Programmatic Biological Opinion for the Endangered American Burying Beetle (*Nicrophorus americanus*) for Federal Highway Administration Projects in the State of Arkansas

Prepared by:
U.S. Fish and Wildlife Service
Arkansas Field Office
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IN REPLY REFER TO:

United States Department of the Interior

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May 18, 2005

Mr. Randal Looney
Federal Highway Administration
Arkansas Division
700 West Capitol Ave., Room 3130
Little Rock, AR 72201-3298

Dear Mr. Looney:

This transmits the United States Fish and Wildlife Service's programmatic biological opinion (PBO) on highway construction activities undertaken by the Arkansas Highway and Transportation Department (AHTD) with Federal Highway Administration (FHWA) funding in western Arkansas, and the potential impacts to the American burying beetle (ABB, *Nicrophorus americanus*) from these activities. The purpose of this PBO is to expedite consultations on proposed highway related projects. This consultation document has been prepared pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act) (16 United States Code [U.S.C.] 1531 *et seq.*) and 50 Code of Federal Regulations [CFR] §402 of our interagency regulations governing section 7 of the Act.

Section 7(a)(2) of the Act requires federal agencies to consult with the Service to insure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any federally listed species nor destroy or adversely modify critical habitat. The Service and the federal agency or its designated representative implement section 7 of the Act by consulting or conferring on any federal action that may affect federally listed or proposed threatened and endangered species and/or designated or proposed critical habitat.

This PBO is based on the best available scientific and commercial data including electronic mail and telephone correspondence with FHWA and AHTD officials, Service files, pertinent scientific literature, discussions with recognized species authorities, and other scientific sources. A complete administrative record of this consultation is on file in the Arkansas Ecological Services Field Office in Conway, Arkansas.

This PBO concerns all reasonably foreseeable bridge replacement/maintenance and new highway construction or existing highway maintenance/upgrades that will occur on an annual basis for the next five years, and follows the general design criteria in 11 counties of western Arkansas. Counties known to support ABB populations within Arkansas are Franklin, Little River, Logan, Scott, and Sebastian. Counties suspected to support the ABB are Crawford, Johnson, Montgomery, Polk, Sevier, and Yell. Projects that are not consistent but similar with the PBO conditions or area may be appended to this PBO only as the Service deems appropriate. For example, the Service may elect to treat under this PBO a project that differs from the design criteria, but is similar in nature, scope, and effect to the described design criteria, and is implemented in a manner consistent with the process described in this PBO.

This PBO evaluates these types of projects at the program or landscape level. The Act's implementing regulations require that a PBO that addresses an overall plan, but lacks individual project level information such as the date, location, and acreage, must require completion of project level consultation prior to individual project implementation. The courts have ruled that both general plans that guide the implementation of future individual actions, as well as each future individual action itself, must fulfill the requirements of section 7 consultation. In addition, the FHWA is responsible for making sure that individual projects comply with this PBO and that take is not exceeded. Consequently, the FHWA or their designated AHTD representative must submit written individual project documentation to the Service for approval prior to project implementation. The Service will re-evaluate this PBO annually to make sure that its continued application will not result in unacceptable effects on the ABB.

CONSULTATION HISTORY

On April 27, 2004, the Service held an intra-agency conference call to discuss the most appropriate way to address AHTD projects in regard to the ABB. It was decided that a programmatic biological opinion would serve the purpose of minimizing impacts to the ABB while expediting the section 7 process for transportation projects. On May 3, 2004, the Service met with representatives from the FHWA and the AHTD to discuss options for a programmatic biological opinion covering impacts to the ABB from various highway and road construction activities. During this meeting the Service provided a summary of the section 7 process and options, and the information needed to fulfill section 7 consultation.

The Service explained our concerns with impacts from highway projects to the ABB. In addition, we discussed the options available under section 7 of the Act which will avoid or minimize adverse impacts to the ABB, address take of the ABB, and facilitate consultation. Members of the FHWA and the AHTD agreed that a programmatic biological opinion would be beneficial to their overall program needs with regard to the ABB. The FHWA requested formal consultation in a letter dated March 22, 2005 and the Service agreed to enter into formal consultation under Section 7(a)(2) of the Act in a letter dated March 24, 2005.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Based upon the current AHTD job list for the next three years, about 63 new highway projects are planned within counties known or suspected to support the ABB. Many other smaller projects such as bridge maintenance, stream bank stabilization, and roadway repair are not included in the job list but are likely to occur within the timeframe of this PBO. The project types range from bridge painting to construction of a four lane interstate on a new alignment. Not all projects will affect ABBs or their habitat, and only those that are potentially detrimental to ABBs were used to estimate the likely amount of habitat to be damaged as a result of highway projects.

Acreage for projects in ABB counties was determined from existing construction plans or by estimations based on standard right of way (ROW) widths for each type of construction project. Estimated ground disturbance for all projects within these counties over the next three years is approximately 7,132 acres. This is an average of 2,377 acres per year or 11,885 acres (less than 0.50 percent of the available habitat in Arkansas) over the next five years. This acreage is considered somewhat excessive given the fact that the majority of the estimated acreage stemmed from the planned construction of Interstate 49, some of which will occur on new alignment and some on existing U.S. Highway 71 between Texarkana, Arkansas and Ft. Smith, Arkansas. This project alone is estimated to affect over 6,000 acres. However, to make sure that all ABB impacts are addressed, we use 12,000 acres to define incidental take for this PBO.

Roadway construction on new alignment

Construction activities for a typical roadway on a new alignment involve clearing vegetation; removing topsoil, rocks, and rooted debris; grading to level the site; placement of culverts, bridges, water diversionary control structures, and erosion control structures; laying gravel, and/or rock over the graded surface; and finally overlaying with asphalt and/or concrete. Land clearing and grading of the construction area, as well as the other measures stated above, are conducted with a bulldozer or other heavy equipment. During routine roadway construction, soil is excavated to a depth of about 12 inches but can be more depending on terrain and presence of rooted vegetation, rocks, etc. Topsoil is scraped from the construction area and is often stored in the construction site for use during other phases of the project. Vegetation debris piles are stored along the edges of the construction site and typically removed after construction operations are completed. In rugged terrain, heavy blasting of higher elevations and filling of valleys is sometimes used to provide proper gradient for the roadway right of way.

Four lane divided (or painted median) and interstate grade roadway rights of way are typically 200 to 300 feet wide but vary depending on the gradient of surrounding landscape. Two lane undivided highway rights of way are 80 to 140 feet wide depending on the designation of the highway. If necessary, additional offsite dirt, gravel, and/or rock is delivered to the construction site via dump trucks to aid in leveling the right of way. In some cases, borrow pits are excavated

near construction sites. The pits vary in size but can be as large as several acres and 60 to 80 feet deep or more. Once constructed, the resulting roadway is a permanent installation; however, right of way adjacent areas and medians are revegetated and maintained indefinitely.

Roadway construction on existing alignment and widening projects
Overlays and maintenance projects on existing alignments do not typically involve additional soil disturbance or other activities that would cause significant impacts to the ABB. As a result, these types of projects will rarely require consultation outside of the initial project notification. Widening projects are usually undertaken to upgrade two lane highways to four lane or to add passing lanes or shoulders to narrow roadways. Clearing and soil preparation are similar to those described for roadway construction on new alignment. Road kill can attract ABBs so these types of projects have the potential to affect the species.

Bridge and culvert construction/maintenance
Bridges are often constructed directly adjacent to existing structures, but may be on new alignments as a result of geographic constraints or construction of new roadways. Areas of soil disturbance range from three to five acres in most instances. Land preparation for bridge construction is similar to that described for roadway construction on new alignment. Additionally, topsoil is often brought to the construction site to satisfy grade requirements and achieve proper elevation. Large boulder or rip rap is also commonly used below bridge abutments to stabilize topsoil that may be exposed to flowing waters. Demolition of existing bridge structures will result in soil disturbance, but the soil underlying bridge abutments is often compacted and not considered suitable breeding habitat for the ABB.

Culverts are primarily used to maintain natural drainages beneath roadways and therefore require relatively little soil excavation even when constructed on new alignments. Replacement of existing culverts is accomplished through excavation of fill material overlying the structures (which is not considered suitable as ABB habitat), and placement of a new preformed structure or a structure created on site.

Projects with fewer than three acres of soil disturbance will not require consultation under this PBO unless the project takes place within an area known to support unusually high numbers of ABBs (e.g. some areas on Ft. Chaffee and other areas in Scott and Sebastian Counties). Further consultation under this PBO will be at Service discretion in such cases. However, these small projects require notification to the Service prior to implementation. The acreage, if deemed suitable for ABBs, will be added to the total disturbed acreage for all highway projects in determining future actions for ABB conservation.

ABB Surveys, Baiting Away, and Relocation Activities
The Service recommends conducting surveys to determine presence or absence of the ABB within the immediate project area. If the ABB is present the implementation of baiting away procedures or, in some cases, trapping and relocation procedures will likely be required. The ABB survey protocol (Creighton *et al.* 1993a), baiting away protocol (Service 2005a), and

trapping and relocation protocol (Service 2005b) should be used to conduct any such activities. The Service should be contacted for the most recent versions of these documents as they are subject to change given new scientific research data. A valid permit from the Service under section 10 of the Act is required for anyone conducting surveys or relocations, but is not required for baiting away procedures at this time. Take of ABBs associated with these activities would be covered under a separate biological opinion and is not considered in this PBO.

Action Area Description

West Central Arkansas
The west central portion of Arkansas known to support the ABB consists of Logan, Franklin, Scott, and Sebastian Counties south of the Arkansas River, which represents the northernmost boundary of the ABB in Arkansas. This portion of Arkansas lies primarily within the Arkansas River Valley ecoregion which occupies 92,207 acres in western Arkansas between the Boston and Ouachita Mountains. The landscape includes a variety of prairie, savanna, glade, oak woodland, riparian, and bottomland plant communities. About 57 percent of the Arkansas Valley ecoregion shared between Arkansas and Oklahoma is forested. About one-third of the wooded area is federally owned, and most of the other two-thirds consist of farm woodlots. Twenty-six percent of the ecoregion is grazed land, 11 percent is cropland, and six percent is used for miscellaneous purposes. Most of the cropland is in the less sloping valleys areas, but some is on flat mountain tops. Small grains and hay are the major crops. Soybeans are an important crop on the Arkansas River bottom land. Orchards, vineyards, and vegetable crops are important locally. Pastures on the bottom land of small streams and throughout cleared parts of the uplands consist of a mixture of tame and native grasses and legumes.

Elevation ranges from328 feet on the lowest valley floors to 2,950 feet on some mountain tops. These ridges and valleys are underlain by slightly folded to level beds of sandstone and shale. Ridge slopes are steep; most crests are narrow and rolling, but some are broad and flat. The intervening valleys are broad and smooth. The ridges and mountains rise sharply, tens of meters, above adjacent valleys.

Average annual precipitation is 44 to 50 inches. Maximum precipitation is in spring and in autumn. Average annual temperature is about 68°F. Average freeze-free period is 200 to 240 days.

The major soils are stony and nonstony and medium textured (called Udults). Well drained, shallow and moderately deep soils exist on ridgetops, benches, and upper slopes (Mountainburg and Linker series). Well drained, deep soils are on middle and lower slopes and in concave interledge positions. Fragiudults (Leadvale, Taft, and Cane series) are in the valleys. Udifluvents (Roxana series), Udipsamments (Crevasse series), Haplaquolls (Roellen series), and Hapludalfs (Gallion series) are minor soils along the Arkansas River, and Dystrochrepts (Barling series) and Hapludults (Spadra and Pickwick series) are minor soils on terraces along smaller streams. This area supports hardwood forests. The primary overstory species are red oak, white oak, and

hickory. Shortleaf pine is important on disturbed sites, on shallow soils, and on sites having a south or west aspect. Big and little bluestem, switchgrass, and indiangrass, are important understory species under medium to open forest canopy. Broadleaf and longleaf uniola, wildryes, and low panicums are important species under a complete canopy. Much of the forest along the Arkansas River has been destroyed. Conversion to agriculture, logging, fire suppression, and grazing are the main causes of habitat loss.

Southwestern Arkansas
The southwestern portion of Arkansas known to support the ABB is within Little River County. The ABB is known to occur only on a portion of land operated by the Weyerhaeuser Corporation. ABBs are found only sporadically during yearly surveys performed by Weyerhaeuser, and it is thought that these specimens are part of the larger southeastern Oklahoma population. Oak-pine forest and an area known as the loblolly pine-hardwood forest characterize the southwestern portion of the state.

The climate in this region is characterized as humid, mesothermal with annual precipitation ranging from 42 to 56 inches per year. The growing season in the northern section is around 200 days and in the southern portion varies from 210 to 230 days.

Soils are typically thin, well drained, and derived from sandstones and shales. Although the slopes are littered with boulders, the valley soils are fine textured. Topography in this region is rugged with relatively high topographic relief. The principal mountain chains in this region are the Ouachita Mountains in Arkansas, and the Kiamichi and Winding Stair Mountains in Oklahoma.

Predominate vegetation of this area includes short leaf pine, loblolly pine, white oak, blackjack oak, post oak, spotted oak, willow oak, black locust, black hickory, basswood, and sugar maple. Common herbs and shrubs include huckleberry, mock orange, pink azalea, gooseberry, bladdernut, and spice bush. Due to the presence of infertile soils and rugged topography, little of this area is used for agricultural production, while the remainder is largely in woodland. The primary land use activities are timber harvest, ranching, and farming.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The ABB was proposed for federal listing in October 1988 (53 Federal Register [FR] 39617) and was designated as a federally endangered species on July 13, 1989 (54 FR 29652) and retains this status. Critical habitat has not been designated for the ABB. The draft recovery plan was issued on July 25, 1991 (56 FR 34072) and the final recovery plan was signed on September 27, 1991.

The ABB is an annual species and typically only reproduces once in their lifetime. They have to compete with other invertebrate species as well as vertebrate species for carrion. Even though

ABBs are considered feeding habitat generalists, they have still disappeared over 90 percent of their historic range. The decline is attributed to habitat loss, alteration, and degradation. The Service (1991) concluded that the best explanation for the decline of ABBs involved habitat fragmentation which creates edge habitat, which leads to a reduced carrion prey base and an increase in vertebrate scavengers, all of which works against the ABB.

The ABB is a member of the beetle family Silphidae (208 species worldwide; Ratcliffe, 1996) and is in the subfamily Nicrophorinae. Silphids are scavengers of carrion and play an important role in breaking down decaying and recycling matter back into the ecosystem. The genus *Nicrophorus* presently contains 85 species distributed in Europe, Asia, and North and South America (Ratcliffe, 1996), 15 of which occur in the United States (Service, 1991). *Nicrophorus* species bury vertebrate carcasses for reproductive purposes and exhibit parental care of young. Care by both parents involves food provisioning, protection, and direct feeding of larvae during the entire larval stage, demonstrating the highest level of sociality in the beetle order Coleoptera (Ratcliffe, 1996).

The ABB is the largest species of its genus in North America, measuring 1 to 1.4 inches long. The body of the ABB is shiny black and has hardened protective wings (elytra) that meet in a straight line down the back. The elytra are smooth, shiny black, and each elytron (hard front wings that protect the hind set of wings) has two scalloped shaped orange-red markings. The pronotum (hard back plate of the front portion of the thorax of insects), or shield over the mid-section between the head and wings, is circular in shape with flattened margins and a raised central portion. The most diagnostic feature of the ABB is the large orange-red marking on the raised portion of the pronotum, a feature shared with no other members of the genus in North America (Service, 1991). The ABB also has orange-red frons (a mustache-like feature) and a single orange-red marking on the top of the head (triangular in females and rectangular in males). Antennae are large, with notable orange clubs at the tips.

Life history

The ABB is an annual species (Service 1991), fully nocturnal, and active when night temperatures consistently (*i.e.* five consecutive nights) exceed 60 degrees Fahrenheit. In Arkansas this typically occurs from mid May to late September (National Oceanic and Atmospheric Administration 2004) and is similar in Oklahoma (Oklahoma Climatological Survey 1993-2002). For the remainder of its life cycle, late September to mid May, the ABB remains in an inactive condition buried in the soil at depths from 6 to 36 inches (Anderson 1982) (Kozol *et al.* 1988). American burying beetles feed and breed on a variety of carrion. Their antenna contain chemoreceptors (chemical sensors) to detect the presence of carrion.

Feeding

When not involved with brood rearing, adult food sources include an array of available carrion, as well as capturing and consuming live insects. Carrion selected by the ABB for reproduction tends to be larger than that used by other burying beetles. Preferred carrion sources are dead birds and mammals weighing from 1.7-10.5 oz, with an optimum weight of 3.5-7.0 oz (Service 1991). *Nicrophorus* species are capable of finding a carcass between one and 48 hours after death at a distance up to two miles (Ratcliff 1996). Success in finding carrion depends upon many factors including availability of optimal habitats for small vertebrates (Lomolino and Creighton 1996), density of competing beetle and vertebrate scavengers, individual searching ability, reproductive condition, and temperature (Ratcliff 1996). The aposematic (conspicuous or warning coloration) patterns of the beetles appear to deter predation by insectivorous birds, although crows are known to eat the ABB and other *Nicrophorus* species (Ratcliff 1996).

American burying beetles are considered feeding habitat generalists and have been found in several vegetation types including undisturbed grasslands, grazed pasture, riparian zones, and oak-hickory forest, as well as various soil types (Creighton *et al.* 1993b, Lomolino and Creighton 1996, Lomolino *et al.* 1995, NatureServe Explorer 2001, Service 1991). Ecosystems supporting ABB populations are diverse and include primary forest, scrub forest, forest edge, grassland prairie, riparian areas, mountain slopes, and maritime scrub communities (Service 1991, Ratcliffe 1996).

Adult ABBs in search of carrion move an average of 0.7 miles per night (Creighton and Schnell 1998). American burying beetles have been recorded traveling as much as two miles during one night (similar to a human traveling about 125 miles in one night) (Creighton *et al.* 1993a). Creighton and Schnell (1998) found that the mean distance recaptured ABBs moved from their original site of captures was 1.66 miles, with a minimum distance of 0.01 mile in one night to a maximum distance 6.2 miles over a six night period.

Of the movements Creighton and Schnell (1998) recorded, 71 percent were to a habitat different from initial capture site. They concluded that ABBs move relatively long distances over short periods of time in their search for carrion. This included movements between open grassland and woodland and between bottomland and upland woodland. No evidence for sex or age related differences were detected in the movement patterns of ABBs.

By moving relatively long distances among different habitat types, ABBs increase the chance of encountering proper sized carcasses, but also increase the exposure to a diversity of natural and unnatural mortality factors including predation, insecticides, commercially available insect traps, and nocturnal light pollution. The probability of individual ABBs being subjected to these types of hazards also increases as areas become more developed (Lomolino and Creighton 1996). The largest populations of ABBs to date are at Camp Gruber, Oklahoma; Gothenburg, Nebraska; and Fort Chaffee, Arkansas (Lomolino and Creighton 1996, Lomolino *et al.* 1995). Given the distance between the sites in Oklahoma and Arkansas (52 miles), the confirmed ABB sightings

between these two sites, and the observed distances ABBs have moved (up to 6.2 miles in 6 nights), it is likely that ABBs from the two sites are components of the same meta population (Creighton and Schnell 1998).

Population dynamics

The overall population size in Arkansas is unknown. Most standard techniques used to estimate population size assume that marked and unmarked individuals are equally likely to be captured and that a substantial number of the animals remain in the available population from one trapping period to the next. The high turnover rate of trappable individuals observed in ABBs suggests that the latter portion of this overall assumption is not valid for ABBs, and that conventional methods of estimating population numbers may not be applicable (Creighton and Schnell 1998).

Instead, catch per unit effort is typically used to measure density. Schnell and Hiott (2002a) report their survey results as catch per unit of trapping effort at each site and compare the abundance of ABBs at each site. This relative abundance is also used to track the status of ABBs over time. Baited pitfall traps have proven to be a successful tool for documenting presence or absence of the species, although false negatives (absence of captures when ABBs are present) are possible (Creighton *et al.* 1993a).

Szalanski *et al.* (2000) compared the genetic variation between ABB concentrations in South Dakota, Nebraska, Oklahoma, Arkansas, and Rhode Island. This study found little evidence that these five concentrations have achieved unique genetic variation, indicating that these concentrations may not be necessarily treated as separate, independent objects of conservation. The amount of genetic variation one would expect to see would depend on a number of factors, most importantly would be the amount of time which has elapsed since the populations were isolated from each other. Considering there is no historical genetic information, we can only assume the populations were not genetically distinct in the past.

The year to year behavior of the ABB can be interpreted from the long term data collected at Camp Gruber by Schnell and Hiott (2002a). From one year to the next the number of ABBs within a general area (like Camp Gruber) fluctuates. Further, locations of ABB high relative abundance concentrations vary through the years. The same cyclic nature in relative abundance and yearly movement patterns has been documented at Fort Chaffee in Arkansas (Schnell and Hiott, 2002b). Consequently, survey efforts could be repeated in the same locale annually and ABBs may not be captured every year. In fact, surveys for ABBs have been conducted in areas where ABBs are known to be currently but were not captured.

Surveys conducted over the recent past have established the occurrence of the ABB within specific areas during the active season. Considering ABBs may move up to 6.2 miles over six nights, an ABB could move as much as 104 miles during the active period. Since most ABBs do not move this distance, positive ABB captures within a given area provide a reasonable certainty that the species occurs within that general area.

Habitat

Soil conditions must be conducive to ABB excavation (Anderson 1982, Lomolino and Creighton 1996). The Block Island population occurs on glacial marine deposits, vegetated with post-agricultural maritime scrub plants including bayberry, shadbush, goldenrod, and numerous exotic plants (Service 1991). Vegetation structure of Rhode Island habitats varies from shrub thickets to large mowed and grazed fields.

In Arkansas and Oklahoma ABBs are found within a mixture of vegetation types from oak-hickory and coniferous forests on lowlands, slopes, and ridgetops to deciduous riparian corridors and pasturelands in the valleys (Service 1991, Creighton *et al.* 1993b). Soils in the vicinity of captures are all well drained and include sandy loam and silt loam, with a clay component noted at most sites. Level topography and a well formed detritus layer at the ground surface are common (Service 1991).

Klein (1989) reported the following on carrion and dung beetles from the South American forest: forest fragments had more rare species; little movement across clear cuts; were not attracted into clear cuts or into second growth clear cuts; forest edge had lower species diversity than interior forest; rarely moved from intact forest to fragments; found more in forested areas than in clear cuts; forest fragments had lower species richness, sparser populations, and smaller beetles than intact forest areas; and a lower rate of dung decomposition was detected in fragments. Schnell and Hiott (2002a) documented similar results at Camp Gruber, Oklahoma, reporting more ABB captures within the installation than at the disturbed perimeters. Also, Schnell and Hiott (2002c) conducted surveys at Weyerhaeuser lands in southeast Oklahoma and southwest Arkansas where they reported fewer ABBs along roads than in the interior of tree plots. At Fort Chaffee in Arkansas, Schnell and Hiott (2005) also noted that ABBs tended to avoid soils of less than 40 percent sand, greater than 50 percent silt, and greater than 20 percent clay.

Reproduction

For breeding, habitat preference studies in Oklahoma indicate ABBs select undisturbed, mature oak-hickory forests having substantial litter layers and deep, loose soils over grasslands or bottomland forests (Lomolino and Creighton 1996, Creighton *et al.* 1993b). In 1996 more than 300 specimens were captured in Nebraska habitats consisting of grassland prairie, forest edge, and scrubland (Ratcliff 1996). These surveys have found certain soil types; such as very xeric (dry), saturated, or loose sandy soils; to be unsuitable for carcass burial and thus are unlikely habitats. Lomolino and Creighton (1996) found the reproductive success to be higher in forested sites than grassland sites. Carcasses tended to be buried deeper in the soil at grassland sites, compared to forested sites which were buried closer to the surface, just below the litter. However, the history of persistence through time, as represented by the population on Block Island during a long period of dramatic land use changes, and the diversity of current habitat types through space would seem to indicate a broad tolerance for different landscapes.

Larger species tend to have large bodies and narrow niches (Diamond 1984). Lomolino *et al.* (1995) reported that it is likely that the generalist nature and the endangered status of the ABB both derive from the fact that it is the largest member of its guild (a group of organisms that exhibit similar habitat requirements). In comparison to smaller species, ABBs breed on larger carcasses, which are more unpredictable in space and time. It is likely that ABBs must search over a larger area and more diverse habitats than its smaller congeners. Further, the ABB is considered a feeding habitat generalist but could be a breeding habitat ~~generalist~~ specialist. The latter has not been confirmed but multiple authors state that ABBs are not as general in breeding habitat selection as they are in feeding habitat selection. Creighton and Schnell (1998) concluded that ABBs are a feeding habitat generalist, but their research does not reflect where the ABB can successfully produce and raise young. They expect that the ABB will not be able to reproduce successfully in as broad a range of habitats as used for feeding.

The reproductive biology of the ABB is complex and unusual. Both parents often participate in the rearing of young with care by at least one parent, usually the female, critical for larval survival (Ratcliff 1996). This is a rare and highly developed behavior in insects, known only among bees, ants, wasps, termites, and a few scarab beetle species. The advantage of male attendance appears to be the added defense of the carcass and brood from *Nicrophorus* competitors and other intruders, as suitable carcasses are scarce relative to the number of potential breeders (Ratcliff 1995).

Reproductive activity occurs between mid May and mid August and commences once a proper carcass, on which to feed and lay eggs, is found. Typically, a male broadcasts a sex pheromone to attract potential mates to the site of his fresh carcass (Eggert and Müller 1989, Bartlett 1987). However, males have been known to emit pheromones both when they have found a carcass and when they have not (Ratcliff 1996). A female responding to a male without a carcass may benefit from obtaining a sperm supply for later use if she finds a carcass on which no mate is present (Eggert and Müller 1992). For females, ovarian response to reproduce is triggered by the behavior of assessing, preparing, and burying a carcass, and not by male presence, male pheromones, or the mere presence of a usable carcass (Ratcliff 1996).

At night during the reproductive phase, male and female ABBs may compete among themselves and with congeneric competitors for a suitable carcass. This struggle continues until one pair remains on the carcass, with greater size being the prime determinant of the outcome. Intrusions and takeovers of a carcass by *Nicrophorus* species are a regular feature of this genus' breeding system. The victorious pair buries the carcass, usually before dawn of the first morning, with individuals of both sexes capable of burying carrion alone (Ratcliff 1996). The pair will bury carrion of about 3.5-7.0 ounces, within a brood chamber constructed around the carcass. Prior to carcass burial, ABBs may move the carrion laterally for up to 3 feet (Service 1991). Lab tests of soil preference by *Nicrophorus* species suggest ABBs do discriminate, choosing substrates for a brood chamber with higher bulk or litter content (Ratcliffe 1996). Immediate, nocturnal burial is important for these *Nicrophorus* species because Calliphorid flies also are attracted to carrion as oviposition (egg laying) sites. The beetles must eat the fly larvae to prevent a fly infestation that

would make the remains unsuitable for the adult beetles and their young. There may be a tradeoff between rapid burial in a less than optimum substrate in the midst of intense competition versus delayed burial where competition is low and optimum substrate occurs nearby (Ratcliff 1996). Once a burial site is located by a *Nicrophorus* species, a beetle displaces soil with its head starting beneath the carcass. As soil is moved to the sides, the carcass settles into the ground and then is buried by both sexes. The carcass is cleaned of feathers or fur, formed into a ball, and coated with anal and oral secretions, which retard decay and contamination (Service 1991).

Eggs are laid in the soil beside the carcass. At least one parent, usually the female, remains with the eggs and subsequent larvae until larval development is complete. Eggs hatch within a few days and larvae move toward the carcass eventually settling into an indentation formed by the attending parents at the top of the carcass. Adult *Nicrophorus* not only guard their offspring and continually clean the carcass, but also feed the begging larvae with regurgitations (Service 1991). Larvae approach adults and press their mouth parts against the adult mouth parts which stimulate parental regurgitation (Ratcliff 1996). Studies have found that single females and males regurgitate to larvae more frequently than paired females and males, suggesting an increase in brood care by individual parents to compensate for loss of a mate (Fetherston *et al.* 1990). These observations may represent the first example of compensation for mate loss in an invertebrate (Ratcliff 1996).

Brood sizes vary between 3-31 individuals (Service 1991) with a positive correlation between carrion weight and number of larvae (Kozol 1990). However, as larval numbers increase, weight per larva decreases. Parents appear to selectively cull larvae if their assessments of the carcass resource reveal its size is less than the amount needed to maintain the parents and the brood. This unusual behavior of calculated infanticide (killing of young), performed especially by the fathers, is the only known case among invertebrates (Ratcliff 1996).

Although the male's presence reduces the chance of the carcass being taken over by an intruder and loss of the brood, continued male presence also may decrease total larval weight. Males consume an amount of food equivalent to one larva. On small carcasses offering limited food supply, females have been known to drive off males in an attempt to increase resources for the brood (Ratcliff 1996).

The larvae pupate and emerge as adults in about 48-60 days. Generally the ABB produces only one brood per year and these newly hatched adults over winter to reproduce the following year. Occasionally the emerging generation of adults succeeds in producing another brood if summers are long and warm (Service 1991). Lomolino and Creighton (1996) found the in grasslands about 56 percent of ABBs buried the carcass successfully and reared young. In contrast, 95 percent of ABB pairs in the forested site were successful. The mean number of young raised on carcasses in the grassland site was 9.79 and 14.77 in the forested site.

Status and distribution

At the time the recovery plan for the ABB was published (1991), several theories had been advanced to explain the decline of ABBs: disease/pathogens, DDT, direct habitat loss and alteration, interspecific competition, increase in competition for prey and edge habitat, decrease in abundance of prey, loss of genetic diversity in isolated populations, and certain agricultural and grazing practices. Although, no evidence to date of disease or pathogens capable of decimating ABBs while not affecting other *Nicrophorus* populations has surfaced, this possibility cannot be discounted. None of these theories adequately explain why the ABB declined when species of the same genus are still relatively common range wide. These theories are briefly discussed below.

At the time of listing in 1989, the prevailing theory on the ABB's decline was habitat fragmentation (Service 1991). Fragmentation of natural habitat that historically supported high densities of indigenous (native) species (made more severe by direct taking, ca. 1900, of birds and other vertebrates) may have been a contributing factor in the decline of ABBs by changing the species composition and lowering the reproductive success of prey species required for reproduction. Likewise, by increasing edge habitat, there may have been an attendant increase in the occurrence and density of vertebrate predators and scavengers such as the American crow, raccoon, fox, opossum, and skunk, which compete with ABBs for available carrion. In the Midwest, windbreaks, hedgerows, park development, and urban planning have all provided new "edge" habitat for these scavengers, as well as for domestic and feral animals such as dogs and cats. All these animals take carrion that may be suitable for ABBs (Ratcliffe 1996). In this way, fragmented habitats not only support fewer or lower densities of indigenous species that historically may have supported ABB populations, but there is more competition for those limited resources among the "new" predator/scavenger community.

It is plausible that the decline of the ABB can be attributed primarily to habitat loss and fragmentation, which lead to a reduction in optimum reproductive carrion resources. This loss has probably been exacerbated by changing land use patterns, including more intensive agricultural practices and grazing (Service 1991). The fecundity and general population levels of large birds, many of which are ground nesting species, have clearly been affected by habitat loss and fragmentation, and probably also by a vast increase of scavenging and predatory mammals, which not only reduce carrion production via increased egg and young predation but also actively compete for available carrion resources. A cessation in the practice of fertilizing agricultural fields with whole fish (prohibited, for example, by law on Long Island about 1920; Service 1991), potentially resulted in a large scale carrion source loss, particularly along coasts and rivers. Factors such as pesticide spraying could have contributed to other local extirpations and further isolation of existing populations.

Although much of the evidence suggesting the reduction of carrion resources as a primary mechanism of decline is circumstantial, this scenario fits the temporal and geographical pattern of the disappearance of ABBs, and is sufficient to explain why ABBs declined while congeneric

species did not. It has been shown that, in a fragmented ecosystem, larger species are negatively affected before smaller species, a process which has been well documented with carrion and dung beetles in South America (Klein 1989).

Since the publication of the Recovery Plan, additional research has been conducted. Sikes and Raithel (2002) conducted a search for papers written and/or published during the last 20 years. They evaluated the following as threats to the ABB: DDT/pesticide use, artificial lighting, pathogens, habitat alteration, habitat fragmentation, vertebrate competition, loss of ideal carrion, and congener competition.

The first hypothesis published to explain the decline of ABBs was that of Anderson (1982), who suggested that the species might be a specialist of old growth forest and require the deeper, looser soils of such habitats. Lomolino *et al.* (1995) tested and rejected Anderson's old growth hypothesis, concluding that ABBs are a vegetation generalist. There is information to indicate that ABBs tolerate and may even prefer, open habitats. Most of the historical ABB collections, at least in the eastern portion of its range, occurred during the period when much of the landscape was agricultural. Lomolino and Creighton (1996) found evidence that ABBs preferred mature forest over clear cuts and had greater breeding success in forests relative to grasslands. However, given the broad historical range of this species, it seems unlikely that ABBs are a habitat specialist.

The decline of ABBs may be linked to the return of forest in eastern North America (Sikes and Raithel, 2002). The ABBs range may have expanded during the agricultural deforestation of eastern North America in the 1800's. Such invasion of eastern "neosavanna" has been documented for various grassland associated bird species (Service 1991). With the shift of agriculture from the east to the west and the following reforestation during the 1900's, one might expect grassland associated species to disappear from many of the areas they had first invaded perhaps centuries earlier.

Service (1991) concluded that the best explanation for the decline of ABBs involved habitat fragmentation, which reduced the carrion prey base and increased the vertebrate scavenger competition for this prey. Kozol (1990), Ratcliffe (1996), Amaral *et al.* (1997), Bedick *et al.* (1993), and other authors have reiterated this theme. ABBs are the largest species of *Nicrophorus* in the New World and require carcasses of 3.5 to 7.0 ounces (Kozol *et al.*, 1988) to maximize its fecundity (productivity), whereas all other *Nicrophorus* species can breed abundantly on smaller carcasses, with the smaller species using carcasses of 0.11 to 0.18 ounces) Trumbo, 1992).

Multiple scavengers and predators such as American crow, raccoon, red fox, striped skunk, and opossum as well as domestic and feral cats and dogs have increased over the last century, whereas, grassland birds are experiencing a decline. There is evidence to support a direct correlation between edge, or fragment size, and vertebrate scavenger pressure, with much of this work involving nesting bird populations (Paton 1994, Yahner and Mahan 1996). Sikes (1996),

working with *Nicrophorus nigrita*, found that most transects laid more than 328 feet from a trail or road had 10 percent or fewer carcasses taken by vertebrates, whereas transects near trails or roads had an average of 85 percent of the carcasses taken by vertebrate scavengers. In Oklahoma, Holloway and Schnell (1997) found a significant correlation between the number of ABBs caught in traps and the biomass of mammals, the biomass of mammals plus birds, the number of mammal species, and the number of individual mammals, irrespective of the predominant vegetation.

The apparent generalist nature of ABBs on Block Island, Rhode Island may be an artifact of this insular environment (Lomolino 1984). Amaral *et al.* (1997) noted that there are unusually large populations of ground nesting birds and few mammal predators or scavengers on Block Island. Service (1991) demonstrated that Block Island has a greater proportion of potential carrion producers than the adjacent mainland. Because of the low diversity of predators and competitors on islands, insular populations often exhibit ecological release, occurring in a variety of habitats considered atypical for populations on the mainland (Lomolino 1984). Because of the peculiar nature of island conditions it is not proper to compare Block Island to the Midwest. With both an increase in vertebrate scavenger pressure and a decrease in carrion of ideal weight, the competition between ABBs and sympatric (species that live in the same area but do not interbreed) congeners for sub-optimally sized carcasses would be expected to increase. However, because of the ABBs larger size it typically out competes other *Nicrophorus* species (Kozol *et al.* 1988).

Historically, the geographic range of the ABB encompassed over 150 counties in 35 states, covering most of temperate eastern North America (Service 1991, Peck and Kalbars 1987). Records are known from Texas in the south, north to Montana (single record in 1913) and the southern fringes of Ontario, Quebec, and as far east as Nova Scotia and Florida. Documentation is not uniform throughout this broad historical range. More records exist from the Midwest into Canada and in the northeastern United States than from the southern Atlantic and Gulf of Mexico region (Service 1991).

During the 20th century, the ABB disappeared from over 90 percent of its historical range (Ratcliffe 1995). The last ABB specimens along the mainland of the Atlantic seaboard, from New England to Florida, were collected in the 1940's (Service 1991). The Service (1991) documented the ABB from 11 states and provinces: Rhode Island, Oklahoma, Arkansas, Nebraska, Kentucky, Missouri, South Dakota, Massachusetts, and Kansas, with additional single records from Ontario and Montana. In July 1989, the species was federally listed as endangered based on its drastic decline and elimination over nearly its entire range (Federal Register 1989). At the time of listing, known populations were limited to Block Island and eastern Oklahoma. Critical habitat has not been designated for this species.

Currently, the ABB is known from only eight states: on Block Island off the coast of Rhode Island, Nantucket and Penieskese Islands off the coast of Massachusetts, eastern Oklahoma, western Arkansas, Sand Hills in north-central Nebraska, Chautauqua Hills region of southeastern

Kansas (Sikes and Raithel 2002), northeastern Texas, and in South Dakota (Ratcliff 1996, Bedick *et al.* 1993). Most existing populations are located on private land. Populations known to exist on public land include: Camp Gruber, OK; Fort Chaffee, AR; Sequoyah National Wildlife Refuge, OK; Block Island National Wildlife Refuge, RI; and Valentine National Wildlife Refuge, NE (Service 1991).

Analysis of the species/critical habitat likely to be affected

The ABB will potentially be affected throughout its range within western Arkansas by highway and road construction projects. No critical habitat has been designated for the ABB, therefore, none will be affected. The leopard darter (*Percina pantherina*) is the only listed species in Arkansas with critical habitat designated. Critical habitat is the Mountain Fork River from the Arkansas/Oklahoma state line, upstream to the community of Mountain Fork, Arkansas in Polk County. Projects which might affect the leopard darter, or any other listed species or their critical habitats, will require separate consultation under the Act and will not be considered in this PBO.

ENVIRONMENTAL BASELINE

The environmental baseline is defined as the effects of past and ongoing human induced and natural factors leading to the current status of the species, its habitat, and ecosystem, within the project area. The environmental baseline is the snapshot of the status of the ABB at this time.

Status of the species within the action area

As of 2005, the ABB is known to occur in five Arkansas counties and is suspected to occur in six adjacent counties that contain suitable habitat. All five counties have confirmed recent (within ten years) sightings. One of the largest remaining ABB concentrations is within the action area at Fort Chaffee in Sebastian and Franklin Counties, Arkansas. A total of 239 ABBs in 2005 were captured at these areas (Schnell and Hiott 2005). A total of 728 beetles were captured on Ft. Chaffee in 1997, the highest number ever recorded on these lands; the ten year average for captures on Ft. Chaffee is 327 ± 59 ABBs. This provides insight into the numbers of ABBs in and around the area (Schnell and Hiott 2003). Seeming differences in population size throughout the ABB's range may largely be a function of survey intensity.

Factors affecting species environment within the action area

To adequately evaluate the effects of highway projects covered in this PBO, the Service must not only consider the impacts from the activities addressed in the PBO, but also must consider other, separate effects currently ongoing and likely to occur in the foreseeable future that also could have adverse impacts to the ABB. To accomplish this the Service considers other incidental take statements, incidental take permits issued, recovery permits issued, other section 7 consultations, and cumulative impacts.

During fiscal year 2003 (Oct. 1 to Sept. 30) the Arkansas Field Office consulted on about 44 projects that were proposed in the five counties in which the ABB occurs. These included roadway construction, oil and gas line activities, and an array of other project types.

In addition to those projects with a federal nexus that undergo consultation, there are other projects that do not require federal funding, permitting, or authorization and thereby do not require consultation with the Service. These projects include private or city utilities expansion, urban and suburban development, and conversion of forest lands for farming and grazing land. Therefore, an undefinable number of acres are also affected by these nonfederal nexus projects.

Currently six entities or individuals possess section 10 permits for ABB work in Arkansas. Five are scientific research permits to enhance the survival of the species and one is an incidental take permit issued with a Habitat Conservation Plan (HCP). Although five permits are enhancement of survival permits, some take of ABBs can occur and is authorized by the Service through this type of permit. One permit allows the take of 18 pairs of ABBs to conduct an overwintering study during fall 2005. The same permit also authorizes take of ten ABBs every third year for translocation from Arkansas to Ohio for reintroduction purposes. The research conducted is deemed to further the efforts of conserving the species. The loss of some individual ABBs over the short term from research has been deemed to not jeopardize the ABB. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with research activities.

Habitat Conservation Plans are available to private landowners, corporations, state or local governments, or other non-Federal landowners who wish to conduct activities on their land that might incidentally harm (or "take") a species listed as endangered or threatened. To obtain a permit, the applicant must develop an HCP, designed to offset any harmful effects the proposed activity might have on the species. The HCP process allows development to proceed while promoting listed species conservation.

In addition to the section 10 permits, there are seven biological opinions with incidental take statements issued for the ABB in Arkansas. Two were issued to the U.S. Forest Service, two to the U.S. Army Corps of Engineers in relation to Ft. Chaffee lands, one to the Bureau of Land Management (BLM) for Ft. Chaffee, one to the Department of Commerce for Logan County, Arkansas, and one intraagency biological opinion associated with the Weyerhaeuser HCP. Incidental take of 168 ABBs per year is authorized cumulatively by those biological opinions issued for ongoing projects/management activities with indefinite timeframes, and additional incidental take of five ABBs per drill permit is authorized for oil and gas pipeline operators on BLM lands in western Arkansas.

EFFECTS OF THE ACTION

Factors to be considered

Timing and Duration
Adverse impacts to ABBs can occur from ground disturbance associated with the proposed actions during the ABBs inactive and active periods. The ABB is a ground dwelling animal that must bury carrion for successful reproduction. Construction activities associated with roadway projects frequently disturb soils in areas within the ABBs range and have a potential for harming individuals. Construction at these sites can take a year or more, and maintenance and repair of the facilities and the associated ROW are recurring impacts over the life of the project. Routine operation of these facilities does not entail disturbance of the soil but resultant traffic and ROW maintenance (e.g. mowing, etc.) can have negative impacts on ABBs.

Analyses for effects of the action

Direct effects
Direct adverse impacts to ABBs during their inactive and active periods may occur as a result of impacts from clearing vegetation, heavy equipment operation, fuel and chemical contamination of the soil, grading rough terrain, soil excavation and filling, and revegetation and reseeding of disturbed areas.

During routine roadway construction, soil is excavated to a depth of about 12 inches and can be up to 24 inches or more depending on conditions. In rugged terrain, soil excavation of more than 50 feet is not uncommon. The overall permanent width of the ROW varies depending on the type of road constructed, but can be as much as 300 feet or more. Excavating soils, clearing vegetation, and grading the ROW and associated access roads will entail displacement of soils that could uncover ABBs. Uncovered ABBs could be exposed to predation, adverse environmental conditions, or being crushed by equipment. If construction occurs during the active season, ABB broods could be displaced during soil excavation; adults could be separated from larvae/eggs, and/or crushed by equipment. Revegetation activities could result in further disturbance.

Use of heavy construction equipment such as bulldozers, excavators, track hoes, and back hoes, could compact the soils. This could result in destroying ABB brood chambers, including adults and larvae, and preventing use by ABBs for carcass burial during the reproductive season. If construction takes place during the winter season, adult individuals could be crushed and/or ABB re-emergence in late spring or early summer could be prohibited. The accidental spilling of petroleum products and chemicals could contaminate the soil if accidentally spilled creating unsuitable habitat, directly killing individuals and/or broods, or displacing individuals to less suitable areas.

Maintenance activities occur continuously from the time of completion of construction. Clearing and maintaining the ROW could alter the habitat by precluding re-establishment of the natural vegetative community. This could potentially displace ABBs to other less suitable areas. Repairs and/or upgrades to the ROW cannot be predicted. However, periodic maintenance and occasional repair of the surface structures usually is required. Those maintenance and repair activities that require surface disturbance involving excavation may result in periodic disturbance of the habitat and could result in direct mortality of individual ABBs inhabiting the soil. The periodic use of heavy equipment for maintenance of the ROW may result is soil compaction, reducing the ability of ABBs to bury the carrion or emerge from hibernation. Chemical use for weed eradication might also negatively impact ABBs.

Indirect effects
Indirect effects are caused by or result from the proposed action but occur later in time. Roadway construction on new alignment results in increased edge habitat and habitat fragmentation. This type of habitat is likely to result in take of ABBs in the form of harm by lowering the availability of appropriate prey for ABBs, reducing reproduction, increasing predation of ABBs, and increasing mortality from vehicle strikes.

Effects tracking
This section addresses the quantification of impacts of project level activities, including incidental take anticipated from implementation of pertinent activities and how these impacts will be monitored to make sure that the effects anticipated and analyzed in this PBO do not jeopardize the continued existence of the ABB nor exceed the parameters in this PBO. This entails reviewing the impacts from project level activities and comparing these impacts to those defined and quantified impacts in this PBO.

Effects to the ABB are evaluated at the landscape level in this PBO. However, effects to the ABB also need to be evaluated at the project level by reviewing the implementation of the typical construction methods; adherence to the Reasonable and Prudent Measures; and implementation of the Terms and Conditions. This PBO defines the typical construction methods and survey/relocation/baiting away protocols to be used, the minimization measures available (Reasonable and Prudent Measures), and how to implement these minimization measures (Term and Conditions).

To make sure that incremental losses of habitat and therefore ABBs are not so great that they jeopardize the continued existence of the ABB, the Service will implement a system to track the effects of this PBO. Specific project level information for each individual project will be recorded in a project evaluation form (Appendix A). The completed form will then be appended to this PBO and become part of the document. The Service will administratively re-evaluate the impacts and effectiveness of the programmatic process each year that this PBO remains in effect to determine future actions in regard to the ABB.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future non-federal state, tribal, local government, and private actions that are reasonably certain to occur in the action area and are considered in this PBO. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

There is little doubt that habitat loss and alteration affect this species at local or even regional levels, and could account for the extirpation of populations once they become isolated from others. Cumulative pressure on existing populations of ABB can be caused by projects that contribute to habitat fragmentation, such as road construction, oil and gas pipeline construction, residential development, agricultural land development, and mineral extraction (Service, 1991). Additionally, development that often accompanies highway construction (especially on new alignments) can adversely affect ABB habitat. The amount and extent of development that will occur with each new project will vary greatly depending upon project type and is very difficult to quantify. The FHWA or AHTD will be required to quantify impacts associated with induced development through the use of aerial photography and geographic information systems (GIS) technology; such impacts will be closely monitored throughout the duration of this PBO to determine what effects, if any, they are having on ABB populations.

CONCLUSION

After reviewing the current status of the ABB, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the ABB across its entire range. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such as an extent as to significantly disrupt normal behavior patterns which included, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out of an otherwise lawful activity. Under terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the FHWA so that they become binding conditions of any grant or permit issued to the AHTD, as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA (1) fails to assume and implement the terms and conditions or (2) fails to require the AHTD to adhere the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA or AHTD must report the progress of the action and its impact on the species to the Service as specified in this PBO.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service expects incidental take of ABB will be difficult to detect for the following reasons: 1) the ABB has a small body size; 2) population losses may be masked by annual fluctuations in numbers and concentrations; and 3) the inability to use standard population estimates. However, the level of incidental take can be estimated by the loss in number of acres of suitable ABB habitat altered by highway projects. Information on the number and types of highway projects planned within the next five years was used in determining the amount of habitat impacted. The Service anticipates that 12,000 acres (less than 0.50 percent of the available habitat in Arkansas) of potentially occupied habitat over the next five years will be directly or indirectly impacted as a result of this proposed action. The level of take for the ABB is based on the anticipated impacts to 12,000 acres of potentially occupied habitat from highway construction and related activities and this acreage will be monitored to determine PBO compliance.

EFFECT OF THE TAKE

In this PBO, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following non-discretionary reasonable and prudent measures (RPM) are necessary and appropriate to minimize take of the ABB.

1. Evaluate ABBs potential of occurring within project area.
2. During the ABBs active season, ABB removal methods must be implemented and strictly adhered to prior to and during project implementation.
3. During the ABBs inactive season, the appropriate measures to minimize impacts to the ABB must be implemented.
4. The FHWA or AHTD must submit written project specific descriptions to the Service prior to individual project implementation for all projects (Appendix A). This completed form will then be appended to the PBO and will become part of the document.
5. Conduct surveys to monitor the status and take of the ABB.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Evaluate ABBs potential of occurring within project area.

Step 1 - Determining presence of ABBs in project area county

The Service maintains a map of counties in which the ABB is known to occur or is suspected to occur (provided). This map may be updated at any time and should be reviewed for each project site.

1. a. Project sites in counties where the ABB *is not* currently or historically found, and is *not* likely to be found can proceed without further precautions with regard to the ABB.

1. b. Project sites in counties where the ABB *is* currently or historically found, or *is* likely to be found, proceed to Step 2.

Step 2 - Determining habitat suitability in project areas in counties with ABBs

2. a. Projects *in* areas exhibiting the below described environmental characteristics are regarded as unsuitable habitat for ABBs and therefore unlikely to have ABBs. Consequently, projects implemented in these areas are unlikely to adversely impact ABBs and projects can proceed without further precautions with regard to the ABB. *However, other federally listed species may need to be addressed.*

   i. Soil that is greater than 70 percent sand.
   ii. Soil that is greater than 70 percent clay.
   iii. Land where greater than 80 percent of the soil surface is comprised of rock.
   iv. Land where greater than 80 percent of the subsurface soil structure within the top four inches is comprised of rock.
   v. Land that has already been developed and no longer exhibits surficial topsoil or leaf litter.
   vi. Land that is tilled on at least an annual basis.
   vii. Land that meets the U.S. Army Corps of Engineers definition of wetland. (However, projects developed in this type of habitat will need to be reviewed by the Corps to ensure compliance with section 404 of the Clean Water Act.)

2. b. Projects *not in* areas that exhibit the above described environmental characteristics, proceed to Step 3.

Step 3 - Determining presence of ABB in immediate project areas in counties with ABBs but in areas not exhibiting the above environmental characteristics.

3. a. Consult the Service for a list of recorded positive and negative ABB surveys conducted. Please note that this list is continually updated and should be referred to frequently.

3. b. If a nearby (within five miles) occurrence or survey is found which was conducted recently (within a year of planned soil disturbance commencement), the survey results *can be applied* to the project site, proceed to Step 4.

3. c. If an existing survey is *not* near the project or the survey was *not* conducted within a year of soil disturbance commencement, the survey results *cannot be applied*, proceed to Step 6.

*Step 4- Project sites **with** applicable positive or negative ABB survey results.*

4. a. If applicable survey results are negative for ABB occurrences, the project can proceed without further precautions.

4. b. If applicable survey results are positive for ABB occurrences, proceed to Step 5.

*Step 5- Project sites **with** applicable positive ABB survey results.*

5. a. Where possible postpone construction activities to occur between mid May to mid September, when night temperatures average greater than 60°F. These projects can proceed using the Baiting Away protocol (Service 2005a) or Trapping and Relocating protocol (Service 2005b).

5. b. For projects which cannot be postponed or constructed during summer months, proceed to Step 7-Inactive Season Construction Precautions.

*Step 6 - Project sites **without** applicable ABB survey results.*

6. a. Where possible postpone construction activities to occur between mid May to mid September, when nighttime temperatures average greater than 60°F. Conduct ABB surveys during the ABBs active season (mid May to mid September). Survey results are valid for one year, meaning projects must commence (not be completed) within one year of completed surveys.

i. If ABBs are *not captured*, the project can proceed without further precautions.
ii. If ABBs are *captured*, these projects can proceed using the Baiting Away protocol (Service 2005a) or Trapping and Relocating protocol (Service 2005b).

6. b. For projects which cannot be constructed during summer months Step 7-Inactive Season Construction Precautions, outlined below, should be implemented.

Step 7 - Inactive Season Construction Precautions
All of the following applicable measures should be implemented to the greatest extent possible.

1. Reduce temporary construction easements to the greatest extent possible.
2. During clearing of temporary construction easements, leave as many stumps in the ground as safely and feasibly allowable.
3. Avoid using areas that are considered suitable ABB habitat for borrow or spoil areas.
4. Replace excavated soil and revegetate completed portions of the project area as soon as feasible.
5. Avoid or minimize the use of herbicides, and/or pesticides during the revegetation process.
6. Avoid or minimize contamination of the soil from fluids such as fuel, oil, or other chemicals by using drip pans or impervious liners in storage areas.
7. Limit vehicle and equipment use on non-ROW areas to only that which is necessary.
8. Minimize soil disturbance to the greatest extent possible.
9. Minimize service roads and highway ROW to the greatest extent possible.
10. Minimize area of permanent disturbance to the greatest extent possible.
11. Restore areas of temporary disturbance to the maximum extent possible and as soon as possible.

Surveys and trapping and relocating ABBs must be conducted under the authority of an appropriate section 10 permit from the Service. Any relocation site must be coordinated with and approved by this office. A "Survey/Relocation Data Form" must be submitted to this office within 30 days following relocation efforts. Section 7 consultation is not considered complete until this form is submitted. This form is available from the Service upon request. Although a section 10 permit from the Service is not currently required to conduct baiting away activities, a permit for such activities could be required in the future.

2. Submit individual project specifications to Service prior to project implementation

Submission to the Service of specific individual projects is needed to assure adherence to the Terms and Conditions of this PBO, for FHWA to be in compliance with section 7(a)(2) of the Act, to ensure project design complies with the conditions set forth in this PBO, to evaluate potential impacts to other federally listed species if applicable, to keep appraised of any new information gathered, to monitor status of the ABB, and to monitor take of the ABB in relation to the allowable incidental take. This PBO allows AHTD personnel and the Service to ascertain which FHWA federal nexus projects do and do not meet the established requirements and will therefore need further, separate compliance action with the Act. This PBO will facilitate project planning and compilation and submittal of individual project notifications to the Service, and expedite the Service's review and response time.

3. **Conduct surveys to monitor status of ABB and to monitor take so as not to result in jeopardizing the continued existence of the ABB.**

The FHWA or AHTD is responsible for monitoring their impacts to the ABB, monitoring whether or not those impacts are accurately represented in this PBO, and monitoring to ensure that their impacts do not jeopardize the continued existence of the ABB. To help fulfill this monitoring obligation, a sufficient amount of ABB surveys need to be conducted prior to project construction. The number of transects per survey required to monitor ABB status within the project area will vary depending on project size, location, and duration. A minimum of one transect (as defined by Creighton *et al.* 1993a) per linear mile of highway projects, surveyed for three consecutive nights, will be required to determine presence/absence of ABBs. The survey is valid for a period of one year.

4. **Death or Impairment of ABBs**

The Service anticipates that detecting a dead or impaired ABB specimen will be unlikely due to its small size and its fossorial and nocturnal behaviors. However, if a specimen is found, care should be taken in handling the specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. The Service is to be notified within three calendar days upon locating a dead or injured ABB. Initial notification must be made to the nearest U. S. Fish and Wildlife Service Law Enforcement Office, at 501-324-6493, then the Arkansas Ecological Services Field Office. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information.

All dead or moribund adults should be salvaged by placing them on cotton in a small cardboard box as soon as possible after collection. The date and location of collection should be included with the container. Specimens should then be furnished to Service personnel for deposition in a Service approved collection of invertebrates.

5. **Incidental Take Exceedance**

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. FHWA or AHTD personnel must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to use their authorities to further the purpose of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse impacts of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Conduct research on the on the ABB coordinated with the Service.
2. Conduct additional surveys for the ABB, in coordination with the Service, above and beyond those surveys required per this PBO.
3. Avoid excessive use of chemicals in highway ROWs from mid May to September.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the proposed FHWA action involving highway construction activities. As provided in 50 CFR Sec 402.16, reinitiation of formal consultation is required where discretionary FHWA involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the FHWA action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the FHWA action is subsequently modified in a manner that causes an effect to the listed species or critical habitat designate not considered in this opinion; and 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Sincerely,

Allan J. Mueller
Field Supervisor

cc:
Joe Johnston, USFWS
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