher/Texarkana	Saratoga	Belcher Bossier
Caddo III	1400 1300		Mineral Springs	
Caddo II	1200 1100	Haley/Cryer	Craves' Chapel	Haley
Caddo	1000 900	Lost Prairie/Bowman 2	Miller's Crossing	Alto

Sources: Jeter et al. (1989); Perttula (1997).

Diagnostic features of Caddo I-V.

Caddo I	Burial of one or more individuals with funerary Adamson dome-shaped or flat-topped mounds, such as Crenshaw Mound C in the Great Bend region and Gahagan Mound in Louisiana.
Lost Prairie Phase	Ceramics: Crockett Curvilinear Incised, Pennington Punctated-Incised, Fine Engraved, Spiro Engraved, Wilkinson Punctated, Hollknowe Ridge-Pinched, Williams Plain, Leflore Plain, Harrison Bayou Incised, Beldeau Incised, Weches Fingernail Impressed, and late varieties of Coles Creek Incised. Other artifacts types included long-stemmed Red River pipes, Alba and Agee points. The latter are considered non-functional and are restricted to ceremonial contexts.
Caddo II	“Baroque” ceramics from burials at mound sites, such as Haley and Mineral Springs.
Cryer Phase	Alluvial valley farmsteads and small upland sites. Paste and design elements are not as well executed as those seen at the Haley site. Poorer-quality ceramics which accompanied burials at Cryer Phase sites can be attributed to class or social distinctions.
Caddo III	Defined in strict chronological sense only. Region heavily occupied, but archaeologists have been unable to isolate any phases attributable to this period. Decline in mound building and mortuary ceremonialism. Shift to more dispersed settlement pattern. Specialized use of salt licks begun ca. 1400-1500 A.D.
Caddo IV	Revival of mortuary ceremonialism and increasing contact with Mississippian cultures to the east. Increased emphasis on use of salt licks in the 17th and 18th centuries which is associated with the development of the deer hide trade. After the last periods of mound construction, the Little River drainage was abandoned. Declining population seen elsewhere resulted in the restriction of settlements to widely separated locales. Site types limited to small hamlets or farmsteads and community cemeteries which were intrusive into non-functioning mounds.
Texarkana Phase	Texarkana Sites are clustered north and northwest of Texarkana on both banks of Red River. Much of the information on this phase came from WPA excavations in Bowie County, Texas and amateur excavations at the Bowman site on the Red River in southwest Arkansas. Ceramics: Avery Engraved, Barkman Engraved, Simms Engraved, Nash Neck Banded, and McKinney Plain. Very distinctive red slip seen on vessels; minor use of shell temper.
Belcher Phase	Sites are found from Fulton, Arkansas south to Shreveport, Louisiana. Important sites include Belcher site (Caddo Parish), Spirit Lake and Cedar Grove sites (Lafayette County, Arkansas). Ceramics: Belcher Engraved, Hodges Engraved, Glassell Engraved, Dunkin Incised, Foster Trail Incised, Cowhide Stamped, Belcher Ridged, Karnack Brush Incised, and Briarfield Plain. Other artifacts included Bassett, Alba, and Scallorn points, triangular and rectangular scrapers, groundstone tools, bone tools and ornaments, and conch and mussel shell tools and ornaments. Structures were circular with vertical walls covered with wattle-and-daub. At the Belcher site, corn, common beans, and wild plant foods, such as hickory nuts, black walnuts, and persimmons, bones of white-tailed deer and a variety of fish species, and mussels were recovered; at the Cedar Grove site bones of white-tailed deer, turkey, gar, bowfin, aquatic turtles, corn, bottle gourd, squash, a variety of nuts, and seeds of persimmon, grape, and marsh elder.
Saratoga Phase	Primarily known from mound shaft burials and cemeteries at the Mineral Springs site. Mortuary complexity diminishes prior to the abandonment of the Little River region after 1550 A.D. 3Sv29, a salt-production site on the Rolling Fork River, and a small habitation site on the Lower River indicate at least some use of this area by the Caddos after ca. 1650 A.D. Ceramics: Haley Engraved, var. Adams, shell-tempered Nash Neck-Banded, and Emory Punctated-Incised.
Caddo V	See text.
Chakanina Phase	Cluster of sites south of Fulton in the Spirit Lake locality. Phase defined primarily on basis of ceramics. Ceramic assemblage included Natchitoches Engraved, Keno Trailed, Belcher Engraved, Belcher Ridged, Foster Trailed Incised, Hodges Engraved, Belcher Engraved and Foster Trailed Incised at least 50% shell-tempered and possible 90-100% in very late assemblage. Possibly associated with the historic Kadohadacho.
Little River Phase	Affiliated with the Upper Nasoni. European bead types indicate contact with early 18th century French traders from Fort de St. Louis.
Lawton Phase	Associated with the Natchitoches Confederacy. Type sites include Fish Hatchery Site (16Na13), and Lawton site (16Na13). These sites are cemeteries and were heavily disturbed during construction. Ceramics: Natchitoches Engraved, Keno Trailed. Shell and glass beads, brass bells, and bracelets, and other European artifacts also found in the burials. Two horse burials associated with pottery were observed at the Fish Hatchery

Site.Sources: Hemmings (1982b); Jeter et al. (1989); Kelley (1994); Perttula (1997); Schambach (1982).

Service Response to Public Comments on Draft CCP

(Comments received at a public meeting held June 3, 1999 at the elementary school, Horatio, AR)

General Comments

Comments	Plan Revised	Fish and Wildlife Service Response
Not enough response to citizen input.	No	Service disagrees; public input has been very carefully considered and included where consistent with law, agency policy and compatibility standards. Also, refuge staff has met repeatedly with the public to review ongoing public use program - each meeting has resulted in changes to the public use program.
Plan and alternative too general; need more specifics.	No	This comment was made based upon review of the highlight summary document <u>only</u> which does not contain details; person commenting was provided a copy of complete document which contains specific details of proposed plan and asked to provide any comments in writing; none received.
Establishment of quota hunts OK if necessary for wildlife management.	No	The preferred alternative provides for using quota hunts, if necessary, to achieve wildlife population objectives and provide quality user opportunities; specific decisions in the future to implement quota hunts will depend upon wildlife population responses and public use levels.
Continue to allow hunting as is.	No	Preferred alternative identifies hunting as a priority public use at this refuge with current and anticipated future levels of hunting determined to be compatible with the purposes for which the refuge was established. Season lengths, bag limits and numbers of hunters will be adjusted as needed across time to meet wildlife population goals.
Access to Cossatot River has been taken away for modern vehicles; boats cannot be shuttled with trucks.	No	Current access point across refuge property to Cossatot River provided by ATV trail open to year round use; this ATV is trail located along a logging road which is impassable to conventional vehicles; location at river not conducive to removal of boats <u>or</u> development due to high, sheer banks. All known access locations to the river in refuge vicinity are on private property; purchase of remaining lands in acquisition boundary will provide usable access.
"Little by little" the plan seems to be taking out some of the things that were originally presented in the first management plan, --access, etc. Against the plan.	No	Road and trail system presented in preferred alternative resulted from indepth coordination with public obtained from many meetings and experience over the past two years and reflects, at current public use levels, an optimum mix to provide for compatible wildlife dependent recreation. As a result of public input, substantial increases in roads and trails open to vehicle use are incorporated in the preferred alternative compared to initial implementation of refuge regulations in 1997 (addition of 3+ miles of ATV trails open to year round use, addition of 5+ miles of seasonally open ATV trails, rerouting of numerous ATV trails, opening 6-7 miles of additional secondary roads to conventional vehicle use for access to lakes for fishing, and establishment of another campground at Red Lake, etc.).
Accelerate funding and staffing for refuge so it can be a stand-alone refuge.	No	Funding, and thus staffing, depends to a large degree on the annual appropriations enacted by Congress; the preferred alternative presents optimum staffing and funding levels needed to operate as a separate refuge; when completed, this plan will assist in competing for needed funding.
Entrance/access fee - opposed to general entrance/user fee.	No	Preferred alternative does not propose a general entrance fee; if quota hunt permit system was implemented in the future, agency policy requires a fee be charged to cover administrative costs for these permits.
Road closures OK if needed for habitat management - good for wildlife management.	No	Road system (primary and secondary) identified in preferred alternative closes about 1/3 - 1/2 of the roads that exist on the area; closure and removal of these roads essential for hydrology restoration and wildlife management.
Nuisance animal control - beaver and coon - increase take on area because populations too high.	No	Refuge staff agrees populations of these species are too high and impact other refuge resources; preferred alternative provides for liberal seasons on these species and provides options for additional control methods if necessary.
Comment: there is an ample number of folks interested in doing volunteer work.	No	Preferred alternative identifies the need for public involvement in refuge management which certainly includes volunteer work. Volunteer work on refuges nationwide is a tremendous asset and will be aggressively pursued at Pond Creek refuge.

Habitat Management

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
Will there be habitat improvements (plantings) to enhance habitat for neotropical birds, migratory birds, etc.? This could be a good “community service project.	No	Habitat improvement actions will be accomplished primarily through active forest management, development of waterfowl management units, etc. Traditional wildlife food plot plantings are not a planned component of the proposed program; could be implemented if needed to achieve habitat objectives; volunteer assistance with this or other efforts would be appreciated.
More water management; i.e. levee construction, greater - greentree reservoirs.	No	See previous comment on this subject
Controlled burning should be done.	No	Native forest communities at Pond Creek refuge are floodplain hardwoods; fire is detrimental to hardwood systems and will not be used as a management tool. Application of prescribed fire to off-site pine plantations would provide some short-term habitat improvements, but would remove all advanced hardwood regeneration on these sites and impact efforts to convert these plantations to hardwood stands.
Control duckweed in sloughs.	No	Preferred alternative contains no provisions to implement duck weed control in refuge waters; such action is considered impractical, cost prohibitive and questionable as to results/impacts to other resources.
Pine Plantations Pine plantations should be eliminated - plant back to hardwoods.	No	Preferred alternative identifies elimination of pine plantations and conversion of these sites to hardwoods.
Convert pine plantations ASAP! economically by thinning when needed, and then harvesting.	No	See previous response on this subject.
Leave the big native pine in place.	No	Where pine occurs as a component of mixed species forest stands, it will be maintained at naturally occurring levels.
Instead of 30 year slow harvest for pine plantations, would it be better for wildlife to have faster conversion to hardwoods?	Yes	Preferred alternative stated conversion of pine plantations to hardwoods would occur across a 15 to 20 year period or as plantations became merchantable; revised this time interval to a 10 to 15 year period for this conversion process.
Get rid of the pine plantations.	No	See previous response on this subject.

continued...

Habitat Management (continued)

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
Hardwoods Emphasize hard mast production in forest management programs.	No	Forest habitat management actions will be addressed by development and implementation of a refuge habitat management plan. In brief, forest management will be directed by the habitat needs of priority refuge wildlife species and will include, among other things, maintenance/enhancement of the mast producing component in refuge forest stands.
Want quick growing hardwood trees on the area.	No	See previous response on forest habitat management
Too many gum trees growing up in bottoms.	No	See previous response on forest habitat management.
Is forest going to be managed? Wants lots of mast trees so forest needs to be managed.	No	Preferred alternative identifies a priority need for development and implementation of a forest habitat management plan. Also, see previous response on forest habitat management.
Get rid of a bunch of that water and the oaks will come back in.	No	Refuge staff agrees that long extended flooding caused by things such as beaver dams or inadequate openings at road crossings of sloughs/streams is detrimental to the hardwood forest system, including oaks; preferred alternative addresses this issue in detail and identifies multiple actions that will be taken to at least partially mediate.
Deer/Turkey Create food plots for deer and turkey.	No	See previous comment on this subject
Want deer populations increased.	No	See above responses to similar comments.
Waterfowl Specific locations and whether man-made or natural for waterfowl areas - need more than 1,000 acres. Consider greentree reservoirs throughout refuge.	No	Preferred alternative identifies open areas and agricultural fields inside acquisition boundary (but still privately owned) as locations for construction of waterfowl impoundments; 1000 acres of intensively managed agriculture fields and moist soil units considered adequate to meet habitat needs for the planning period covered by this document. Due to potential long-term adverse habitat impacts (among other things, heavy beaver infestations makes de-watering virtually impossible), greentree reservoirs not proposed in preferred alternative; habitat management plans developed within next 3-4 years will examine this need further.
Is there going to be moist soil units for waterfowl?	No	Preferred alternative calls for developing up to 1,000 acres of intensively managed moist soil units and agriculture fields to provide wintering waterfowl habitat.
Encourage establishment of millet to be provided in sufficient amount to enhance waterfowl population.	No	Preferred alternative calls for specific management actions, including establishment of moist soil units, to meet needs of wintering waterfowl; the major food component of these units is native riparian plants, including wild millets.
Is there a possible need for "set aside" area for waterfowl without disturbance?	No	See previous response on this subject.

Population Management

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
General Closure of areas due to colonial bird nesting is OK if needed to protect these sites.	No	Preferred alternative describes actions proposed to protect these sites which includes closure <u>if</u> monitoring indicates any impacts caused by public use.
Are you going to stock elk, bear, wolves? Fine if you do.	No	No plans to stock the species mentioned in this comment.
Fisheries Believe it is not possible to improve fisheries as stated.	No	Development and implementation of a fishery management plan to enhance fishery resources is a priority item of the preferred alternative; the degree to which these resources can be improved will depend upon many things such as results achieved through implementation of management actions.
Deer/Turkey Deer population lower than what needs to be; do management to increase.	No	The lower than desired deer populations currently present in the area are addressed in the plan and actions identified to correct this deficiency.
Something needs to be done to enhance deer population.	No	See previous response on this subject
Something needs to be done to enhance the turkey population; Will birds be brought in?	No	Plan identifies depressed turkey population present on area. Turkey restocking actions already underway; 16 wild trapped birds released in February 1999; more scheduled for release in 2000.
Want deer herd managed for trophy bucks	No	Implementation of actions designed to deliberately produce only 'trophy' bucks is not an objective of the preferred alternative. Such an approach would inhibit the ability to implement management based upon biological parameters and best science for priority wildlife species, including deer, and be incompatible with refuge purposes. Wildlife management on national wildlife refuges is directed at restoring and maintaining healthy, viable populations of all native wildlife within carrying capacities and with emphasis placed on priority species.
Feral Swine Nothing mentioned about hog management, way too many! Trap and liberal hunts!	Yes	Plan amended by adding section addressing feral swine and establishing a new objective on non-native animal control.
Get rid of (feral) hogs!	Yes	See above response on this subject.
What about problem with "wild hogs:" too many of them!	Yes	See previous response on this subject

continued...

Population Management (continued)

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
Beaver Service work with adjacent landowners on nuisance animals (beaver).	No	Preferred alternative states that “The refuge staff...and provide direct assistance to adjacent landowners where beaver dams on refuge property are impacting private property.”
Nuisance animals (beaver and hogs) - could use approach detailed in alternative 4 (use of contract trappers if necessary) to eliminate nuisance animals (beaver).	Yes	Strategy in preferred alternative addressing management of beaver populations to minimize habitat impacts was modified to include use of contract trappers if necessary to control populations. Refer to Comprehensive Conservation Plan for response on control of feral hogs.
Eliminate beaver		See previous response on this subject.

Land Conservation

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
General Comments If the refuge could purchase Dr. Hall’s land - would be excellent habitat to attract waterfowl.	No	Agree. This 600-plus-acre tract inside the approved acquisition boundary is a high priority identified in the preferred alternative.
Not moving fast enough in buying inholding.	No	See above responses to comments pertaining to land acquisition actions. In addition, the purchase of inholdings is identified as a priority action in the preferred alternative.
Expand refuge to include hardwood bottoms south of Little River in Little River Co.	No	This area is outside the established acquisition boundary for Pond Creek refuge. Detailed planning that leads to acquisition boundary expansion approval would be required. Field reconnaissance of this area will be conducted to determine if this recommendation is feasible.
Purchase inholdings ASAP, regardless of market value or cost of land.	No	Service will aggressively seek to purchase inholdings, dependent upon willing sellers and available funding; preferred alternative identifies this need. Purchase price offered to property owners must depend upon fair market value as determined by certified appraisals.
No problem with buying land on a willing seller basis - if price of land is high enough, we will sell.	No	See above response to similar comment

Wildlife-Dependent Recreation

Comments	Plan Revised	Fish and Wildlife Service Response
Accessibility Not enough conventional vehicle access (reconfirmed by others).	No	Primary and secondary road access identified in preferred alternative (with the modifications made through this planning process) is considered adequate to support existing levels of public use at this time; some changes will occur across time as needs change due to increases or decreases in public use levels or wildlife populations. Also, see response given below to comment on access for fishing.
Increase vehicle access to fishing lakes (e.g. Red Lake, Crane Lake).	Yes	Figure 6, which shows road and ATV trail system open to public use. Figure 6 was amended to include conventional vehicle access to Red, Jace, Litchford, and Spring Lakes. See above response pertaining to Crane Lake access.
Better road maintenance, refuge-wide.	No	Major improvements to the primary road system have been completed since refuge establishment. Road maintenance will continue to be a high refuge priority with accomplishments dependent upon the ability to obtain funding and staffing.
Wants a boat ramp on Little River - Hwy 41 Bridge.	No	This location is not on refuge property.
The more access the better.	No	See above responses to similar comments pertaining to road and trail system.
Hiking and Camping Would like to have more camping area (spread throughout the refuge).	Yes	Figure 6, which shows campgrounds, was amended by adding a camping area at Red Lake. With this addition, camp sites available are considered adequate to meet the needs of refuge users at current use levels.
Want hiking trails constructed; could try to find partners to help with this (Sierra Club for example).	No	Preferred alternative contains provisions for development of various public use facilities, including interpretive wildlife foot trails. Public Use Management Plan, scheduled for completion by September 1999, will detail these developments and locations.
All Terrain Vehicles Want more liberal ATV use (relative to hunting and fishing), specifically south of cable to Beason place.	No	ATV access identified in preferred alternative is considered adequate to support existing levels of public use; some changes will occur across time as needs change due to increases or decreases in public use levels or wildlife populations. Access past cable toward Beason Place is on private property; refuge has no authority to grant access across private property.
Change ATV trail on Salt Lick Road that goes to Cossatot River back to a vehicle road to put and take boat out of river.	No	This road impassible to conventional vehicles; would require major road construction project. Also see above response to comment on vehicle access to Cossatot River.
Would like all roads and ATV trails to be open year round.	No	See above responses to similar comments pertaining to road and trail system.
Concern: if a deer is killed a long way from end of ATV trail - can ATV be used to get the deer back to the trail? What about cases where the hunter is physically disabled?	No	Under refuge regulations, an ATV cannot be operated off a designated trail - the answer is no to the first question. In the case of physically disabled hunters, special arrangements can be made to meet their needs by contacting the refuge prior to the hunt.

continued...

Wildlife-Dependent Recreation *(continued)*

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
Hunting and Fishing Refuge hunting - don't restrict gradually - do it immediately if necessary for populations to be increased.	No	Long range hunting season frameworks and season specifics will be developed in a refuge hunt plan; hunting seasons and other public use regulations being implemented in 1999-2000 probably sufficiently restrictive to build population levels to desired levels; adjustments undoubtedly will be necessary across time due to wildlife population cycles and public use levels. Draft plan provides for making adjustments as needed across time in response to these changes; refuge staff views this as an extremely important component of long-term management of the area.
Competition by non-residents for hunt permits will be so high that residents will be eliminated.	No	No limits currently placed on number of hunters that can utilize the refuge; preferred alternative provides for implementation of quota permit hunts, if needed, due to increases in public use levels or to meet wildlife population goals. If implemented, quota permits will be issued by random drawings; residents will not be eliminated.
Fishing access to Crane Lake - (need to go by truck for older people).	No	Access to this remote lake is provided by ATV trail open to year round use; providing for regular vehicle access would require major road construction. Numerous other lakes and water bodies on refuge accessible by conventional vehicle to meet the needs of all segments of the public.
Steel shot - do away with for squirrel hunting.	No	Service policy requires use of non-toxic shot on any refuge hunts where potential exists for significant shot deposition resulting from hunter activities, (e.g. small game hunts) in areas where waterfowl use may occur; at Pond Creek refuge, most of the refuge subject to flooding and possible waterfowl use.
Wondering if some parts of refuge may be closed to duck hunting in order to improve habitat for waterfowl.	No	Preferred alternative identifies the need for waterfowl sanctuary areas at Pond Creek refuge; hunt plan (scheduled for completion by July 2000) will identify and establish these areas.
Maximize hunting and fishing.	No	A Recreation Management Emphasis alternative, which proposed maximizing hunting and fishing opportunities, was considered in development of this plan (see pp 59). This alternative was rejected since it conflicts with Service policy and compatibility standards dealing with quality of user opportunities and wildlife first requirements of the National Wildlife Refuge Improvement Act.
Permit system for hunts - how does it work? What would be the cost of permits?	No	If quota permit hunts were implemented, an application period would be established and a random drawing held to select a predetermined number of permittees. Current cost of quota hunt permits in the Service's Southeast Region is \$12.50; payment usually required before permit is issued.
Non-resident hunters and quota hunt permits - how would they be handled?	No	No distinction made between state residents and non-residents in selecting permittees for quota hunts - selection strictly on a random drawing basis. Non-residents selected for quota permits must adhere to Arkansas non-resident hunting licenses requirements.
Could arrangements be made for ADA/handicap sticker on ATVs for handicap use?	No	Special arrangements can be made to accommodate handicapped hunters by contacting the refuge prior to the hunt. These arrangements can include, among other things, special refuge permits authorizing limited off trail ATV use. When off trail ATV use is authorized, this includes refuge-issued handicap stickers for the ATV. Accommodations for disabled/handicapped hunters are handled on a case by case basis since the needs vary.
Wildlife Observation Many folks would appreciate improved opportunities for observing wildlife - photo blinds, etc.	No	Preferred alternative contains provisions for development of public use facilities (trails, photo blinds, etc.). A Public Use Management Plan will be completed that details these developments (scheduled plan completion is September 1999).
Wants interpretive trails	No	Preferred alternative identifies the need for interpretive foot trails. Trail location(s) and development will be detailed in the Public Use Management Plan.

Administration

<i>Comments</i>	<i>Plan Revised</i>	<i>Fish and Wildlife Service Response</i>
More visible law enforcement.	No	Preferred alternative presents staffing needed for optimum management, including law enforcement. Increased law enforcement presence depends upon obtaining additional staffing. See above comments on staffing/funding.
Do not want to fence the refuge.	No	Preferred alternative contains no provisions to fence the refuge.
Concern about adjacent landowner's access to their property.	No	Legitimate access to private property has been and will continue to be authorized through issuance of special use permits.
Do not let wetlands management impact adjacent landowners.	No	Service understands that on-refuge management should not impact the land of adjacent landowners.
Do not deny access to private property.	No	See previous response on this subject
Don't purchase additional lands for a headquarters site.	No	Preferred alternative lists two potential sites for headquarters development - both inside the approved acquisition boundary but currently privately owned. Both sites are parts of large privately owned tracts that have outstanding wildlife habitat potential and are key additions to the refuge. The Service will aggressively pursue purchase of <u>all</u> remaining lands in the approved acquisition boundary, including the two sites that have potential for headquarters areas, dependent upon willing sellers and available funding. These two sites were selected because they are easily accessible by the public <u>and</u> outside of the 100 year floodplain - a mandatory requirement for all facility construction on national wildlife refuges.
Concerned that coordinated group involvement will have undue influence on regulations.	No	Service values public input and will continue to seek involvement of area users; preferred alternative identifies providing for public involvement/partnership as a high priority. Compatibility standards ensures that refuge purposes of <u>wildlife first</u> will not be compromised through user involvement.
Put headquarters in a central location on the refuge.	No	See previous response to this subject.
Encourage purchase of Paracrafta property for headquarters site.	No	Paracrafta is one of two possible sites identified by the preferred alternative for a headquarters location. Either site will work equally well for a headquarters location; efforts are currently underway to purchase both areas.
Adjacent landowner concerned about pet dogs getting on refuge - would this be a violation?	No	Any domestic animal that comes onto the refuge, other than as authorized in regulations (on a leash or dogs used in specific hunts) constitutes an animal trespass violation. Incidental occurrences of pets wandering onto the refuge are handled through informal contacts with owners requesting voluntary assistance in removing their animals and keeping them off refuge property.
Wants right to carry firearms on the area at all times for protection; this is a dangerous area to visit.	No	Regulations pertaining to possession of firearms on national wildlife refuges are provided in Title 50 of the Code of Federal Regulations and are not in the preview of this plan to modify. Implementation of refuge regulations and law enforcement efforts by refuge staff have eliminated most problems being alluded to by this comment; public safety has been and will continue to be an important part of the refuge law enforcement program.
Need <u>visible staff presence</u> for public to see, perceive the area is being managed.	No	Agree. The preferred alternative identifies the staffing needed to manage this refuge. Completion of this plan will assist in competing for funding and staffing.
Concern that there is not enough personnel to get the job done.	No	See above responses to similar comments

Other Comments

Right alternative was picked for plan.

Approves of use of ATV trails to access remote fishing spots - good job!

ATV access provided by preferred alternative and current use requirements are good.

Amazing; think they picked the right alternative.
The deer and turkey populations are improving since refuge established!
Campground locations (as identified in the preferred alternative) are fine.

Like converting the pine (plantations) to hardwoods.

Approves completion of land acquisition on willing seller basis.

Pleased with the land acquisition program.

Feels Officers have done a good job of administering enforcement regulations.

Comment: "Couldn't be any better use put to the land" - from a person attending who said he had hunted the area since he was 12 years old (and is now 77).

Feels they have done a good job improving the roads.

Service Response to Comments on Draft CCP by Arkansas Natural Heritage Commission



Harold K. Grimmett
Director

ARKANSAS NATURAL HERITAGE COMMISSION
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Mike Huckabee
Governor

Date: July 22, 1999
Subject: Draft Comprehensive Conservation Plan
Pond Creek National Wildlife Refuge
ANHC No.: F-FWS.-99-010

Mr. Jim Johnson
Pond Creek National Wildlife Refuge
c/o Felsenthal NWR Complex
5531 Highway 82 W
Post Office Box 1157
Crossett, AR 71635

Dear Mr. Johnson:

Staff members of the Arkansas Natural Heritage Commission (ANHC) have reviewed the Draft Comprehensive Conservation Plan for Pond Creek National Wildlife Refuge (NWR). The NWR was established in 1994 to protect the largest remaining tract of bottomland hardwoods along the Little River. The Conservation Plan identifies the role of the Refuge towards the mission of the National Wildlife Refuge System and provides guidance in refuge management for the next 15 years.

Inventory work conducted by the Arkansas Natural Heritage Commission has shown Pond Creek Bottoms to be one of the most significant areas in Southwest Arkansas. It is a large, intact bottomland supporting several species that are rare in the state. The integrity of the area has been compromised over time by hydrologic modifications and insensitive timber management. Creation of the NWR in this area allows a never again opportunity to exploit the full potential, or alternatively to preclude some potentials forever. The primary goal of Refuge management should be the restoration of the full natural diversity of this system. Principles of ecosystem management should be employed to reach the goals and achieve the purposes stated on page 5 of the Draft document.

The refuge is known to support rare plants and animals. Inventory work should be done for these species to identify where they occur on the refuge. Monitoring programs should be implemented and management, adapted to meet changing needs, developed. Exemplary natural communities have also been identified on the refuge. These areas, and/or others that represent the full range of natural communities found on the refuge, should be protected as Natural Areas. This agency will be happy to provide technical support for inventory and monitoring work targeted at sensitive species and high quality natural communities.

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Loss of old-growth has been listed as an issue in Appendix A (P. 63). However, none of the alternatives address this. A larger area (ca. 1000 acres) should be committed to “old-growth” management. Hopefully, several of the Natural Areas, addressed above, can be included within it. This old-growth area should, in turn, be embedded within an area an order of magnitude larger that is managed to minimize fragmentation. Agricultural areas, moist-soil areas, and other open lands should be excluded from this area. However, it might include patches of pine that will have to be harvested and reforested.

We strongly support the limitation of All Terrain Vehicles (ATVs) to designated trails. Likewise, we support the limitation of roads to the existing 25 miles, but recommend that even this network be critically examined to determine whether all of it is essential. One particular issue of access is that areas within 1/4 mile of heronries should be closed to the public during nesting, except for guided tours.

The opportunity to comment is appreciated.

Sincerely,



Tom Foti
Chief of Research

Response:

Management of refuge forestlands will be directed by the purposes expressed in establishing authorities (see pp 5 of the draft plan), by the provisions contained in the National Wildlife Refuge System Improvement Act of 1997 (see pp 4 of the draft plan) and by the goals and objectives presented in the draft plan itself. These major guiding laws, policies and objectives direct that all refuge management, including forest management, be conducted to develop and maintain conditions to meet wildlife and wildlife habitat needs first. Within the constraints of these directives, restoring and maintaining the “natural diversity of the system”, to the extent possible and practical, is a priority presented by this plan (see pp 5, pp 34 and pp 36).

The absence of old age class stems over parts of the refuge forest was addressed at several locations in the draft plan, including pp 9~ The reference to old growth on pp 63 identified in your comment obviously refers to effects of loss of old growth on wildlife habitat productivity and wildlife populations, not a need for establishment of a system of “natural areas committed to old growth”. The impacts to wildlife associated with this and many other conditions were addressed repeatedly throughout the plan and alternatives. As described above, refuge habitat management will be directed by priority wildlife needs, including establishment of an old age class forest component throughout the area to meet identified habitat needs of those species that may be dependent upon these type conditions. Establishment of natural areas is one tool or approach that will be considered during development of a forest habitat management plan, but decisions to establish such areas and how large must be based upon meeting identified priority wildlife habitat needs.

Routing of existing roads and trails open to public use deliberately avoided all known rookery sites by more than 1/4 mile.