Chapter 5: CCP Implementation and Monitoring

Plan implementation is the reason for the development of this CCP. It is where we see the results of all our vision and planning efforts.

A successful CCP…

- helps guide the Refuge to achieve its purposes and goals
- is highly utilized by Refuge Manager and staff
- contributes to resolution of controversial issues
- becomes a reference document
- outlines a flexible approach to achieving goals and purposes
- facilitates partnerships
- helps to obtain funding
- is realistic and achievable
- is transparent and written clearly (understood by staff and by public)
- has broad support
- gets implemented
- is monitored and evaluated
- is amended, if necessary

Building cave gate at Belles Bluff. (Credit: Richard Stark)

This chapter describes the various factors that affect the implementation of the management direction presented in Chapter 4 of this CCP. It also identifies factors for monitoring and evaluating Refuge success of meeting its goals and objectives outlined in Chapter 4.

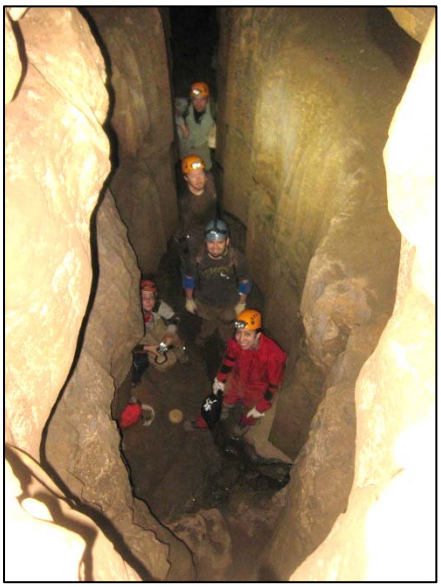
The following factors provide the outline of discussion within this chapter:

- Partnerships
- Appropriate refuge uses and compatibility
- Intra-Service Section 7 (Endangered Species Act Consultation)
- Funding & staffing
- Current and future Refuge projects and associated funding and staffing needs
- Step-down plans
- Monitoring & evaluation of the CCP
- Amendment & revision of the CCP

5.1 Partnerships

As described throughout this CCP, partnerships continue to be an integral part of the Refuge's actions to acquire, manage, and conserve lands, inventory and monitor, conduct research, assist in protecting and restoring habitat, share information about resources, conduct environmental education, and reduce Ozark habitat loss and fragmentation. Ozark Plateau NWR has worked extensively with private, NGO, university, state, tribal, and federal partners over the past 30 years and would not have accomplished what it has without the cooperative effort. Table 5-1 lists the partners Ozark Plateau NWR has and would like to continue to work with. It is extremely important that this partnering effort continue in the future for the Refuge to accomplish its assigned purpose.

Future plans for protecting caves and other habitat in karst areas used by listed cave species, will probably involve agreements with The Nature Conservancy (TNC), Land Legacy, National Speleological Society (NSS) and their local chapters (grottos), Bat Conservation International (BCI), development of a memorandum of understanding (MOU) with the Cherokee Nation and other Tribes, working with the Oklahoma Department of Wildlife Conservation (ODWC) to protect cave and karst resources on some of their Wildlife Management Areas, cooperating with the Natural Resource Conservation Service (NRCS) to implement their Healthy Forest Reserve Program, and working with the U.S. Army Corps of Engineers, among others. These actions and different combinations of them are some of the options the Service is already using to protect cave and karst sites in the seven-county project area. However, it has become clear over the years that we must continue to increase our landscape- level partnership efforts and support one another's conservation projects in order accomplish Refuge goals, wildlife targets, and the mission of the U.S. Fish and Wildlife Service.



Cave volunteers.
(Credit: Steve Hensley)

As described in the *Conserving the Future* vision document for national wildlife refuges and the next generation,

> *"Just as we cannot overcome the management challenges of the future alone, neither can we overcome the scientific challenges alone. We must embrace communication and collaboration in all fields if we are to achieve our goals. In the realm of conservation science, that means we must both lead and be strong partners. If we coordinate research and monitoring projects with our partners and communicate the results to the conservation community, we will improve our ability to leverage assistance; enhance our opportunities to share ideas, plans and strategies; and maximize our changes to capitalize on shared interests and opportunities."*

Sharing discoveries of human and nature "interconnectedness".
(Credit: Shea Hammond)

Table 5-1. Ozark Plateau NWR Partners

Internet Groups:
- Yahoo: Greenway of the Cherokee Ozarks

Volunteers and (unofficial) Friends Group

Landowners

Non-governmental organizations (NGOs):
- American Fisheries Society
- Audobon Society
- Bat Conservation International (BCI)
- Becoming an Outdoors Woman (BOW)
- Blue Skywater Society
- Blue Thumb
- Boy Scouts of America (BSA)
- Campfire USA
- Central Hardwoods Joint Venture
- Ducks Unlimited
- Girl Scouts of America (GSA)
- Land Legacy
- Master Gardeners of Oklahoma
- Master Naturalists of Oklahoma
- Missouri Chimney Safety Council
- National Speleological Society (NSS)
- Northwestern Arkansas Beekeepers' Association
- Oklahoma Academy of Science
- Oklahoma Historical Society
- Oklahoma State Historic Preservation Office (SHPO)
- Ozark Subterranean Biodiversity Project
- Ozark Tracker Society (OTS)
- Partners in Flight
- Sam Noble Museum of Natural History
- Southeastern Bat Diversity Network
- Student Conservation Association (SCA)
- The Nature Conservancy (TNC)
- Tulsa Regional Oklahoma Grotto
- Tulsa Zoo and Living Museum
- Western Bat Working Group
- Wild Turkey Federation
- Wilderness Awareness School
- Wildlife Federation
- The Wildlife Society

Private Businesses:
- Contractor agencies
- Private utility companies
- Private research lab/institutions

Schools:
- Local public K-12 schools
- Local private K-12 schools
- Local K-12 homeschools

Universities:
- Arkansas State University
- John Brown University
- Missouri State University
- Northeastern State University (NSU)
- Oklahoma State University (OSU)
- Rogers State University (RSU)
- Southeastern OK State University (SEOSU)
- Tulsa University
- University of Arkansas (UA)
- University of Central Arkansas
- University of Central Oklahoma (UCO)
- University of Missouri
- University of Oklahoma (OU)
- University of Southern Mississippi

Cities:
- City Fire Departments
- Jay
- Stillwell
- Tahlequah
- Tulsa

Counties:
- Adair
- Cherokee
- Craig
- Delaware
- Mayes
- Ottawa
- Sequoyah

State agencies:
- Arkansas State Parks
- Grand River Dam Authority (GRDA)
- Oklahoma Conservation Commission
- Oklahoma Department of Environmental Quality (DEQ)
- Oklahoma Department of Tourism and Recreation
- Oklahoma Department of Wildlife Conservation (ODWC)
- Oklahoma Scenic Rivers Commission
- Oklahoma State Forestry Division
- Oklahoma State Parks
- Oklahoma Water Resources Board (OWRB)
- Oklahoma Natural Heritage Inventory

Native American Tribal Nations:
- Caddo Nation
- Cherokee Nation
- Choctaw Nation
- Chickasaw Nation
- Delaware Nation
- Eastern Shawnee Tribe of Oklahoma
- Miami Nation
- Modoc Nation
- Muscogee (Creek) Nation
- Osage Nation
- Peoria Tribe of Indians of Oklahoma
- Ottawa Tribe of Oklahoma
- Quapaw Tribe of Oklahoma
- Seneca-Cayuga Tribe of Oklahoma
- Shawnee Tribe
- United Keetoowah Band of Cherokee Indians
- Wyandotte Nation

Federal:
- Bureau of Land Management (BLM)
- Environmental Protection Agency (EPA)
- National Park Service (NPS)
- Natural Resources Conservation Service (NRCS)
- The U.S. Forest Service (USFS)
- U.S. Army Corps of Engineers
- U.S. Fish & Wildlife Service (FWS)
- United States Geological Survey (USGS)

5.2 Memorandums of Understanding and Other Agreements

During the establishment and continuing management of Ozark Plateau NWR, a number of memoranda of understanding (MOU), memoranda of agreement (MOA), conservation agreements, and other agreements have been used. These were with private, municipal, county, state, tribal, and federal agencies and organizations and used by the Refuge to accomplish its purpose of protecting and preventing the extinction of federally listed threatened and endangered and other important cave, karst, and trust resources of the Ozarks.

The Service has a national MOU with the NSS developed on April 4, 1992 to increase public awareness of the value cave resources and the concern that those resources be managed and protected for future generations. Also, it provides a source of volunteers and expertise needed to inventory, protect, and assist with the management of cave resources. It recognizes the shared concerns and benefits of cooperation between the NSS and the Service and establishes guidelines for volunteer agreements. Also the Service has a MOU with BCI to establish a framework for cooperation and participation in conservation of bat species that are federally listed or proposed for listing as threatened or endangered, or are candidates for placement on the federal list of threatened and endangered wildlife (50 CFR 17.11). It promotes cooperation in activities necessary to maintain or increase the productivity of bats and their habitat on lands managed by the Service, and on other lands as appropriate.

In addition, there is an interagency agreement among the National Park Service, Bureau of Land Management, Forest Service, and Fish and Wildlife Service for implantation of the Federal Cave Resource Protection Act. A specific interagency agreement to coordinate cave inventory and management was developed between the Ozark Plateau NWR and the Ozark National Forest that borders the Refuge to the east in Arkansas and Region 4 of the Service.

Also conservation agreements have been developed between the Cherokee Nation and Ozark Plateau NWR and the City of Tulsa and Ozark Plateau NWR allowing the Refuge to help with cave and forest management on two important tracts of land.

The Refuge also has entered into an agreement with Natural Resource Conservation Service and the Service's Oklahoma Ecological Services Field Office to help implement the Healthy Forest Reserve Program to protect federally listed endangered and threatened Ozark cave species.

Lastly, the Refuge works closely with the ODWC through Section 6 of the Endangered Species Act agreements and TNC and Land Legacy through a conservation easement to implement additional cave, karst, and forest management.

5.3 Appropriate Refuge Uses and Compatibility

5.3.1 Appropriate Refuge Uses

All uses of a national wildlife refuge over which the Service has jurisdiction must be determined to be appropriate under the Appropriate Refuge Uses policy (603 FW 1). If an existing use is not appropriate, the refuge manager will deny the use without determining compatibility (see Section 5.2.2). An appropriate use of a national wildlife refuge is a proposed or existing use that meets at least one of the four following conditions:

1) The use is a wildlife-dependent recreational use as identified in the Refuge Improvement Act (i.e., hunting, fishing, wildlife observation and photography, and environmental education and interpretation);
2) The use contributes to fulfilling the refuge purposes, the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Refuge Improvement Act was signed into law;
3) The use involves the take of fish and wildlife under State regulations;
4) The Refuge Manager has evaluated the use following guidelines in the Service Manual 603 FW 1.11 and found it appropriate.

5.3.2 Compatibility

In accordance with the Refuge Improvement Act of 1997, no uses for which the Service has authority to regulate may be allowed on a unit of the National Wildlife Refuge System unless it is determined to be compatible. A compatible use is a proposed or existing wildlife-dependent recreation use, or any other use of a national wildlife refuge that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes pertaining to the national wildlife refuge.

Aside from wildlife-dependent recreation uses, compatibility determinations are not required for other refuge management activities (e.g., conducting bird surveys) except economic activities (e.g., haying). Economic uses of a natural resource must contribute to achieving refuge purposes and the Refuge System mission. They are also not required where statute directs mandatory approval of the activity, as in the case of facilities for national defense. If a use is found to be incompatible, the Refuge will follow normal administrative procedures for stopping the action.

Compatibility determinations for existing hunting, fishing, wildlife observation and photography, and environmental education and interpretation must be re-evaluated with the preparation or revision of a comprehensive conservation plan or at least every 15 years. Compatibility determinations for all other uses must be re-evaluated every 10 years or earlier if conditions change or significant new information relative to the use and its effects becomes available. Refuge managers must complete a written compatibility determination for each use, or collection of like-uses, that is signed by the manager and the Regional refuge chief.

Primitive camping as part of environmental education programs offered on the Refuge. (Credit: Shea Hammond)

Appendix B contains five compatibility determinations that have been developed as part of this comprehensive conservation planning effort, including:

- Environmental Education
- Interpretation
- Hunting
- Wildlife Observation & Photography
- Wood Harvesting

5.4 Intra-Service Section 7 (Endangered Species Act Consultation)

An Intra-Service Section 7 consultation was conducted for the implementation of this CCP's objectives and strategies with the Oklahoma Ecological Services Field Office (see Appendix F).

5.5 Funding & Staffing

In the previous chapters, Ozark Plateau NWR has outlined a vision for the future management of the Refuge and included the objectives and strategies needed to realize that vision. Current financial resources available to the Refuge will not adequately provide the means to protect habitat and wildlife, and improve the condition of visitor services through the life of the CCP. In fact, the Refuge constantly seeks funding through grants and elsewhere to implement many of their environmental education and interpretation programs as well as to perform their cave and karst resource management activities. Similarly, pre-CCP staff levels do not allow adequate interactions with the public for welcoming, education, interpretation, information, safety, or enforcement purposes; nor are the wildlife and habitat management strategies described in this

plan achievable at minimum staffing levels. The rate at which each refuge achieves its full potential of contributing to local, regional, and national conservation goals depends on the resources provided for those purposes.

Increased funding and staffing will result in preventing extinction and aid in recovering federally listed threatened and endangered cave species and provide long-lasting protection, maintenance, and enhancements to Ozark cave and aquatic habitats, Ozark forests, Ozark species, migratory birds, visitor experiences, and the education of future conservationists.

The operations and maintenance budget provide funds for routine, day-to-day costs on the Refuge. These costs include utilities, upkeep of offices and structures, required safety inspections, maintenance of Refuge facilities, and cave monitoring activities. Currently, the operations and maintenance costs for the Refuge are fairly moderate because of the Refuge's small size, and because habitat in many acquisition areas is still relatively intact. However, land acquisition funds and other options to protect identified lands occur outside the normal operations and maintenance funding process for refuges. On a national level, Ozark Plateau NWR does not rank high in the Service's objective-based Land Acquisition Priority System (LAPS), because of the 200-point limitation for each category, preventing full consideration of Ozark Plateau NWR's extremely high value for federally listed threatened and endangered Ozark cave species.

Refuge staff remain committed to seeking new opportunities for funding support for implementation of various conservation projects (scientific and educational) as well as acquisition support and options for land protection – both from within the Service and from external sources.

This CCP does not constitute a commitment for additional staffing or increases in operational and maintenance resources. These decisions are at the discretion of Congress in overall appropriations, and in budget allocation decisions made at the national and regional levels of the U.S. Fish and Wildlife Service.

5.6 Refuge Projects

Repairing a cave gate. (Credit: Steve Hensley)

This CCP outlines an ambitious course of action for the future management of Ozark Plateau NWR. The Refuge will need appropriate and consistent operational and maintenance funding and staffing to implement each of the objectives and strategies outlined in Chapter 4 of this CCP. In Table 5-2, we have compiled a list of current and future "projects", which we define not only as specific efforts to help us achieve our objectives within the lifetime of this CCP, but also that require substantial staffing and/or funding to implement. Some projects are and may always be ongoing. For this reason, we have included current staffing and funding and future staffing and funding within the same project rows for easy reference. At the bottom of the table, you will see the totals for number of projects, staff, and costs.

In Table 5-2, projects are divided into the following five color categories:

LL	= Landscape-Level
HAB	= Habitat Management
WL	= Wildlife Management
VS	= Visitor Services
IN	= Infrastructure

Table 5-2. Refuge projects, staffing, and funding required for implementation.

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
L L	**Maintain and Increase Partnerships**	Perform outreach, coordinate, build and maintain long-term relationships and enter into conservation easements and agreements with the public, willing landowners, NGOs, businesses, cities, states, tribes, and federal agencies	Goal 1, Obj. 1; Goal 1, Obj. 2; Goal 1, Obj. 3; Goal 1, Obj. 4; Goal 1, Obj. 5; Goal 1, Obj. 6; Goal 1, Obj. 7; Goal 3, Obj. 1; Goal 3, Obj. 2	$5K/yr.	• .25 FTE Refuge Manager (GS 11/12) and/or • .25 FTE Wildlife Refuge Specialist (GS 07/09)	$10K/yr.	• .25 FTE Refuge Manager (GS 12/13) and/or • .25 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .20 FTE Biologist (GS 07/09/11) • .20 FTE Outdoor Rec Planner (GS 07/09/11) • .10 FTE Maintenance Worker (WG 07/08) • .20 FTE Administrative Assistant (GS 05/07/09)
L L	**Acquire up to 15,000 Acres of Land**	Acquire up to 15,000 acres of land and conservation easements from willing sellers within the approved acquisition boundary and enter into conservation agreements with private landowners, conservation organizations, state, Tribal Nations, and other federal agencies	Goal 1, Obj. 1; Goal 1, Obj. 2; Goal 1, Obj. 3; Goal 1, Obj. 4; Goal 1, Obj. 5; Goal 1, Obj. 6; Goal 1, Obj. 7; Goal 2, Obj. 1; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 4	$140/acre (1985) up to $2K/acre (2012)	• .20 FTE Refuge Manager (GS 11/12)	$3K/acre	• .20 FTE Refuge Manager (GS 12/13) and/or • .20 FTE Wildlife Refuge Specialist (GS 07/09/11)
L L	**Lead and/or Participate in Landscape Level Conservation Projects and Conferences**	Lead and/or participate in conservation conferences, research, environmental education projects, interpretive projects, habitat management that involve multiple partners across boundaries on the landscape-level; Share and present data, surveys, and research with landscape-level conservation partners as appropriate for effective conservation	Goal 1, Obj. 1; Goal 1, Obj. 2; Goal 1, Obj. 3; Goal 1, Obj. 4; Goal 1, Obj. 5; Goal 1, Obj. 6; Goal 2, Obj. 6; Goal 2, Obj. 7; Goal 2, Obj. 8 Goal 3, Obj. 2	$5K/yr.	• .10 FTE Refuge Manager (GS 11/12) and/or • .10 FTE Wildlife Refuge Specialist (GS 07/09)	$15K/yr.	• .10 FTE Refuge Manager (GS 12/13) and/or • .10 FTE Wildlife Refuge Specialist (GS 07/09/11) and/or • .10 FTE Biologist (GS07/09/11) and/or • .10 FTE Outdoor Rec Planner (07/09/11)
L L	**Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/ Implementation**	Educate landowners about incentives such as the Service's Partners for Fish & Wildlife Program, Section 6 of Endangered Species Act, NRCS Healthy Forest Reserves Program, and others and assist with implementation to help private landowners implement natural resource management	Goal 1, Obj. 1 Goal 1, Obj. 5; Goal 2, Obj. 1; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 3, Obj.2	n/a	• .02 FTE Refuge Manager (GS 11/12) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09)	n/a	• .02 FTE Refuge Manager (GS 12/13) and • .02 FTE Wildlife Refuge Specialist (GS 07/09/11) • .05 FTE Biologist (GS 07/09/11)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
L L	**Implement Climate Data Loggers Program**	Partner with universities to implement a long-term data logger program to collect air temperature, humidity, light, cave rock temperature, groundwater elevation, and cave stream temperature data at cave, surface and groundwater locations on each unit	Goal 1, Obj. 4	$2K/yr.	• .01 FTE Wildlife Refuge Specialist (GS 07/09) • (+ .02 SCA Intern)	$15K/initial cost + $5K/yr.	• .02 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .05 FTE Biologist (GS 07/09/11) • (+ .05 SCA Intern)
L L	**Locate Additional Caves**	Use geological records and coordinate with partners to locate additional caves within the ecoregion by "ridge walking"; Map searched and unsearched geological areas that are conducive to cave formation on- and off-Refuge to assess overlying land use and prioritize areas to be searched; Investigate the use of technologies such as satellite and aerial imagery (to look for features indicative of having a cave opening), thermal imagery (to locate potential hot or cold zones), radio telemetry (track bats to unknown roost sites)	Goal 1, Obj. 1; Goal 1, Obj. 3; Goal 2, Obj. 4	$12K/yr (contractor)	• .10 FTE Refuge Manager and/or • .10 FTE Wildlife Refuge Specialist	$15K for geologist/yr. $10K for GIS undergrad mapping project $60K/project (out of 3) w/ university master's student	• .10 FTE Refuge Manager (GS 12/13) and/or • .10 FTE (GS 07/09/11) Wildlife Refuge Specialist and • .06 FTE Biologist (GS 07/09/11)
L L	**Install Weather Stations**	Install permanent weather stations at the Mary and Murray Looney, Boy Scout, and Sally Bull Hollow Units, and any appropriate new areas	Goal 1, Obj. 4	→	→	$30K/initial cost + $1K/yr.	• .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and/or • .01 FTE Biologist (GS 07/09/11)
L L	**Coordinate Across FWS Regional Boundaries to Manage Ozark Cave Species**	Coordinate with FWS Region 3 and 4 to help manage Logan Cave NWR, Cavefish NWR and Pilot Knob NWR as units of Ozark Plateau NWR in cooperation with Mingo NWR in Region 3 and Holla Bend NWR in Region 4; Coordinate with FWS Region 6 to manage federally listed Ozark cave species in cooperation with Ozark Plateau NWR; Establish new acquisition areas within the landscape level of Service Regions, 3, 4, and 6 to include a larger range of all federally listed Ozark cave species	Goal 1, Obj. 2; Goal 2, Obj. 6	n/a	• .02 FTE Refuge Manager (GS 12/13) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09)	TBD	TBD

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
HAB	**Prevent Unauthorized Cave Entry**	Increase cave monitoring, especially as more lands are acquired (up to 15,000 acres), using alarm systems, light data recorders, secure cave gates, and utilize LE support, to assist when needed, to prevent unauthorized entry and to monitor cave and karst resources; Build and maintain cave gates	Goal 1, Obj. 6; Goal 2, Obj. 3	$7.5K/yr. (includes contractor)	• .02 FTE Refuge Manager (GS 12/13) and • .02 FTE Wildlife Refuge Specialist (GS 07/09) • .01 FTE Law Enforcement Officer (GS 09) (on-call) based out of Sequoyah NWR • .03 FTE Maintenance Worker (WG 07/08)	$15K/yr. (alarm/video + contractor)	• .01 FTE Refuge Manager (GS 12/13) and • .01 FTE Wildlife Refuge Specialist (GS 07/09/11) • .20 FTE Law Enforcement Officer (GS 09) based out of Sequoyah NWR (routine visits + on-call) • .06 FTE Maintenance Worker (WG 07/08)
HAB	**Implement Water Quality Monitoring Program**	Install small water quality measurement devices (semi-permeable membrane), submerge them in cave water, leave them for one month, send results to a laboratory for analysis, monitor, repeat every 5 years in Refuge streams and caves and off-Refuge	Goal 1, Obj. 5; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 5	n/a (university monitors 2 caves)	• .01 FTE Refuge Manager (GS 12) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09)	$10K/yr. (includes 2 devices, analysis & contractor)	• .02 FTE Biologist (GS 07/09/11)
HAB	**Implement Water Quantity Monitoring Program**	Install water quantity devices permanently, to record data constantly, reviewing results every two years to establish baseline data on water levels and identify trends in water levels on and off-Refuge	Goal 1, Obj. 5; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 5	→	→	$5K/initial cost + $500/yr.	• .01 FTE Refuge Manager (GS 12/13) and • .02 FTE Biologist (GS 07/09/11)
HAB	**Map Groundwater Recharge Areas**	Contract with private companies, universities, and the United States Geological Survey (USGS) to use dye-tracing methods to delineate groundwater recharge areas within the acquisition area, in and around all Refuge units, including private lands, specifically where cavefish are present	Goal 1, Obj. 5; Goal 2, Obj. 5	$10-15K / recharge area (includes contract w/ University)	• .01 FTE Refuge Manager (GS 12) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09)	$15-25K /recharge area (min. 10) (includes contract w/ university + USGS + private contractors)	• .01 FTE Refuge Manager (GS 12/13) and • .01 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
HAB	**Use Prescribed Fire on 1/3 of total Refuge lands per year**	Develop a Fire Management Plan (FMP) for all Refuge Units, including burn plans and a training program for Refuge staff, to increase the use of prescribed fire to approximately 1,000 acres per year in 3 to 5 year rotations. This acreage would increase to about 1/3 of the total Refuge acreage per year as land is acquired; Assess effects on cave and bird species	Goal 2, Obj.1; Goal 2, Obj. 6; Goal 2, Obj. 7; Goal 2, Obj. 8; Goal 2, Obj. 9	$16K/yr. (funding from RO Fire Fund)	• .01 FTE Refuge Manager (GS 12) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09) • .10 FTE Prescribed Fire Specialist (GS 11) based out of Oklahoma/North-Texas Fire Management District	$40K/yr. + $2.50/acre burned for additional lands acquired	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .01 FTE Biologist (GS 07/09/11) • .30 FTE Prescribed Fire Specialist (GS 11) based out of Oklahoma/North-Texas Fire Management District
HAB	**Identify and Map the Distribution and the Condition of Forest Habitat**	Work with FWS Inventorying & Monitoring (I&M) on GIS projects to identify and map the distribution and the condition of forest, woodland, and savannah habitats on- and off- Refuge to establish baseline conditions on a landscape-level and evaluate effectiveness of forest management	Goal 2, Obj. 1; Goal 2, Obj. 9	→	→	$1K/yr.	• .10 FTE Biologist (GS 07/09/11) and/or • (+.10 Intern)
HAB	**Map Subterranean Extent of Known Caves**	Partner with local cavers, NSS, universities, Tribal Nations, I&M, USGS and other organizations or agencies to map full subterranean extent of known caves and identify all surface cave entrances	Goal 2, Obj. 3; Goal 2, Obj. 4; Goal 2, Obj. 6	$500/yr. avg. (contract w/ NSS)	• .05 FTE Refuge Manager (GS 12)	$10K/yr. (contract w/ NSS)	• .10 FTE Refuge Manager (GS 12/13) and/or • .10 FTE Wildlife Refuge Specialist (GS 07/09/11) and/or • .10 FTE Biologist (GS 07/09/11)
HAB	**Identify & Survey Plant Species**	Work with partners such as landowners, NGOs, universities, state agencies, tribal nations, and federal agencies to identify, document, and monitor all plant species (native and non-native) occurring on all units of the Refuge	Goal 2, Obj. 9	$3K/survey (every 5 years)	• .01 FTE Refuge Manager (GS 12) and • .01 FTE Refuge Wildlife Specialist (GS 07/09)	$3K/survey (every 5 years)	• .02 FTE Biologist (GS 07/09/11) and • .01 Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
HAB	**Monitor Impacts of Non-Native Flora Species**	Work with landowners, NGOs, cities, universities, states, tribal nations, and federal agencies to conduct studies to evaluate impacts of non-native plant species on stream, riparian forest, bottomland and upland forest communities; Identify which non-native flora species are causing the greatest negative impact to T&E, species of concern and/or representative species	Goal 2, Obj. 9	→	→	$3K/yr.	• .05 FTE Biologist (GS 07/09/11)
HAB	**Monitor & Reintroduce Chestnut Blight-resistant Chinquapin**	Monitor and/or reintroduce chestnut blight-resistant chinquapin (*Castanea ozarkensis*)	Goal 2, Obj. 1; Goal 2, Obj. 9	→	→	$100K/study (includes contract w/ grad student + seedlings)	• .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .02 FTE Biologist (GS 07/09/11)
HAB	**Implement Adaptive Management to Control Non-Native Invasive Flora**	Based on impacts research, develop an Integrated Pest Management Plan to control species causing greatest harm to ecosystem using prescribed burns (see HAB project above), the application of minimal herbicide spot treatments, and removal of invasive plants with mechanical treatments such as hand tools, chainsaws, and mowing with a tractor; Develop an I&M program to evaluate the effectiveness of these control measures and use adaptive management accordingly	Goal 2, Obj. 1; Goal 2, Obj. 9	→	→	$10K (contract w/ invasive removal crew)	• .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .02 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)
WL	**Bio-inventory Cave Fauna**	Participate on cave fauna bio-inventory projects on Refuge units and private lands, such as the Ozark Subterranean Biodiversity Project, with TNC and other NGOs, universities, state agencies, Tribal Nations, US Forest Service (USFS), National Park Service (NPS), and other agencies	Goal 2, Obj. 6; Goal 2, Obj. 7	$8K/yr. (+ ES funds)	• .02 FTE Refuge Manager (GS 12) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09)	$15K/yr. (+ ES funds)	• .02 FTE Refuge Manager (GS 12/13) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .05 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
WL	**Monitor for White-nose Syndrome**	Identify and monitor important roost trees, caves, and foraging habitats of bat species that have been known to be affected by WNS (i.e. northern long-eared, big brown, and tri-colored bats); Track movement and occurrence of WNS, search for physical signs of WNS-effected bats, sample soil and cave substrate, search for bat mortality in caves	Goal 1, Obj. 6	$1K/yr. (+ .05 SCA intern)	• .02 FTE Refuge Manager (GS 11/12) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09) • (+ ES staff)	$3K/yr. (+.05 intern)	• .02 FTE Refuge Manager (GS 12/13) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .05 FTE Biologist (GS 07/09/11) • (+ ES staff)
WL	**Prevent White-nose Syndrome from Occurring on the Refuge**	Perform education, outreach, decontaminate caving gear & clothing, dedicated site-specific cave equipment, control access to caves	Goal 1, Obj. 6; Goal 2, Obj. 6	$10K/initial cost (decon. site) + $4K/yr. (gear & supplies)	• .02 FTE Refuge Manager (GS 11/12) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09)	$10K/new decon. site + $8K/yr. (gear & supplies)	• .05 FTE Refuge Manager (GS 12/13) and/or • .05 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .10 FTE Biologist (GS 07/09/11) • .05 FTE Outdoor Rec Planner (GS 07/09/11)
WL	**Reduce and/or eliminate White-nose Syndrome from affected bats and/or sites**	Coordinate with wildlife health organizations, zoos, universities, state, Tribal Nations, ES and other agencies to assist in the recovery of impacted species and implement effective mitigation strategies, (i.e., environmental manipulations, vaccines, captive management program, etc.) to reduce or eliminate *G. destructans* from affected bats or sites, as they are identified	Goal 1, Obj. 6; Goal 2, Obj. 6	→	→	TBD May require substantial funding	TBD May require substantial staffing & assistance from partners
WL	**Conduct Genetic Sampling**	Conduct genetic sampling to identify which populations are genetically isolated	Goal 1, Obj. 6; Goal 1, Obj. 7; Goal 2, Obj. 6; Goal 2, Obj. 7;	n/a	• .01 FTE Refuge Manager (GS 11/12) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09) • (University research project/ special use permit)	$60K/study (includes grad student researcher) (2-4 studies/15 yrs.)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .02 FTE Administrative Assistant (GS 05/07/09) • .02 FTE Biologist (GS 07/09/11)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
WL	**Identify Migration Corridors of Bat, Bird, or other Wildlife Species**	Utilize various methods (i.e., conduct acoustic route monitoring, banding, tagging, and using radio transmitters, radar technology, GIS mapping, and other technology) to identify and delineate migration corridors of bat, bird or other wildlife species	Goal 1, Obj. 3; Goal 1, Obj. 6; Goal 1, Obj. 7; Goal 2, Obj. 6; Goal 2, Obj. 7; Goal 2, Obj. 8	$8K/yr.	• .50 PT SCEP and • .01 FTE Wildlife Refuge Specialist	$60K/study (4 studies/15 yrs.) (grad student)	• .25 FTE Biologist (GS 07/09/11) and • .07 FTE Wildlife Refuge Specialist (GS 07/09/11) • .50 PT SCEP
WL	**Conduct Species Surveys**	Conduct surveys of invertebrates, herpatofauna, fish, birds, and mammals to identify and document all wildlife species occurring on all units of the Refuge and within potential acquisition areas	Goal 1, Obj. 4; Goal 2, Obj. 6; Goal 2, Obj. 7; Goal 2, Obj. 8; Goal 2, Obj. 10	$3K/yr.	• .02 FTE Refuge Manager (GS 11/12) and/or • .02 FTE Wildlife Refuge Specialist (GS 07/09) • (+ contract universities)	$10K/yr.	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .10 FTE Biologist (GS 07/09/11) • (+ contract universities)
WL	**Monitor Bat Population Trends**	Partner to monitor bat maternity colonies and hibernacula annually (conduct exit count as bats emerge from caves, thermal videography, infrared videography, guano pile measurements, acoustic surveys)	Goal 1, Obj. 4; Goal 2, Obj. 6; Goal 2, Obj. 7	$30K/yr.	• .20 FTE Refuge Manager (GS 11/12) and/or • .20 FTE Wildlife Refuge Specialist (GS 07/09) • (+ .50 Intern & contract Geologist)	$50K/yr. (includes contractor + .50 intern)	• .125 FTE Refuge Manager (GS 12/13) and • .05 FTE Wildlife Refuge Specialist (GS 07/09/11) • .30 FTE Biologist (GS 07/09/11)
WL	**Monitor Bat Response to Cave Habitat Conditions**	Implement climate data loggers program (see LL project) and develop an I&M program to monitor existing cave habitat conditions trends and determine bat cave habitat preferences; Assess the effects of forest and cave management practices (i.e. prescribed fire/thinning, etc.) on species' cave habitat selection, foraging, movement, breeding behavior and population trends	Goal 2, Obj. 3; Goal 2, Obj. 6; Goal 2, Obj. 7	$500/yr. (grad student)	• .01 FTE Refuge Manager (GS 12) and/or .01 Refuge Wildlife Specialist (GS 07/09)	$50K/5 yrs. (includes grad student contract)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 Refuge Wildlife Specialist (GS 07/09/11) and • .10 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)
WL	**Identify Baseline Data regarding Bat Species & Distribution within Foraging Areas**	Perform a permanent mobile acoustic survey program on designated routes within bat species' foraging areas to determine baseline data of species' presence, location, and distribution on and around Refuge management units, of listed and non-listed bats	Goal 2, Obj. 3; Goal 2, Obj. 4; Goal 2, Obj. 6; Goal 2, Obj. 7	$8K/yr. (SCEP)	• .01 Refuge Wildlife Specialist (GS 07/09)	(see WL project, "Determine Bat Foraging Ecology & Habitat Use")	(see WL project, "Determine Bat Foraging Ecology & Habitat Use")

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
W L	**Determine Bat Foraging Ecology & Habitat Use**	Utilize radio tracking, a permanent mobile and stationary acoustic survey program, transects, insect surveys, guano dissection, vegetation surveys, and other methods to identify roost trees, determine foraging habitat preferences, habitat conditions that affect foraging ecology, and monitor trends overtime; work with I&M to create a database documenting these results; Use this data for adaptive management within forest habitat and other foraging habitats of bat species	Goal 2, Obj. 3; Goal 2, Obj. 4; Goal 2, Obj. 6; Goal 2, Obj. 7	→	→	$50K/5 yrs. (includes grad student contract)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 Refuge Wildlife Specialist (GS 07/09/11) and • .10 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)
W L	**Install Cameras in Cave Interiors to Monitor Bat Activity/Behavior**	Install permanent cameras inside January-Stansberry Cave and/or other appropriate caves to monitor bat activity to provide additional scientific information (i.e., seasonal use of the caves by the bats, observe bat behavior, etc.) and monitor human disturbance; Provide online web-streaming during the maternity season for interpretation purposes twenty-four hours per day	Goal 2, Obj. 6; Goal 2, Obj. 7; Goal 3, Obj. 2; Goal 3, Obj. 4	→	→	$120K/camera + installation	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and/or • .01 Outdoor Recreation Planner (GS 07/09/11) and • .01 Administrative Assistant (GS 05/07/09)
W L	**Monitor Cavefish & Cave Crayfish Population Trends**	Perform annual monitoring count surveys of cavefish and cave crayfish and mark recapture to understand population trends	Goal 2, Obj. 6; Goal 2, Obj. 7	$2K/yr. (+ $9.5K/yr. from ESA Section 6/ODWC)	• .02 FTE Refuge Manager (GS 12) and • .01 FTE Refuge Wildlife Specialist (GS 07/09)	$10K/yr. (unless receive funding from ESA Section 6 / ODWC)	• .01 FTE Refuge Manager (GS 12/13) and • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) • .02 FTE Biologist (GS 07/09/11)
W L	**Research Ecology of Ozark Cavefish**	Work with landowners, conservation agencies, universities, Tribal Nations, and scientific agency partners to develop research projects to record and monitor the distribution, abundance, habitat preference, and breeding ecology of Ozark cavefish	Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 6; Goal 2, Obj. 7	→	→	$50K/yr. (contract with FWS co-op unit or other universities)	• .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .01 FTE Biologist (GS 07/09/11) • .01 Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
WL	**Monitor Bird Population Trends & Identify Habitat Requirements**	Work with partners to conduct bird point counts, banding, and nesting studies to monitor bird populations and establish data trends over time; identify habitat requirements for resident and migratory birds occurring on the Refuge and within the acquisition area	Goal 2, Obj. 7; Goal 2, Obj. 8	(volunteers)	• .01 FTE Refuge Wildlife Specialist (GS 07/09)	$7K/yr. (contractor + volunteers)	• .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .20 FTE Biologist (GS 07/09/11) • .01 Administrative Assistant (GS 05/07/09)
WL	**Develop Habitat Suitability Index Model**	Develop a habitat suitability index model to determine optimum forest and cave habitat requirements for Ozark big-eared bats, gray bats, Ozark cavefish, and cave crayfish	Goal 1, Obj. 4; Goal 2, Obj. 1; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 6; Goal 2, Obj. 7	→	→	$50K/species model (3 yrs. each)	(contract w/ FWS Co-op unit)
WL	**Pesticide Sampling**	sample prey insects in foraging areas, guano in summer caves, and surrogate bat species to monitor pesticide amounts to reoccur every 10 years	Goal 1, Obj. 5	→	→	$60K/study (includes ES and/or university contractor)	• .02 FTE Biologist (GS 07/09/11)
WL	**Monitor Impacts of Non-Native Fauna Species**	Work with partners to conduct studies to identify, document, and monitor all non-native wildlife species occurring on and near the Refuge; evaluate impacts of these species on cave, stream, riparian forest, bottomland and upland forest communities	Goal 2, Obj. 10	→	→	$50K/hothouse millipede study (grad student)	• .01 FTE Refuge Manager (GS 12/13) and • .20 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)
WL	**Implement Adaptive Management to Control Non-Native Invasive Fauna Species**	Based on impacts research, and if necessary, develop an Integrated Pest Management Plan to control species causing greatest harm to ecosystem using control measures such as trapping, shooting, spaying/neutering, etc.; Develop an I&M program to evaluate the effectiveness of these control measures and use adaptive management accordingly; Coordinate with and educate private landowners, state agencies, Tribal Nations, and federal agencies to encourage them to control invasive and exotic species	Goal 2, Obj. 10	→	→	$5K trapping of feral hogs/feral cats + TBD	• .01 FTE Refuge Manager (GS 12/13) and • .20 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Coordinate to Establish and Train Official Friends Group**	Coordinate with unofficial Friends group volunteer members, current partners, and other members in the community to encourage the formation of an organized and official Friends Group; Educate Friends on current issues and solutions regarding karst and cave management and other Refuge resources; Train volunteers to perform their job/role in a safe, quality, and efficient manner to include citizen science, EE, interpretation, outreach, cave management and cave rescue and perform other actions as needed	Goal 1, Obj. 1; Goal 2, Obj. 1; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 6; Goal 2, Obj. 7; Goal 2, Obj. 8; Goal 3, Obj. 1; Goal 3, Obj. 2; Goal 3, Obj. 3; Goal 3, Obj. 4; Goal 3, Obj. 5	→	→	$5K/yr.	• .05 FTE Refuge Manager (GS 12/13) and/or • .05 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .05 FTE Outdoor Recreation Planner (GS 07/09/11) • .02 FTE Biologist (GS 07/09/11) • .01 FTE Administrative Assistant (GS 05/07/09)
VS	**Develop a Visitor Services (step-down) Plan**	Once Outdoor Recreation Planner is hired, develop a step-down VS Plan within 15 years of implementing the Comprehensive Conservation Plan to improve visitor experiences by planning time, energy, funding, content, approach, and evaluation of VS programs.	Goal 3, all objectives	→	→	$10K (Planner contractor)	• .02 FTE Outdoor Recreation Planner (GS 07/09/11)
VS	**Ozark Nature Connection Series EE Programs**	Maintain monthly Ozark Nature Connection Series (ONCS) in cooperation with partners, Ozark Tracker Society	Goal 3, Obj. 3	n/a from Refuge budget (approx. $11K/yr. from YOG and/or CPWN grants + $30K from NGOs, participant fees)	• .15 FTE Refuge Wildlife Specialist (GS 07/09) and • .01 FTE Administrative Assistant (GS 05/07/09)	$45K/yr. (including OTS contract)	• .03 FTE Refuge Manager (GS 12/13) and • .02 FTE Refuge Wildlife Specialist (GS 07/09/11) • .25 FTE Outdoor Recreation Planner (GS 07/09/11) • .03 FTE Biologist (GS 07/09/11) • .02 FTE Maintenance Worker (WG 07/08) • .04 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Coordinate with Other Partners to Provide EE Programming**	Provide MMLERC site for EE programs and logistical support/coordination in collaboration with many local NGOs, state, tribal and federal partners	Goal 1, Obj. 1; Goal 3, Obj. 1; Goal 3, Obj. 3	n/a from Refuge budget (+ $30K/yr. in grants)	• .02 FTE Refuge Wildlife Specialist (GS 07/09) and • .01 FTE Administrative Assistant (GS 05/07/09)	$35K/yr.	• .02 FTE Refuge Manager (GS 12/13) and • .02 FTE Refuge Wildlife Specialist (GS 07/09/11) • .10 FTE Outdoor Recreation Planner (GS 07/09/11) • .03 FTE Biologist (GS 07/09/11) • .02 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
VS	**Partner with Tribal Nations to Conduct EE Programs for Tribal Youth**	Partner with Tribal Nations to conduct an EE program for tribal youth on the Looney Unit to improve communication in native language and promote cultural resources, including healthy living and cooking using native/natural edible plants	Goal 3, Obj. 1; Goal 3, Obj. 3	→	→	$5K/yr.	• .01 FTE Refuge Manager (GS 12/13) and • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) • .05 FTE Outdoor Recreation Planner (GS 07/09/11) • .02 FTE Administrative Assistant (GS 05/07/09)
VS	**Partner with City of Tulsa and NGOs to Provide EE Program on Drinking Water Supply/Water Quality**	Develop programs with Blue Thumb, Land Legacy, and other NGOs as well as City of Tulsa, Oklahoma Water Resources Board, Oklahoma Conservation Commission, and Oklahoma Dept. of Environmental Quality to utlilize the Looney Unit as a water quality testing site (Spavinaw Creek, cave streams/springs, etc.) to conduct programs for youth to educate them about water quality and how that affects their drinking water supply	Goal 1, Obj. 1; Goal 3, Obj. 3	→	→	$5K/yr.	• .01 FTE Refuge Manager (GS 12/13) and • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) • .05 FTE Outdoor Recreation Planner (GS 07/09/11) • .03 FTE Biologist (GS 07/09/11) • .02 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Develop and Conduct Training for FWS Staff on the "Coyote Mentoring" EE Method**	Develop curricula and conduct training for FWS and other partner agencies staffs on effective EE methods based on "coyote mentoring" techniques (Young, et. al., 2010), using the Ozark resources as a vehicle and example. Coordinate curricula with Region 2 Regional Office Division of Visitor Services and NCTC. Training would be Refuge-based due to the proximity of four states, four FWS regions, the Ozark ecoregion common to all four states/regions, and other unique landscapes and facilities	Goal 3, Obj. 3; Goal 4, Obj. 1	→	→	n/a from Refuge budget (participants would pay a fee to include contract with NGO)	• .01 FTE Refuge Manager (GS 12/13) and • .02 FTE Refuge Wildlife Specialist (GS 07/09/11) • .02 FTE Outdoor Recreation Planner (GS 07/09/11) • .02 FTE Administrative Assistant (GS 05/07/09)
VS	**Coordinate with Universities to Conduct Field Trips, Outdoor Classes and Continuing Education Credits on Refuge**	Coordinate with participating universities to conduct field-based collegiate-level classes, field trips on-site, and learning survey techniques using Refuge resources or in cooperation with adjacent landowners who allow the classes on private lands; Provide a Teacher Continuing Education and General Education Credits Program on the Refuge	Goal 3, Obj. 2; Goal 3, Obj. 3	n/a	• .01 FTE Refuge Manager (GS 12) and • .02 FTE Refuge Wildlife Specialist (GS 07/09)	n/a	• .01 FTE Refuge Manager (GS 12/13) and • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) • .02 FTE Outdoor Recreation Planner (GS 07/09/11) • .02 FTE Biologist (GS 07/09/11)
VS	**Work with K-12 Classes to Utilize MMLERC**	Coordinate with local public, private, and home-school K-12 classes to utilize the Refuge and MMLERC for environmental education to provide quarterly programs that meet state curriculum standards	Goal 3, Obj. 3	→	→	$1K/yr.	• .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .03 FTE Outdoor Recreation Planner (GS 07/09/11) • .01 FTE Biologist (GS 07/09/11)
VS	**Conduct EE Programs Off-site**	Conduct some EE programs off-site regarding karst and cave resources to private landowners, at local schools, to 4H groups, scouts, county officials, and Tribal Nations, etc.	Goal 3, Obj. 3	→	→	$1K/yr.	• .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .02 FTE Outdoor Recreation Planner (GS 07/09/11)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Hands-on Master Gardener/ Master Naturalist Permaculture EE Program**	Collaborate with master gardeners and master naturalists to lead EE hands-on gardening programs on growing traditional foods and herbs (seeds provided by Cherokee Nation) in raised garden beds and landscape design using native plants (aesthetically-pleasing landscape, while also benefitting native wildlife such as birds and pollinators). MMLERC would also be utilized as a quarterly training and meeting site. Create limited signage of native plants and flowers within close proximity to the MMLERC	Goal 3, Obj. 3; Goal 3, Obj. 4	→	→	$1K/yr.	• .02 FTE Outdoor Recreation Planner (GS 07/09/11) and • .01 FTE Biologist (GS 07/09/11)
VS	**Conduct Interpretation Programs On-site at MMLERC**	Provide interpretive programs on the Looney Unit or at MMLERC to school and youth groups, civic organizations, naturalists/scientists, university faculty and students, Tribal groups, Service staff, and other agency staff, which may include short interpretive hikes and discussions that primarily provide information on natural, cultural, and biological resources of the Ozark ecoregion and promote sustainability on-site by showcasing green technologies and sustainable-living methods	Goal 3, Obj. 4	n/a	• .01 FTE Refuge Manager (GS 12) and • .08 FTE Refuge Wildlife Specialist (GS 07/09)	$500/yr.	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .08 FTE Outdoor Recreation Planner (GS 07/09/11)
VS	**Conduct Outreach Off-site at Public Events**	Perform outreach to off-site venues or events, including civic centers, organizational meetings, state park events, festivals/fairs wildlife expos and tribal pow-wows, using video, power point presentations with many visual photographs of Refuge resources, and/or table information booths	Goal 3, Obj. 2	n/a	• .01 FTE Refuge Manager (GS 12) and • .01 FTE Refuge Wildlife Specialist (GS 07/09)	$500/yr.	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .03 FTE Outdoor Recreation Planner (GS 07/09/11)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Design and Install Interpretive Displays in MMLERC**	Develop a display on cave history, including old cave photographs, caving equipment, cave maps, and cave exploration and ecology at the MMLERC; Develop model (display) showing interconnectivity of ground and surface water at the MMLERC	Goal 3, Obj. 8	→	→	$5K total	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .01 FTE Outdoor Recreation Planner (GS 07/09/11)
VS	**Install Photography Blinds**	Install photography blinds on Looney Unit, or other units as deemed appropriate	Goal 3, Obj. 5; Goal 3, Obj. 7	→	→	$4K total	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and/or • .01 FTE Outdoor Recreation Planner (GS 07/09/11) and • .01 FTE Maintenance Worker (WG 07/08)
VS	**Coordinate with ODWC to Allow and Monitor Hunting**	Develop a step-down Hunt Plan in collaboration with the ODWC to include details and impacts analysis of allowing walk-in only, open access hunting, according to State regulations on the Sally Bull Hollow Unit, once it has been surveyed and marked; Inventory and monitor federally listed endangered cave species to identify whether hunting is causing any adverse effects**;** If necessary, modify hunting regulations in cooperation with the ODWC**;** Evaluate the feasibility of allowing hunting on other areas of the Refuge as lands are acquired	Goal 1, Obj. 1; Goal 3, Obj. 6	→	→	(see IN project, "Survey and Mark Refuge Boundaries") $3K total	• .10 FTE Outdoor Recreation Planner (GS 07/09/11) and • .10 FTE LE Officer (GS 09) (based out of Sequoyah NWR)
VS	**Perform Outreach w/ Social Media & Update Refuge Website(s)**	Use social media tools and update Refuge websites to inform the public of current and upcoming EE, interpretation, wildlife photography & observation, and hunting opportunities, including visitor maps/directions; Stream live "bat cam" video online; Maintain and write online nature journal/blog	Goal 3, Obj. 2	→	→	n/a	• .03 FTE Outdoor Recreation Planner (GS 07/09/11)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Develop and Distribute Informational Materials**	Develop and distribute informational materials with guidance on adaptive sustainable land and water management practices and recommendations to landowners, utility companies, Tribal Nations, and other governmental agencies; Develop educational materials and programs for schools and landowners that highlight the value (i.e., ecological and economic) of the ecology of cave, forest, and aquatic habitats of the Ozarks as well as volunteer opportunities	Goal 2, Obj. 1; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 2, Obj. 9; Goal 2, Obj. 10; Goal 3, Obj. 2	→	→	$3K/yr.	• .03 FTE Outdoor Rec Planner (GS 07/09/11)
VS	**Develop Flier/Brochure of Visitor Service Opportunities**	Create a flier/brochure to advertise visitor services opportunities, including EE programs, interpretation, wildlife photography & observation, and hunting opportunities as well as volunteer opportunities	Goal 3, Obj. 2	→	→	<$500/yr.	• .02 FTE Outdoor Recreation Planner (GS 07/09/11)
VS	**Design and Distribute Merchandise and Other Promotional Materials**	Design and distribute promotional materials including merchandise (shirts, hats, flashlights, headlamps, belt buckles, coffee mugs, water bottles, posters, etc.) to promote the Refuge and its resources	Goal 3, Obj. 2	$1K/yr.	• .01 FTE Refuge Manager (GS 12) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09)	$3K/yr.	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and/or • .01 FTE Outdoor Recreation Planner (GS 07/09/11)
VS	**Establish and Maintain Walking Trails**	Establish a 0.25-mile mostly primitive trail to connect the MMLERC Pavilion/Spavinaw Creek trail to the Looney maintenance shop trail; Improve the 0.25-mile trail with gravel from the Looney maintenance shop to the MMLERC; Build a new 2-mile primitive trail around the perimeter of the Looney Unit; Repave the 0.1-mile concrete path from the MMLERC cabin to the pavilion; Improve the 0.1 mile primitive trail with gravel from the parking/camping area to MMLERC; Maintain and reassess primitive trails annually at the end of Winter/early Spring	Goal 3, Obj. 7	→	→	$1.5K/yr.	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .05 FTE Maintenance Worker (WG 07/08) • + intern or temporary maintenance worker

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
VS	**Install Primitive Overlook Areas**	Install 3 primitive overlook areas (with bench or sitting area) on the Looney Unit perimeter trail, to use as stopping points for wildlife observation and photography, environmental education, and interpretation	Goal 3, Obj. 7	→	→	$500 total	• .01 FTE Maintenance Worker (WG 07/08)
VS	**Construct and Install Refuge Signs**	Construct a sign at the MMLERC to say "Mary & Murray Looney Education & Research Center"; Construct MMLERC sign at the county road entrance; Once established, post sign for new Refuge Headquarters; Install limited interpretive signage on the nature trail at Looney Unit; Install signs at all cave entrances to prohibit public entry and inform about WNS	Goal 3, Obj. 8	→	→	$2.5K total	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .02 FTE Maintenance Worker (WG 07/08) • .01 FTE Outdoor Recreation Planner (GS 07/09/11) • .01 FTE Biologist (GS 07/09/11)
VS	**Survey and Mark Refuge Boundaries**	Contract surveyors to survey and mark all unsurveyed and unmarked boundaries on the Refuge, using permanent metal boundary markers; Maintain and repair existing markers	Goal 2, Obj. 1; Goal 2, Obj. 2; Goal 2, Obj. 3; Goal 3, Obj. 6; Goal 3, Obj. 9	n/a: surveying + marking	• .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .01 FTE Maintenance Worker (WG 07/08)	TBD (substantial cost for survey; $10K to mark current units that have been surveyed); $200K to survey/mark Sally Bull Hollow Unit; $33K Gittin Down Mountain; $27K Varmint Unit	• .02 FTE Refuge Manager (GS 12/13) and/or • .02 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .05 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09) • (+ .05 intern)
IN	**Develop Training Program on Cave Safety and Search & Rescue**	Create an EE program to train fire departments, grottos, and state and federal law enforcement agencies, as well as Refuge staff, on cave safety, search & rescue, and first-responder medical training	Goal 4, Obj. 1	→	→	$10K/yr.	• .02 FTE Refuge Manager (GS 12/13) and • .02 FTE Refuge Wildlife Specialist (GS 07/09/11) • .02 FTE Outdoor Recreation Planner (GS 07/09/11) • .02 FTE Biologist (GS 07/09/11) • .02 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
IN	**Coordinate and Lead Cave/Karst/Bat Management Training**	Coordinate and assist in leading a training and education workshop for inter-, intra-Service and collegiate partners focusing on cave, karst and bat management, using methods such as anabat acoustic detectors, infrared and thermal videography, mist-netting techniques and bat identification, cave gate construction, recharge area delineation, and other resource management techniques	Goal 3, Obj. 1	$2K/yr.	• .01 FTE Refuge Wildlife Specialist (GS 07/09)	$10K/yr.	• .05 FTE Refuge Manager (GS 12/13) and • .02 FTE Refuge Wildlife Specialist (GS 07/09/11) • .01 FTE Outdoor Recreation Planner (GS 07/09/11) • .10 FTE Biologist (GS 07/09/11) • .02 FTE Administrative Assistant (GS 05/07/09)
IN	**Establish Refuge Headquarters Site**	Retrofit/remodel and/or build new headquarters site with adequate office and administrative space for anticipated staffing; Include facilities for volunteers (lounge, kitchen, showers, etc.) in the site plan	Goal 4, Obj. 3	→	→	TBD	TBD
IN	**Renovate MMLERC Roof**	Remove cedar shingles and re-roof with new plywood and metal roof	Goal 4, Obj. 4	→	→	$25K total (includes contractor) Or $15K (MAT)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .02 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
IN	**Renovate MMLERC Porch**	Renovate flooring of porch and ensure porch railing meets safety standards	Goal 4, Obj. 4	→	→	$20K total (includes contractor) Or $10K (MAT)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .02 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
IN	**Renovate MMLERC Exterior**	Replace logs and grout, seal the exterior, paint exterior trim, and repair the retaining wall behind the cabin	Goal 4, Obj. 4	→	→	$40K initial + $3K/yr.	• .03 FTE Maintenance Worker (WG 07/08)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
IN	**Make MMLERC Handicap-accessible**	Renovate front door to be handicap accessible; Renovate one bathroom in the EE center to include an accessible entrance and shower	Goal 4, Obj. 4	→	→	$20K total (includes contractor) or $10K (MAT)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .03 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
IN	**Install Solar Panels**	Install solar panels on Looney Unit and potentially on any newly acquired or developed buildings	Goal 1, Obj. 4; Goal 4, Obj. 4	→	→	$50K/initial cost/installation + $1K/yr. maintenance	• .01 Wildlife Refuge Specialist (GS 07/09/11) and • .01 Maintenance Worker (WG 07/08)
IN	**Make MMLERC Energy-Efficient**	Install and maintain energy-efficient heating and cooling system and appliances (geothermal heating and cooling system, double pane windows, insulation, stove, refrigerator, dishwasher, on-demand hot water, washer and dryer) on all Refuge buildings	Goal 1, Obj.4; Goal 4, Obj. 4	$3k/yr.	• .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and/or • .02 FTE Maintenance Worker (WG 07/08)	$40K/initial cost + $2K/yr.	• .01 FTE Wildlife Refuge Specialist (GS 07/09/11) and • .02 FTE Maintenance Worker (WG 07/08)
IN	**Maintain Safe & Adequate Drinking Water Supply**	Maintain water filtration system and replace filters at the MMLERC and other Refuge buildings to reduce energy and waste associated with bottled water; Test drinking water quality; Repair plumbing system, if necessary	Goal 1, Obj. 4; Goal 4, Obj. 4	$500/yr./system (2 systems total)	• .01 FTE Wildlife Refuge Specialist (GS 07/09/11)	$6K/filter system + $500/yr./system	• .01 FTE Maintenance Worker (WG 07/08)
IN	**Install Rainwater Collection System**	Install a rainwater collection system at the Looney Unit and the Guess house for irrigation purposes	Goal 1, Obj. 4; Goal 4, Obj.4	→	→	$1K/initial cost	N/A
IN	**Install Alarm System at MMLERC and Maintenance Shops**	Install monitored alarm system in cabin and the Guess and Krause maintenance shops	Goal 4, Obj. 4	→	→	$5-10K/alarm system	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .01 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
IN	**Install Audio/Visual Technology in MMLERC**	Install audio/visual technology (i.e. ceiling-mounted projector, etc.) for modern methods of teaching EE programs (i.e., power points, etc.)	Goal 3, Obj. 3; Goal 3, Obj. 4; Goal 4, Obj. 4	→	→	$6K total	n/a

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
IN	**Improve and Widen Access Roads and Parking Areas**	Widen the MMLERC access drive by 2 feet and improve with gravel, including parking area; improve road with gravel from county road to maintenance shop (next to Guess House) on the Mary & Murray Looney Unit; improve 0.3 miles of gravel road on the Beck Unit; improve and/or maintain roads on newly acquired lands, where necessary	Goal 4, Obj. 5	→	→	$50K total supplies	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .03 FTE Maintenance Worker (WG 07/08)
IN	**Protect and Survey Historical, Archeological, and Paleontological Sites**	Partner with Oklahoma Historical Society, university faculty and/or students, Sam Noble Museum of Natural History, Tribes, SHPO, and others to conduct archeological, surveys to preserve and perform studies on known sites and any newly discovered sites	Goal 4, Obj. 2	→	→	TBD (as per situation dictates)	TBD
IN	**Construct & Maintain Maintenance Facilities**	Build additional 50'x100' metal building on concrete pad maintenance shop at new Headquarters site; Construct a separate ventilated building located next to maintenance shop for hazardous materials storage; Construct an additional decontamination and storage facility/structure at the new Headquarters location; Outfit these facilities with appropriate maintenance equipment, heat, insulation, electricity, appropriate plumbing, lighting, etc.; Construct a new fueling station for Refuge vehicles and equipment at new Headquarters location; Reconstruct existing pole barn on the Beck Unit, near the Krause house; Maintain all maintenance facilities and supplies	Goal 4, Obj. 6	→	→	$250K initial + $5K/yr. (including contractors)	• .03 FTE Refuge Manager (GS 12/13) and/or • .03 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .10 FTE Maintenance Worker (WG 07/08) • .03 FTE Administrative Assistant (GS 05/07/09)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
IN	**Provide Refuge Housing Adjacent to New HQ Site**	Construct and/or purchase two new residences (one staff, one volunteer/student) adjacent to the new Headquarters building location	Goal 4, Obj. 7	→	→	$300-400K (approx.)	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .05 FTE Maintenance Worker (WG 07/08) • .02 FTE Administrative Assistant (GS 05/07/09)
IN	**Construct two RV Pads for Volunteers at new HQ site**	Construct two RV pads for volunteers at the new Headquarters site, to include utilities	Goal 4, Obj. 7	→	→	$5K total	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .03 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
IN	**Renovate Krause Residence for Refuge Housing**	Once agreement with Leslie Krause is terminated (via donation), renovate Krause residence and use for staff/volunteer/student housing	Goal 4, Obj. 7	→	→	$20K (contracted) or $10K MATS	• .01 FTE Refuge Manager (GS 12/13) and/or • .01 FTE Refuge Wildlife Specialist (GS 07/09/11) and • .10 FTE Maintenance Worker (WG 07/08) • .01 FTE Administrative Assistant (GS 05/07/09)
IN	**General Maintenance**	General grounds upkeeping, maintain and clean facilities, trash removal, vehicle maintenance, minor repairs, mowing, weeding, etc.	n/a	$5K/yr.	• .01 FTE Refuge Manager (GS 12) and • .05 FTE Refuge Wildlife Specialist (GS 07/09) • .45 FTE Maintenance Worker (WG 07/08)	$7-10K/yr.	• .50 FTE Maintenance Worker (WG 07/08)
IN	**General Administration**	General administration including: file-keeping, upkeep of paperwork, book-keeping, budget, contracting, data calls, SAMS, RONS, FBMS, online/safety trainings, etc.	n/a	n/a	• .10 FTE Refuge Manager (GS 12) and • .10 FTE Refuge Wildlife Specialist (GS 07/09) and • .02 FTE Maintenance Worker (WG 07/08) and • .30 FTE Administrative Assistant (GS 07) based out of Sequoyah NWR	n/a	• .15 FTE Refuge Manager (GS 12/13) and • .10 FTE Refuge Wildlife Specialist (GS 07/09) • .35 FTE Administrative Assistant (GS 05/07/09) • .02 FTE Maintenance Worker (WG 07/08) • .02 FTE Biologist (GS 07/09/11) • .02 FTE Outdoor Rec Planner (GS 07/09/11)

#	Project	Project Description	Ch. 4 Reference	Current Cost	Current Staffing	Future Cost Required	Future Staffing Required
	Total Projects • **(08) Landscape Level** • **(11) Habitat Management** • **(19) Wildlife Management** • **(24) Visitor Services** • **(21) Infrastructure**			**Current Cost** **Total Annual** $119,100 **Total Initial** $25,000 **Total Land Acquisition (4,000 acres)** $400,000	**Current Total Staffing** • >1.0 FTE Refuge Manager (GS 12) • >1.0 FTE Refuge Wildlife Specialist (GS 07/09) • .50 FTE Maintenance Worker (WG 07/08) • .30 FTE Administrative Assistant (GS 07) *based out of Sequoyah NWR* • .10 FTE Prescribed Fire Specialist (GS 11) *based out of Oklahoma/North-Texas Fire Management District*	**Future Cost** **Total Annual** $447,600 **Total Initial for 2013-2028** $2,919,000 **Total Land Acquisition (11,000 acres) + Boundary Marking** approx. $33,270,000	**Future Total Staffing Required** • 1.0 FTE Refuge Manager (GS 12/13) • 1.0 FTE Refuge Wildlife Specialist (GS 07/09/11) • 3.0 FTE Biologist (GS 07/09/11) • 1.5 FTE Outdoor Recreation Planner (GS 07/09/11) • 1.5 FTE Maintenance Worker (WG 07/08) • 1.0 FTE Administrative Assistant (GS 05/07/09) • 0.3 FTE Law Enforcement Officer (GS 09) *based out of Sequoyah NWR* • .30 FTE Prescribed Fire Specialist (GS 11) *based out of Oklahoma/North-Texas Fire Management District* • .50 PT SCEP

5.7 Step-Down Management Plans

Implementation of this CCP will be accomplished, in part, through various step-down management plans (see sections 5.7.1 and 5.7.2). Each step-down plan has its own program focus, identifying and directing the implementation of strategies (i.e., actions, techniques, and tools) designed to achieve programmatic objectives outlined in the CCP.

5.7.1 Current Step-Down Plans

Current Refuge step-down management plans and other plans referred to that guide Refuge management include:

- (Draft) Station Safety Plan (2012)
- (Draft) Cave Safety Plan (2012)
- Ozark Plateau NWR Fire Management Plan for the Looney Unit (2008)
- Ozark Plateau NWR Fire Management Plan for the Sally Bull Hollow Unit (2008)
- Ozark Plateau NWR Habitat Management Plan (2005)
- Ozark Plateau NWR Proposed Boundary Expansion EA, LPP, and CMP (2002; approved 2005)

5.7.2 Future Step-Down Plans

The following list of step-down management plans may be necessary to guide management of specific Refuge programs:

- Fire Management Plan (to include all Refuge Units)
- Hunt Plan
- I&M Plan
- Integrated Pest Management Plan
- Visitor Services Plan

5.7.3 Other Frequently Referenced Plans

- Ozark big-eared bat Revised Recovery Plan (1995)
- Ozark big-eared bat 5-Year Review (2008)
- Gray bat Recovery Plan(1982)
- Indiana bat Recovery Plan (2009)
- Ozark cavefish Recovery Plan (1989)
- Ozark cave crayfish Recovery Plan (1996)
- Oklahoma Comprehensive Wildlife Management Strategy (2005)
- The Nature Conservancy’s Ozark Ecoregional Conservation Assessment (2003)
- The Central Hardwood Joint Venture Concept Plan (2003)

- Tri-State (Tar Creek) Superfund Site, Final Partial Restoration Plan and Environmental Assessment (2000)
- North American Landbird Conservation Plan (2004)
- A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats (2011)
- White-nose Syndrome Response Plan for the State of Oklahoma (http://www.wildlifedepartment.com/wildlifemgmt/Oklahoma_Response_Plan_WNS.pdf)

5.8 Monitoring and Evaluation of the CCP

Inventorying and monitoring DNA samples to learn more about genetic diversity of cave species. (Credit: Shea Hammond)

Inventorying and monitoring helps the Refuge track the progress of implementing the CCP. The results of monitoring show how well objectives are being achieved and measure progress towards accomplishing overall Refuge goals. Table 5-3 is meant for the Refuge staff to utilize throughout the length of this CCP in order to monitor the effectiveness of their efforts as they correspond to their objectives identified in Chapter 4. This table is to be used as a practical stand-alone electronic monitoring data document. This provides Refuge staff with the flexibility to modify monitoring notes as frequently as needed, as well as the information (i.e. add a new scientific monitoring technique or an additional project), while saving it as an electronic file to be easily referenced. Refuge staff is responsible for consistently monitoring the progress of project implementation and especially, of whether objectives are being achieved. It is recommended that Refuge staff at least review these annually. This monitoring table will be refined throughout the lifetime of the CCP:

- as additional Refuge management units are acquired
- as management is adapted to meet changing conditions (see Chapter 4 introduction regarding *Adaptive Management*)
- as management is adapted to meet the identified needs and requirements of various habitats and wildlife species (see Chapter 4 introduction regarding *Adaptive Management*)
- as step-down management plans are drafted or revised
- as additional projects become necessary to implement (may require further NEPA documentation)

Table 5-3. 2013-2028 CCP Monitoring & Evaluation Table.

Goal 1. Landscape-level Context

Collaborate with multiple partners to implement Strategic Habitat Conservation on a landscape-level in order to prevent extinction and recover federally listed threatened and endangered Ozark cave species as well as prevent the need for listing other Ozark species of concern.

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
1	**Continue Building Landscape-Level Partnerships**	2013-2028	# of partnerships, collaborate projects, co-hosted conferences, additional funding sources, increase capability, maximize strengths, work across state, regional, tribal, agency, and private organizational boundaries and involve private landowner to make best use of their authorities and capabilities.	track existing and any new partnerships, keep partners informed, maintain personal communications and visits, collaborate projects, and/or co-hosted planning and management teams, meetings, conferences, and websites.	ongoing	
↓ ***Associated Projects*** *(**type date and progress details** below each project):* ☐ Maintain and Increase Partnerships ☐ Lead and/or Participate in Landscape Level Conservation Projects and Conferences ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/ Implementation						
Obj. #	**Objective**	**Implement by year:**	**Effectiveness Measures**	**Monitoring Techniques**	**Monitoring Frequency**	**Date & Monitoring Notes**
2	**Coordinate Across FWS Regions to Better Manage Federally Listed Ozark Cave Species on a Landscape-Level**	2013-2028	on-the-ground collaboration between distinct FWS regions to manage cave resources, population recovery of T&E cave species, increased scientific information/knowledge regarding cave species in the Ozarks	development of management agreement(s) to manage federally listed Ozark cave species across multiple FWS regions; evaluation of effectiveness of these management agreements	ongoing	
↓ ***Associated Projects*** *(**type date and progress details** below each project):* ☐ Coordinate Across FWS Regional Boundaries to Manage Ozark Cave Species						

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
3	**Expand Refuge Boundaries**	2013-2028	15,000 acres of land acquired Oklahoma, but yet to be determined in Arkansas, Missouri, and Kansas	land and conservation easements; conservation agreements with private, municipal, county, state, tribal, and federally landowners	ongoing	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Maintain and Increase Partnerships
- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/ Implementation

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
4	**Implement Climate Change Monitoring & Mitigation Program**	2018	air, water, cave, rock, soil, and stream temp., % humidity, % light, precipitation, stream flow, groundwater elevation; % energy efficiency, % alt. energy use, and gallons of water conservation, migration patterns, shifts in both aquatic and terrestrial plant and animal species composition	record climate data, species movement and population base lines and measure trends over time; monitor and track energy efficiency levels, water use and alternative energy use	seasonally	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Implement Climate Data Loggers Program
- ☐ Install Weather Stations
- ☐ Monitor and Reintroduce Chestnut blight-resistant Chinqapin
- ☐ Install Solar Panels
- ☐ Make MMLERC Energy-Efficient
- ☐ Maintain Safe & Adequate Drinking Water Supply

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
5	**Implement Water Quantity & Quality Monitoring & Management Program**	2018	levels of contaminants of surface and groundwater quality in streams, lakes, aquifers, springs, and caves; water quantity (levels and flow) based on groundwater elevation and discharge of aquifers, springs, caves, streams, and lakes	record and compare results of water quality and quantity levels; compare results with population health of cavefish and cave crayfish and other surface and subterranean species	every 5 years for quality; every 2 years for quantity	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Implement Water Quality Monitoring Program
- ☐ Implement Water Quantity Monitoring Program
- ☐ Map Groundwater Recharge Areas

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
6	**Assist with White-nose Syndrome Research, Monitoring, Prevention, and Recovery**	2013-2028	presence of *Geomyces destructans*; if present, species type, severity of impact, and % of bat pop. affected by WNS; # of caves with WNS occurrences; # caves prevented from occurrence of WNS; # of Refuge- managed populations recovered from WNS	document mitigation measures; document all occurrences of *Geomyces destructans* and WNS, including species type and location; document prevention and recovery of WNS including species type and location	ongoing	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives and Assist w/Implementation
- ☐ Lead and/or Participate in Landscape Level Conservation Projects and Conferences
- ☐ Coordinate beyond FWS Regional Boundaries to Manage Ozark Cave Species
- ☐ Monitoring Cave Entry
- ☐ Bio-inventory Cave Fauna
- ☐ Monitor for White-nose Syndrome
- ☐ Prevent White-nose Syndrome from Occurring on the Refuge
- ☐ Reduce and/or eliminate White-nose Syndrome from Affected Bats and/or Sites
- ☐ Conduct Genetic Sampling
- ☐ Identify Migration Corridors of Bat, Bird, or Other Wildlife Species
- ☐ Monitor Bat Population Trends
- ☐ Monitor Bat Response to Cave Habitat Conditions
- ☐ Monitor Cavefish & Cave Crayfish Population Trends

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
7	**Identify Migration Routes/Habitat Corridors**	2018	# of bat and bird species whose migration routes/habitat corridors have been identified	ID and map migration routes/habitat corridors/timing and update	every 5 years	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Maintain and Increase Partnerships
- ☐ Lead and/or Participate in Landscape Level Conservation Projects and Conferences
- ☐ Identify Migration Corridors of Bat, Bird, or other Wildlife Species

Goal 2. Wildlife Habitat & Population Management

Protect, enhance, conserve and restore Ozark natural caves, springs, streams, aquifers, wetlands, watersheds, forests, and groundwater recharge areas to prevent extinction and recover federally listed cave species as well as prevent the need for listing other native species including migratory birds and other species of concern in the Ozarks to promote natural species diversity on a landscape-level.

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
1	**Protect, Enhance, and/or Restore Forested Habitat**	2013-2028	condition of forested habitat or habitat restored to forest (mod. stocked, open woodlands w/ herbaceous understory); # of acres protected, enhanced, and/or restored	observation, professional judgment, establish transects, and other sampling points to determine and monitor forest conditions; document # of acres acquired as forest or restored to forest; sustainability of Ozark big-eared bats and other forest-foraging or roosting species	as needed; at least every 5 years	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/Implementation
- ☐ Use Prescribed Fire on 1/3 of Total Refuge Lands
- ☐ Identify and Map the Distribution and the Condition of Forest Habitat
- ☐ Identify & Survey Plant Species
- ☐ Monitor Impacts of Non-Native Flora Species
- ☐ Monitor & Reintroduce Chestnut Blight-Resistant Chinquapin
- ☐ Implement Adaptive Management to Control Non-Native Invasive Flora
- ☐ Determine Bat Foraging Ecology & Habitat Trends

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
2	**Protect, Enhance, and/or Restore Aquatic Habitat**	2013-2028	Levels of contaminants of surface and groundwater quality and other habitat parameters in streams, lakes, aquifers, springs, and caves; pop. levels of cavefish and other surface and subterranean species	Record and compare results of water quality and quantity levels and other habitat parameters; compare results with population monitoring of cavefish and cave crayfish and other surface and subterranean species	As needed; at least every 5 years	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/Implementation
- ☐ Implement Water Quality Monitoring Program
- ☐ Implement Water Quantity Monitoring Program
- ☐ Map Groundwater Recharge Areas
- ☐ Identify & Survey Plant Species
- ☐ Monitor Impacts of Non-Native Flora Species
- ☐ Implement Adaptive Management to Control Non-Native Invasive Flora
- ☐ Monitor Bat Response to Cave Habitat Conditions
- ☐ Monitor Cavefish & Cave Crayfish Population Trends
- ☐ Research Ecology of Ozark Cavefish

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
3	**Provide Undisturbed, Safe, and Protected Cave Habitat**	2013-2028	# of cave vandalism incidents; frequency of monitoring human access to important caves; condition of existing cave gates; educated public (public aware of importance of not disturbing cave resources)	document cave vandalism incidents; document Refuge staff and LE cave surveillance visits (where and when); monitor condition of existing cave gates, construct new cave gates to control human access where needed, repair damaged or deteriorating cave gates; interact with public and EE/interp participants about importance of cave closures	annually	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/Implementation
- ☐ Locate Additional Caves
- ☐ Coordinate beyond FWS Regional Boundaries to Manage Ozark Cave Species
- ☐ Monitoring Cave Entry
- ☐ Install Cameras in Cave Interiors to Monitor Bat Activity/Behavior

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
4	**Locate Additional Caves**	2013-2028	# and importance of new cave locations discovered; extensive ridge-walking efforts	continue search for important caves and map (and update map) of searched and unsearched geological areas conducive to cave formations	annually	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/Implementation
- ☐ Locate Additional Caves
- ☐ Coordinate beyond FWS Regional Boundaries to Manage Ozark Cave Species
- ☐ Map Subterranean Extent of Known Caves

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
5	**Delineate Recharge Area of Cavefish and Crayfish Caves**	2013-2028	map total groundwater recharge areas of important caves	map ground water recharge and watershed areas based on results of dye tracing	update every 5 years	

↓ ***Associated Projects*** ***(type date and progress details*** *below each project):*

- ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers
- ☐ Map Groundwater Recharge Areas

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
6	**Inventory & Monitor to Increase Scientific Knowledge Regarding Federally Listed Cave Species and Species of Concern**	2013-2028	establishment of I&M program(s) that increases knowledge of pop. trends, density, distribution, genetic diversity, and habitat preferences of federally listed species and species of concern	documentation and presentation of current research; use of information in adaptive management; sustainability of cave species	as needed	

↓ ***Associated Projects*** ***(type date and progress details*** *below each project):*

- ☐ Lead and/or Participate in Landscape Level Conservation Projects and Conferences
- ☐ Coordinate beyond FWS Regional Boundaries to Manage Ozark Cave Species
- ☐ Use Prescribed Fire on 1/3 of Total Refuge Lands
- ☐ Bio-inventory Cave Fauna
- ☐ Monitor for White-nose Syndrome
- ☐ Conduct Genetic Sampling
- ☐ Identify Migration Corridors of Bat, Bird, or other Wildlife Species
- ☐ Conduct Species Surveys
- ☐ Monitor Bat Population Trends
- ☐ Monitor Bat Response to Cave Habitat Conditions
- ☐ Identify Baseline Data regarding Bat Species & Distribution within Foraging Areas
- ☐ Determine Bat Foraging Ecology & Habitat Trends
- ☐ Install Cameras in Cave Interiors to Monitor Bat Activity Behavior
- ☐ Monitor Cavefish & Cave Crayfish Population Trends
- ☐ Research Ecology of Ozark Cavefish
- ☐ Develop Habitat Suitability Index Model
- ☐ Pesticide Sampling

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
7	**Inventory & Monitor to Increase Scientific Knowledge Regarding Migratory and Resident Non-T&E Species**	2013-2028	establishment of I&M program(s) that acquires Refuge species list and increases knowledge of pop. trends, density, distribution, and habitat preferences of non-T&E species	documentation and presentation of current research; use of information in adaptive management; sustainability of non-T&E species	as needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Lead and/or Participate in Landscape Level Conservation Projects and Conferences
- ☐ Use Prescribed Fire on 1/3 of Total Refuge Lands
- ☐ Bio-inventory Cave Fauna
- ☐ Monitor for White-nose Syndrome
- ☐ Conduct Genetic Sampling
- ☐ Identify Migration Corridors of Bat, Bird, or other Wildlife Species
- ☐ Conduct Species Surveys
- ☐ Monitor Bat Population Trends
- ☐ Monitor Bat Response to Cave Habitat Conditions
- ☐ Identify Baseline Data regarding Bat Species & Distribution within Foraging Areas
- ☐ Determine Bat Foraging Ecology & Habitat Trends
- ☐ Install Cameras in Cave Interiors to Monitor Bat Activity Behavior
- ☐ Pesticide Sampling

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
8	**Monitor Migratory and Resident Bird Species utilizing the Refuge and Surrounding Landscape**	2013-2028	establishment of I&M program(s) to identify migratory & resident birds and understand their habitat requirements	documentation and presentation of current research; use of information in adaptive management; sustainability of bird species	as needed	

↓ ***Associated Projects*** ***(type date and progress details*** *below each project):*

- ☐ Lead and/or Participate in Landscape Level Conservation Projects and Conferences
- ☐ Identify and Map the Distribution and the Condition of Forest Habitat
- ☐ Identify Migration Corridors of Bat, Bird, or other Wildlife Species
- ☐ Use Prescribed Fire on 1/3 of Total Refuge Lands
- ☐ Conduct Species Surveys
- ☐ Monitor Bird Population Trends & Identify Habitat Requirements

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
9	**Map, Monitor, Research, and Implement Adaptive Management to Assess and Control Invasive Non-native Flora**	2013-2028	establishment of I&M program(s) to identify non-native invasive plants on and surrounding every unit and understand impacts to native flora & fauna species	documentation and presentation of current research; use of information in adaptive management to control invasive flora; sustainability of native species	as needed	

↓ ***Associated Projects*** ***(type date and progress details*** *below each project):*

- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/ Implementation
- ☐ Use Prescribed Fire on 1/3 of total Refuge Lands per year
- ☐ Identify and Map the Distribution and the Condition of Forest Habitat
- ☐ Identify & Survey Plant Species
- ☐ Monitor Impacts of Non-Native Flora Species
- ☐ Monitor & Reintroduce Chestnut Blight-resistant Chinquapin
- ☐ Implement Adaptive Management to Control Non-Native Invasive Flora

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
10	**Map, Monitor, Research, and Implement Adaptive Management to Assess and Control Invasive Non-native Fauna**	2013-2028	establishment of I&M program(s) to identify non-native invasive wildlife species on and surrounding every unit and understand impacts to native flora & fauna species	documentation and presentation of current research; use of information in adaptive management to control invasive fauna; sustainability of native species	As needed	

↓ ***Associated Projects*** ***(type date and progress details*** *below each project):*

- ☐ Educate Landowners about Private Land Conservation Mgmt. Incentives & Assist w/ Implementation
- ☐ Monitor Impacts of Non-Native Fauna Species
- ☐ Implement Adaptive Management to Control Non-Native Invasive Fauna Species

Goal 3. Visitor Services

Provide safe, high quality, compatible, wildlife dependent use opportunities for visitors, students, and nearby residents, to give them an understanding of the importance and value of Ozark cave, spring, aquifer, stream, wetland, watershed, groundwater recharge areas, and forest wildlife habitat conservation efforts.

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
1	**Establish a Friends Group and Increase Volunteers**	2013-2028	establishment of official Friends Group; # of Friends and length of dedication/commitment; # of volunteer hours	assist in establishment of Friends Group; maintain "Friends Log" with contact info, each member's expertise, Friend role/job/expertise, and total volunteer hours; coordinate and lead meetings with Friends Group; train (job, education, safety) dedicated Friends members to then train new Friends members or volunteers; Host Friends appreciation events	seasonally	
↓ ***Associated Projects*** ***(type date and progress details*** *below each project):* ☐ Coordinate to Establish and Train Official Friends Group						

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
2	**Increase Public Awareness via Outreach**	2013-2028	local public awareness of surrounding cave and karst resources; local public awareness of Ozark Plateau NWR; # of visitors from various surrounding communities as a result of outreach efforts	maintain "Outreach Log" of date, location, method, and audience type of conferences, festivals, schools, and other local events attended for public outreach; update "Outreach Log" when materials are produced and to whom they are distributed; visitor log/survey with Q: "how did you hear about us?"	As performed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Coordinate to Establish and Train Official Friends Group
- ☐ Conduct Outreach Off-site at Public Events
- ☐ Perform Outreach w/Social Media & Update Refuge Website(s)
- ☐ Develop Flier/Brochure of Visitor Services Opportunities
- ☐ Develop and Distribute Informational Materials
- ☐ Design and Distribute Merchandise and Other Promotional Materials

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
3	**Collaborate to Increase Program Opportunities for Environmental Education**	2013-2028	# of EE participants; # of visits per week; # and ~~quality~~ of collaborative EE programs with partners; # of repeat visits	achieving desired visitor numbers; feedback from participants (via pre- and post-program surveys, verbal communication, comments, evaluations)	seasonally	

↓ ***Associated Projects*** ***(type date and progress details*** *below each project):*

- ☐ Ozark Nature Connection Series EE Programs
- ☐ Coordinate with Other Partners to Provide EE Programming
- ☐ Partner with Tribal Nations to Conduct EE Programs for Tribal Youth
- ☐ Partner with City of Tulsa and NGOs to Provide EE Program on Drinking Water Supply/Water Quality
- ☐ Develop and Conduct Training for FWS Staff on "Coyote Mentoring" EE Method
- ☐ Coordinate with Universities to Conduct Field Trips, Outdoor Classes and Continuing Education Credits on Refuge
- ☐ Work with K-12 Classes to Utilize MMLERC
- ☐ Conduct EE Programs Off-site
- ☐ Hands-on Master Gardener/Master Naturalist Permaculture EE Program
- ☐ Install Audio/Visual Technology in MMLERC

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
4	**Collaborate to Promote and Conduct Interpretation Programs**	2013-2028	# of interpretation program participants; # of visits per week; # and quality of collaborate interpretive programs with partners; # of repeat visits	documentation of visitor numbers and purpose of visit; feedback from visitors (via pre- and post- program surveys, verbal communication, comments, evaluations)	as needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Conduct Interpretation Programs On-site at MMLERC
- ☐ Conduct Interpretation Programs Off-site at Public Events
- ☐ Design and Install Interpretive Displays in MMLERC
- ☐ Install Audio/Visual Technology in MMLERC

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
5	**Promote Opportunities for Wildlife Observation & Photography**	2013-2028	# of participants observing wildlife and/or using cameras; displayed wildlife photographs by visitors in MMLERC; use of social media to share images taken on Refuge; # of repeat visits	documentation of visitor numbers and purpose of visit; feedback from visitors (via pre- and post- program surveys, verbal communication, comments, evaluations); log of identified wildlife species	as needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Install Photography Blinds
- ☐ Install Primitive Overlook Areas

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
6	**Collaborate with ODWC to Provide Hunting Opportunities**	2018	development and completion of a step-down Hunt Plan + NEPA documentation in cooperation with the ODWC; Sally Bull Hollow Unit boundaries surveyed and marked	development of Hunt Plan in cooperation with the ODWC; once hunting is allowed, feedback from hunters on hunting on the Sally Bull Hollow Unit and if necessary, documentation of effects of hunting on important cave species and game species	as needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Survey and Mark Refuge Boundaries
- ☐ Coordinate with ODWC to Allow and Monitor Hunting

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
7	**Create More Hiking/Nature-viewing Opportunities**	2018	at least 2.7 miles of primitive trails on and around perimeter of Looney Unit established and/or improved; # of visitors using trails	feedback from visitors using trails (verbal communication, comments, surveys, evaluations); Ease and safety of trail use and views from trails	As needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Establish and Maintain Walking Trails
- ☐ Install Primitive Overlook Areas

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
8	**Design and Display Refuge Signs**	2013-2028	establishment of MMLERC sign at cabin and county road entrance; establishment of Refuge HQ sign; # of caves with signs prohibiting public entry	observation of visitors not getting lost and less illegal cave entry due to signage	As needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Construct and Install Refuge Signs

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
9	**Survey and Mark Refuge Units' Boundaries**	2013-2028	% of Refuge Units (boundaries) that have been surveyed and marked	track (Table 4-1 from Ch. 4) which Units have been surveyed and marked (and maintenance of markers, fences, gates); Prioritize survey and marking projects	Annually	
↓ ***Associated Projects*** *(**type date and progress details** below each project):* ☐ Survey and Mark Refuge Boundaries						

Goal 4. Refuge Infrastructure & Administration

Provide administrative support and appropriate facilities required to ensure that Refuge goals and objectives are met through effective landscape conservation management of Ozark habitats, fish and wildlife, and visitor services and for the primary purpose of preventing extinction and recovering federally listed threatened and endangered Ozark cave species.

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
1	**Ensure Workforce and Volunteer Training and Safety**	2013-2028	# of injuries; comfort level of staff in performing their job; time/energy efficiency to accomplish projects	document each employee or volunteer's trainings with dates, perform and save job hazard analysis ; observe staff on the job to evaluate knowledge, efficiency, and safety precautions; feedback from employee/volunteer evaluations	As needed	
↓ ***Associated Projects*** *(**type date and progress details** below each project):* ☐ Coordinate to Establish and Train Official Friends Group ☐ Develop Training Program on Cave Safety and Search & Rescue ☐ Coordinate and Lead Cave/Karst/Bat Management Training ☐ Develop and Conduct Training for FWS Staff on the "Coyote Mentoring" EE Method						

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
2	**Protect and Survey Historical, Archeological and Paleontological Sites**	2013-2028	increased knowledge of newly discovered historical, archeological, and paleontological sites; Protection of known sites	monitor protection of known sites; Get information regarding newly discovered sites from partners' surveys	As needed	
↓ ***Associated Projects*** ***(type date and progress details*** *below each project):* ☐ Protect and Survey Historical, Archeological and Paleontological Sites						
Obj. #	**Objective**	**Implement by year:**	**Effectiveness Measures**	**Monitoring Techniques**	**Monitoring Frequency**	**Date & Monitoring Notes**
3	**Establish a Refuge Headquarters Site**	2013-2028	establishment of central HQ site; increased efficiency in communication and coordination between Refuge staff members	n/a	n/a	
↓ ***Associated Projects*** ***(type date and progress details*** *below each project):* ☐ Acquire up to 15,000 Acres of Land and Conservation Easements from Willing Sellers ☐ Establish Refuge Headquarters Site						

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
4	**Renovate and Repair the MMLERC**	2018	# of repairs and renovation projects completed (from Ch. 4 strategies)	feedback from MMLERC users/visitors' experience of the facility (verbal communication, comments, surveys, evaluations)	As needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Renovate MMLERC Roof
- ☐ Renovate MMLERC Porch
- ☐ Renovate MMLERC Exterior
- ☐ Make MMLERC Handicap-accessible
- ☐ Install Solar Panels
- ☐ Make MMLERC Energy-efficient
- ☐ Maintain Safe & Adequate Drinking Water Supply
- ☐ Install Rainwater Collection System
- ☐ Install Alarm System at MMLERC and Maintenance Shops

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
5	**Improve and Widen Access Roads and Parking Areas**	2018	less damage to soil, tires, and roadside vegetation compared to previous road conditions	professional judgment	As needed	

↓ ***Associated Projects*** *(**type date and progress details** below each project):*

- ☐ Improve and Widen Access Roads and Parking Areas

Obj. #	Objective	Implement by year:	Effectiveness Measures	Monitoring Techniques	Monitoring Frequency	Date & Monitoring Notes
6	**Construct Building Facilities Associated with Maintenance**	2013-2028	ability to perform maintenance; utilization of maintenance facilities	effectiveness and usefulness of all maintained and newly established facilities associated with maintenance	As needed	
↓ ***Associated Projects*** ***(type date and progress details*** *below each project):* ☐ Construct & Maintain Maintenance Facilities						
Obj. #	**Objective**	**Implement by year:**	**Effectiveness Measures**	**Monitoring Techniques**	**Monitoring Frequency**	**Date & Monitoring Notes**
7	**Provide Housing for Refuge Staff, Interns, Volunteers, Researchers, and Educators**	2013-2028	ratio of available rooms/RV/house to permanent and temporary staff members, volunteers, interns, researchers, and/or educators	feedback from housed guests and those that need to find alternative housing	As needed	
↓ ***Associated Projects*** ***(type date and progress details*** *below each project):* ☐ Provide Refuge Housing Adjacent to New HQ Site ☐ Construct two RV Pads for Volunteers at New HQ Site ☐ Construct RV Pad for Volunteers on Looney Unit ☐ Renovate Krause Residence for Refuge Housing						

5.9 CCP Amendment and Revision

In order for the CCP to remain as a useful guide and tool for monitoring Refuge success of meeting its overall goals, the CCP must be reviewed and updated throughout its lifetime. It is the Refuge staff's responsibility to revise the CCP while preparing annual work plans. It may also be reviewed during routine inspections or programmatic evaluations. Results of these reviews may indicate a need to modify the CCP.

In an unpredictable environment where fish and wildlife populations, user groups, adjacent land activities, and climates are constantly fluctuating - often in unforeseen ways - Refuge staff will most likely need to adjust sections of this CCP accordingly. In addition, if desired results for CCP implementation are not being achieved, management will also need to be adapted accordingly. If these management changes are substantial, Refuge staff is responsible for making amendments to CCP. The project leader will determine the level of public involvement and associated NEPA documentation regarding any amendment(s). This CCP will be formally revised at least every 15 years.

Wet and dry stones at Spavinaw Creek. (Credit: Sarah Catchot)

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