# Biological Assessment

## Arkansas Nuclear One, Unit 2
**License Renewal Review**

## Pope County, Arkansas

## June 2004

**Docket No. 50-368**

## U.S. Nuclear Regulatory Commission
## Rockville, Maryland

**Evaluation of the Potential Effects on Endangered or Threatened Species from the Proposed License Renewal for Arkansas Nuclear One, Unit 2**

## Setting

The proposed license renewal will apply to the facilities at the site of Arkansas Nuclear One, Unit 2 (ANO-2) (Figure 1) located near Interstate Highway 40 (I-40) on a peninsula formed by Lake Dardanelle in southwestern Pope County, Arkansas. The site is located approximately 109 km (68 mi) east of Fort Smith, Arkansas, and about 91 km (57 mi) northwest of Little Rock, Arkansas (Figure 2).

The Arkansas Nuclear One site is located about 9.5 km (6 mi) upstream from Dardanelle Dam on Lake Dardanelle. Lake Dardanelle, a run-of-the-river impoundment, is part of the Arkansas River and is 80 km (50 mi) long. The lake was created as part of the multi-purpose project for improvement of the Arkansas River by the construction of the Dardanelle Lock and Dam. The Dardanelle Lock and Dam facilitate navigation on the river and provide for generation of hydroelectric power, as well as recreation and fish and wildlife resources. The lake was one of 17 impoundments built along the Arkansas River to provide a 724 km (450 mi) navigable channel from the Mississippi River to Catoosa, Oklahoma. Lake Dardanelle is over 18 m (60 ft) deep at its lower end, and its average depth is 3 m (10 ft). The lake has a surface area of approximately 14,975 ha (37,000 ac) and a storage capacity of $6 \times 10^8$ $m^3$ (486,000 ac-ft). The Arkansas River navigation channel is about 2.2 km (1.4 mi) south of the reactor building.

The site is located on a 3.2-km-wide and 3.2-km-long (2-mi-wide and 2-mi-long) peninsula. The peninsula elevation varies from 122 to 150 m (400 to 500 ft). The land around the site is mostly maintained meadow, and outside the property line is mostly forest, with the remaining land-use being pasture and residential development. The site drains naturally. Surface runoff from the site is collected in storm water drains, the intake canal, and the emergency cooling pond from which it is discharged to Lake Dardanelle. The average annual rainfall in the site area is approximately 124 cm (49 in).

North of the site, the land gradually ascends to an elevation of 305 m (1000 ft) and then continues to ascend to the Boston Mountains, which have a maximum height of 823 m (2700 ft). The Arkansas River flows along the base of the Boston Mountains. Across from the Arkansas River, south and west of the site, is a range of hills, with Mount Nebo, at an elevation of 573 m (1880 ft), directly south and at a distance of 40 km (25 mi) from the site. Magazine Mountain lies nearby, southwest of the site at an elevation of 927 m (3042 ft), the highest point in the state. The land east and south of the site is moderately level, interspersed with rolling hills and covered with woods.

The geology around the Arkansas Nuclear One site is mostly clay with underlying bedrock. Under the site is a 4- to 7-m (13- to 24-ft) deep layer of heavy clay or silty clay, which rests on horizontally-laid hard shale and sandstone of the McAlester formation. The nearest geological faults are 4 to 8 km (2.5 to 5.0 mi) from the site and have not been active for over 65 million years. After intermittent submergence by relatively shallow seas during most of the Paleozoic Periods, the late Mississippian time opened dramatic episodes of ocean-trough development and thick sedimentary and volcanic depositions, followed by late Pennsylvanian mountain-folding and faulting, which caused the bedrock features seen today. The bedrock under the site

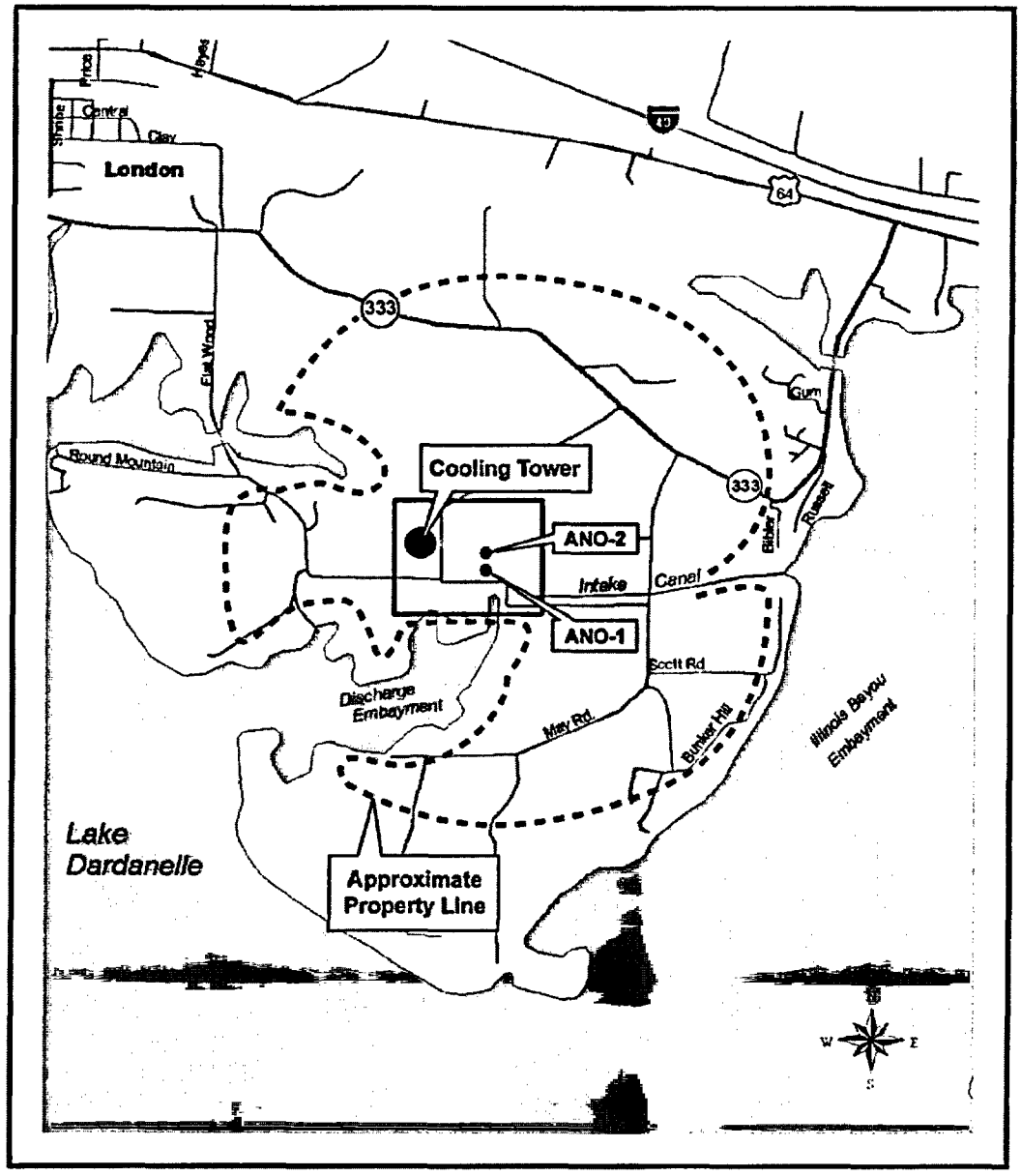


**Figure 1.** Arkansas Nuclear One, Unit 2 Site Map.

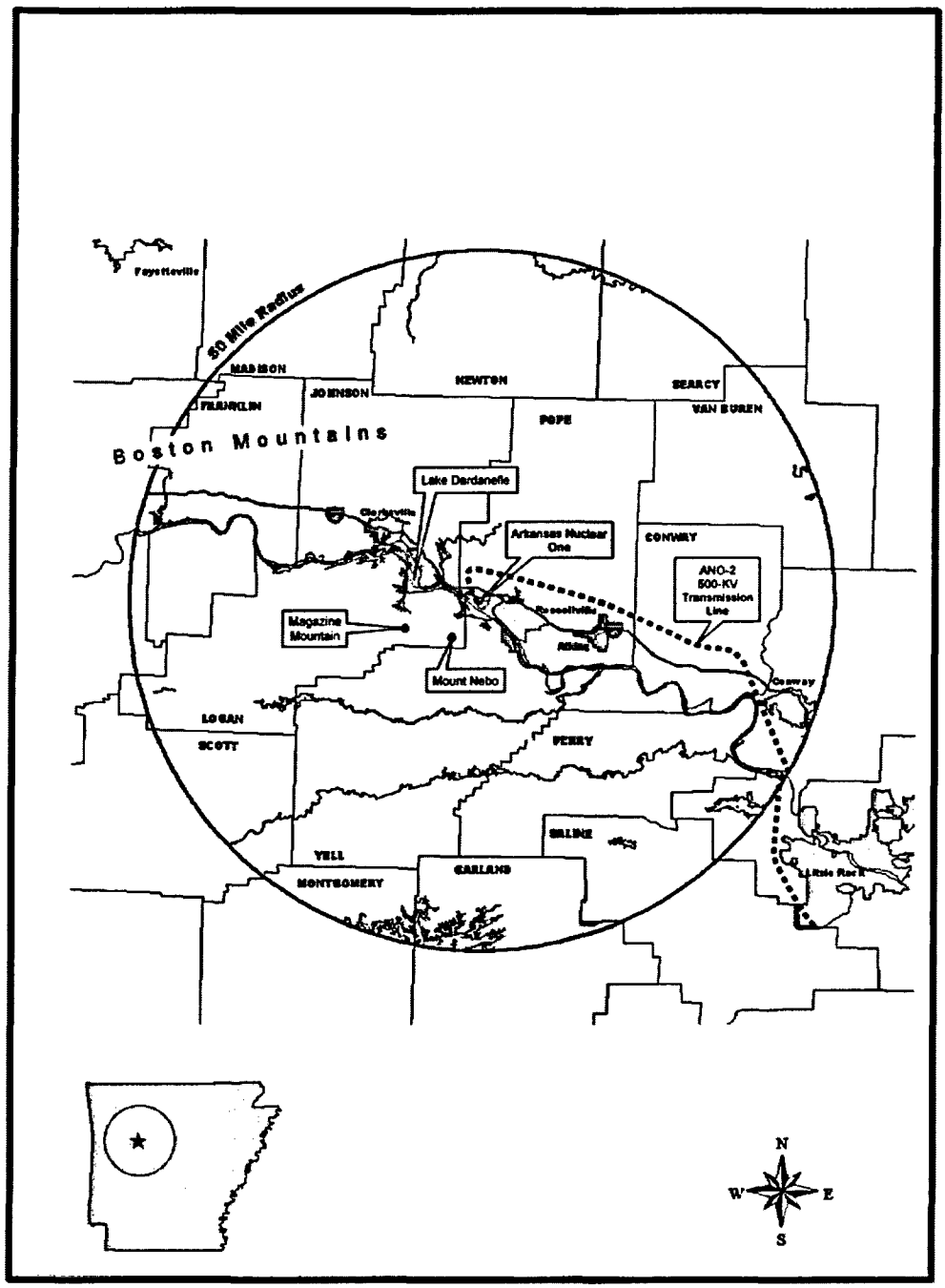


**Figure 2.** Location of Arkansas Nuclear One, Unit 2 and the Transmission Line.

is part of a large syncline, known as the Scranton syncline, which lies in an east and west direction (AEC 1973).

ANO-2 is a pressurized water reactor designed by Combustion Engineering, with a maximum reactor core power level output of 3026 megawatts thermal (MW[t]) and 1048 megawatts electric (MW[e]). Plant cooling is provided by a closed-cycle cooling system equipped with a natural-draft cooling tower that dissipates heat primarily to the atmosphere. After moving through the condenser, circulating water rejects waste heat to the atmosphere utilizing the natural-draft cooling tower. Remaining waste heat is discharged in the form of blowdown from the circulating water system to a 158-m (520-ft) long canal discharging into Lake Dardanelle. This blowdown is mixed with the ANO-1 circulating water system discharge. For the ANO-2 service water system, water is drawn from Lake Dardanelle through a 1341-m (4400-ft) long canal to the ANO-2 intake structure at an average rate of approximately 1009 L/sec (16,000 gpm) (NRC 1977).

Arkansas Nuclear One, Unit 2 facilities also include an approximately 146-km (91-mi), 500-kV, single-circuit transmission line that connects ANO-2 to the electric grid (Figure 2). The line extends from the existing ANO-2 500-kV station switchyard southeasterly via the Mayflower substation (southwest of Mayflower, Arkansas) and terminates at the Mabelvale substation (southwest of Little Rock, Arkansas). The transmission line rights-of-way are 55 m (180 ft) wide (NRC 2001), encompass 730 ha (1804 ac), and cross lands that consist of rural property, forest land, and to a limited degree, agricultural and timber production operations (Entergy 2003a). The transmission line rights-of-way do not cross State or Federal parks, wildlife refuges, or wildlife management areas (Entergy 2003a). No critical habitat has been designated in Arkansas for any of the Federally-listed species known to or that may occur in the vicinity of the ANO-2 site and its transmission line rights-of-way (FWS 2004a).

Vegetation management along the ANO-2 transmission line rights-of-way will continue during the renewal period and consist of mechanical and manual clearing only. No herbicides are used along the rights-of-way. Mechanical clearing employs tractors with mowing and tree cutting equipment in the open areas of the rights-of-way, while manual clearing involves cutting trees around poles, down guys, anchor rods, and structure legs and foundations, and at fences and road crossings. Hazard trees (trees that pose an immediate threat to line reliability because they are leaning toward the line or are subject to falling on the line because of advanced soil erosion) outside the rights-of-way are also removed or topped. Semiannually, an aerial survey of the transmission line rights-of-way is performed to identify issues that would cause potential operational problems (e.g., erosion, vegetation control, equipment maintenance) (Entergy 2003a, 2003c).

**Proposed Action**

The proposed action is the renewal of the operating license (OL) for ANO-2. Entergy Operations, Inc., (Entergy) operates Arkansas Nuclear One, Units 1 and 2, under OLs DPR-51 and NPF-6, issued by the NRC. Entergy holds the licenses for these units, and is an operating subsidiary of the Entergy Corporation. The OL for Arkansas Nuclear One, Unit 1, has already been renewed and will expire in June 2034. The current OL for ANO-2 will expire in July 2018. Therefore, on October 15, 2003, Entergy submitted an application to the NRC to renew the ANO-2 OL for an additional 20 years of operation (i.e., until July 17, 2038).

The extension of the license term will result in the continued operation and maintenance of the nuclear power reactor, the cooling water intake and discharge structures and canal, cooling tower, and support facilities at the plant site. No changes are expected in terms of ecological or environmental impacts of current operations. In addition, the renewal of the operating license is not anticipated to require any significant new construction at the site or modification of existing terrestrial or aquatic habitats.

The staff has determined that it should consult with the U.S. Fish and Wildlife Service (FWS) as part of its review of the proposed action. Consultation with the FWS was initiated by Entergy on September 17, 2002 (FTN 2002a), and by the NRC on December 9, 2003 (NRC 2003), with letters requesting information about the presence of Federally-listed threatened or endangered species on and in the vicinity of the ANO-2 site and its transmission line. The FWS responded to Entergy on December 20, 2002, identifying the endangered interior population of the least tern (*Sterna antillarum*) as occurring along portions of the Arkansas River, and the threatened Arkansas River shiner (*Notropis girardi*) as having had an historic occurrence in the river (FWS 2002). The FWS concurrently concluded that no threatened or endangered species had been observed in the vicinity of the ANO-2 site and its transmission line (FWS 2002). In contrast, the FWS responded to the NRC on January 14, 2004, identifying the least tern and the threatened bald eagle (*Haliaeetus leucocephalus*) as present in the vicinity of the ANO-2 site and its transmission line (FWS 2004a). The FWS concurrently concluded that no threatened or endangered species would be likely to be impacted by continued operation of ANO-2 during the license renewal term (FWS 2004a). Consultation with National Oceanic and Atmospheric Administration (NOAA) Fisheries indicated that they had no listed species or critical habitat in their purview associated with ANO-2 (NOAA 2003). In addition to these three Federally-listed species, the Entergy ER identified the endangered gray bat (*Myotis grisescens*) as occurring in the vicinity of the ANO-2 site and its transmission line. No critical habitat has been designated for any of the above three Federally-listed terrestrial species (FWS 2004b). Critical habitat has been designated for the Arkansas River shiner, but not in the state of Arkansas (FWS 2004b).

Consultation with the Arkansas Natural Heritage Commission (ANHC) (FTN 2002b) and the Arkansas Game and Fish Commission (AGFC) (FTN 2002c) was initiated by Entergy in September 2002 with letters requesting information about the presence of State-listed species on and in the vicinity of the ANO-2 site and its transmission line. No State-listed species were identified by either the ANHC (ANHC 2002) or AGFC (AGFC 2003) as occurring on or in the vicinity of the ANO-2 site or its transmission line rights-of-way.

**Species Evaluated**

The only Federally-listed terrestrial species protected under the Endangered Species Act known to occur in the vicinity of the ANO-2 site and its transmission line rights-of-way are the least tern (interior population only) (FWS 2002; 2004b,c), bald eagle (Entergy 2003a; FWS 2004a), and gray bat (Entergy 2003a) (Table 1). No critical habitat has been designated for any of these Federally-listed terrestrial species (FWS 2004a). No Federally-listed plant species are known to occur in the vicinity of the ANO-2 site or its transmission line rights-of-way (Entergy 2003a, FWS 2002, 2004b). The Federally-protected Arkansas River shiner is known to occur along portions of the Arkansas River. However, none have been observed in the vicinity of ANO-2 or

the transmission line rights-of-way. Critical habitat has not been designated in Arkansas by the FWS or the AGFC for these species (FWS 2004d).

**Table 1.** Species Listed as Endangered or Threatened Under the Endangered Species Act That Have Been Reported to Occur Within Pope County, Arkansas and the Arkansas River. (http://ecos.fws.gov/tess_public/TESSWebpageVipListed?code=V&listings=0) as of May 11, 2004.

| Scientific Name | Common Name | Federal Status | Determination |
|---|---|---|---|
| Birds | | | |
| *Sterna antillarum* | least tern | Endangered | No Effect |
| *Haliaeetus leucocephalus* | bald eagle | Threatened | No Effect |
| Mammals | | | |
| *Myotis grisescens* | gray bat | Endangered | No Effect |
| Fish | | | |
| *Notropis girardi* | Arkansas River shiner | Threatened | No Effect |

There are no species currently proposed for formal listing or considered candidates for listing in the vicinity. The NRC has determined that the proposed action will have no effect on the endangered or threatened species in the vicinity of the ANO-2 plant and associated transmission corridor (Table 1). The basis for the determinations for each species in the vicinity of the plant site and transmission corridor is discussed in the following paragraphs.

1. *Myotis grisescens,* gray bat

The gray bat is a medium-sized bat with gray or chestnut-brown fur. The species was listed as Federally endangered in 1976 throughout its range by the FWS (Storming Media 2004), primarily due to human disturbance, environmental disturbance, and impoundment of waterways. Gray bats are year-round cave residents but migrate between caves in wintering and summering areas of the Midwestern and Southeastern United States. Populations are mainly concentrated in Alabama, Arkansas, Missouri, Tennessee, and Kentucky.

The gray bat is known to occur near the ANO site, where it resides in caves upstream of the Dardanelle Lock and Dam. However, these caves are 16 km (10 mi) from the ANO facility and 3.6 km (2 mi) from the transmission line rights-of-way (NRC 2001, Section 4.6). None have been observed in the vicinity of ANO-2 or the transmission line rights-of-way. Therefore, the NRC staff has determined that the proposed license renewal would have no effect on gray bats.

2. *Haliaeetus leucocephalus*, bald eagle

Arkansas ranks in the top 10 states in the number of winter bald eagle sightings (AGFC 2004). Over 1,000 bald eagles are counted each winter, nearly triple the 368 recorded in 1979. The bald eagle is a winter transient to the Lake Dardanelle area, where birds forage during colder periods of the winter months. Eagles have been observed flying near the ANO site, but there are no reports of eagles on the site. Nest sites have been reported at several localities on Lake Dardanelle, but none are within 16 km (10 mi) of ANO-2 and none are within the transmission line rights-of-way. Therefore, the NRC staff has determined that the proposed license renewal would have no effect on bald eagles.

3. *Sterna antillarum*, least tern

The interior least tern is a small white bird with grayish back and wings (FWS 2004c). The species is distinguished by the combination of a black crown, white forehead, and black-tipped yellow bill. Interior least terns are present in the Arkansas and Red rivers from April through August. They nest in small colonies on exposed salt flats, reservoir beaches, and river sandbars along most of the larger rivers. Nests are small scrapes in the sand with 2-3 eggs laid in a clutch. The young are fairly mobile soon after hatching and both parents feed and remain with the young until fall migration. They feed mostly on small fish. Major threats include predation, human disturbance, and the construction and operation of mainstem reservoirs.

The species requires exacting sand bar conditions, i.e., sand bars with very low vegetation cover and affording some protection from predators and flooding. These conditions are not present within the site area. The interior least tern breeds on sandbars in the Arkansas River near Atkins, and Clarksville, Arkansas (about 35 and 39 river km [22 and 24 river mi] up- and downstream, respectively, from the ANO site [Figure 2]). These nesting locations are beyond a 16-km (10-mi) radius from the ANO facility and the transmission line right-of-way. Therefore, the NRC staff has determined that the proposed license renewal would have no effect on interior least terns.

4. *Notropis girardi*, Arkansas River shiner

This small (usually less than 5 cm [2 in.]) shiner is straw-colored with silvery sides. Scattered brown flecks occur on its sides behind the head. The anal fin has 8 rays compared to 7 on other shiner species found in the same habitat. This fish inhabits the main channels of sandy rivers, especially those with highly variable flows, high water temperatures and dissolved solids.

The Arkansas River shiner formerly occurred throughout the Arkansas River main stem with historical records of specimens from Pope County Arkansas (NatureServe 2004). The distribution of the species has declined dramatically over the last few decades prompting the FWS to establish critical habitat in upstream watercourses for remaining populations in Oklahoma, Texas, Kansas and New Mexico. Decline in the distribution of this species is related to changes in natural stream-flow patterns, including habitat loss, from stream dewatering/depletion and the construction of impoundments (FWS 1998). It is typically found in turbid waters of broad, shallow, unshaded channels of creeks and small or moderate sized rivers, over mostly silt and shifting sand bottom (Lee et al. 1980, Page and Burr 1991). It is believed that the Arkansas River shiner is extirpated from the State of Arkansas. No recent

records of the species is known from the Arkansas River in the vicinity of ANO-2 or the State of Arkansas. The construction of Lake Dardanelle likely eliminated any suitable habitat for this species in the vicinity of the plant. Because of the lack of any recent records of the species from Pope County and the presence of Lake Dardanelle, the NRC staff has determined that the species is not present in the Arkansas River in the vicinity of the plant, and that the proposed license renewal would have no effect on the Arkansas River shiner.

**Conclusion**

The only Federally-listed terrestrial species protected under the Endangered Species Act that are known to or that may occur in the vicinity of the ANO-2 site and its transmission line rights-of-way are the least tern, bald eagle, and gray bat. No critical habitat has been designated for any of these Federally-listed terrestrial species. No Federally-listed plant species are known to occur in the vicinity of the ANO-2 site or its transmission line rights-of-way. The Federally-protected Arkansas River shiner is not now known to occur along portions of the Arkansas River in the vicinity of ANO-2 or the transmission line rights-of-way. Critical habitat has not been designated in Arkansas by the FWS or the AGFC for these species. There are no species currently proposed for formal listing or considered candidates for listing in the vicinity of the ANO site. The NRC has determined that the proposed license renewal would have no effect on any Federally-protected endangered or threatened species in the vicinity of the ANO-2 plant and associated transmission corridor.

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