Attachment L-22

American Burying Beetle Survey Guidance
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American Burying Beetle *Nicrophorus Americanus* Survey Guidance for Oklahoma

Updated May 20, 2009

Introduction

The goal of this document is to provide guidance in designing and conducting presence/absence surveys for the ABB as a means of complying with section 7 and 9 of the Endangered Species Act (ESA). Section 9 of the Endangered Species Act (ESA) prohibits all persons from the taking of federally listed species. Take includes harming, harassing, or killing. Section 7 of the ESA requires federal agencies to consult with the Service if a project they authorize, fund, or carry out may adversely affect a federally listed species. Baited pitfall traps are the most effective method known for surveying for ABBs (Creighton *et al.,* 1993; Service, 1991; Bedick *et al,*. 2004). The below baited pitfall survey methodology has proven to be successful in safely capturing the ABB. Following this guidance should help to ensure the validity of survey results. Implementing other survey methods, not recommend by the Service, may not result in confidence of survey results. Due to the ABBs life history, false negative survey results can occur. Further, data gathered using this guidance will allow for comparison of results between surveys. Surveys for ABBs that are conducted for research purposes are beyond the scope of this guidance and should be coordinated with the Service.

Time for Surveys

As a means of determining the presence or absence of ABBs, the Service recommends surveys be conducted during the ABBs primary active season, which is between May 20 and September 20 in Oklahoma. Surveys should begin no earlier than May 20 and end no later than September 17 in Oklahoma (dates may vary among states and will need to be verified for each state). Additional nights of survey are needed for each night during a survey effort where the night-time ambient temperature falls below 60 degrees Fahrenheit [ºF] and when rain events deposit ½ inch or more during 7 pm to 7 am.

The ABB's nocturnal activity and trapping success decreases or is absent when temperatures drop below 60 (Bedick *et al*. 1999, Kozol 1991). Further, ABB nocturnal activity is shown to be delayed when temperatures are greater than 75ºF (Bedick *et al*. 1999).

The determination of the ABB's activity period in Oklahoma is based on the past eleven years of weather data in eastern Oklahoma (Oklahoma Mesonet) where nighttime ambient temperatures are consistently above 60ºF. Mesonet data from the Tahlequah and Broken Bow stations were analyzed. May 20 is typically the day commencing the onset of a five day period were nighttime ambient temperatures remain 60ºF or higher, and September 20 is the first day of a five day period with temperatures below 60ºF. There is the potential that the temperature will drop below 60ºF for a night or two, but typically not for five consecutive nights or more.

Timing

Although the capture rates of ABBs are known to be higher during certain dates during their prime active period, May 20 and September 20, the Service is not recommending restricting survey implementation to specific dates during this prime active period.

Both Bedick *et al.* (2004) and the U.S. Fish and Wildlife Service (Service) (1991) reported an increase in capture rates during certain times during the ABBs active season and during the ABBs nightly activity. Capture rates for ABBs are highest from mid-June to mid-July and again in mid-August. Bedick *et al.* (2004) reported that a peak in capture success also occurred in mid-August. In Nebraska, Bedick et al (1999) reported two peak activity periods. One in late June and early July when ABB are most actively searching for carrion, and in late August and early September when teneral ABBs

emerge.

Surveying during the above two peak timeframes would result in the greatest potential for trapping success and the Service would prefer that surveys be conducted during these periods. However, we understand that limiting surveys to these time periods is too restrictive and therefore conducting surveys during these time periods is not a requirement. Further, this survey protocol is only a method to determine presence/absence and not an abundance or population survey.

Timeframe a Survey is Valid

Survey results are only valid for one calendar year from the last date of the survey effort. This determination is based on the fluctuating nature of ABB populations. Data indicates that ABBs likely have moved and numbers have fluctuated within a given area from year to year.

Much of the long-term information concerning the life history of the ABB pertinent to Oklahoma has come from work done at Fort Chaffee, Arkansas; McAlester Army Ammunition Plant (McAlester), Oklahoma; and Camp Gruber, Oklahoma. While the land use at Fort Chaffee, McAlester, and Camp Gruber is different among each entity, each entity maintains a relatively consistent land use pattern of its own through time. However, Hiott and Schnell (2003) reported the number of ABBs captured and the location of high density ABB concentrations typically varies annually or biennially at each site. This trend indicates ABBs are cyclic, where there are high numbers and abundance for one or two years, followed by a decline in numbers the following year or two, and repetition of the cycle over time. In addition, each year they reported that the high concentration areas of ABBs appeared to shift annually throughout the sites. Further, the ABB is an annual species (living for only one year) and the following year's numbers are dependent upon the reproductive success of the previous year.

False negatives are possible outcomes of with ABB surveys. The Service (1991) reported that during late July ABBs were easy to attract to carrion bait but were difficult to capture in pitfall traps. Standard transects on Camp Gruber that resulted in ABB captures in one year showed no capture of ABBs in another year. Other surveys conducted in a given area of Oklahoma have resulted in ABB captures during one survey but surveys conducted in the same given area and the same active season have resulted in negative ABB captures.

Survey effort radius

A survey is valid for a 5 mile radius. Considering ABBs mobility, small size, recorded movement distances, and distance from which they can detect carrion, a presence/absence survey was effective only over 5 miles and that this erred on the side of the species.

An ABB may move as little as 0.15 mile per night to a maximum of 6.2 miles in 6 nights (1.03 miles per night), with a mean movement distance of 0.52 mile per night (Schnell and Hiott 1995, 2003). Bedick *et al.* (2004) reported average nightly movements of 0.62 mile with the large proportion (85%) of recaptures moving distances of 0.31 mile per night. Creighton *et al.* (1992) reported that individual ABBs moved over 4 miles in only a few days. Creighton and Schnell (1998) reported an average nightly movement of 0.76 mile, and maximum distances of four miles in five nights (0.8 mile per night) and 6.2 miles in 6 nights (1.03 miles per night), a minimum distance of 0.15 mile in one night, and a mean nightly movement of 1.67 miles.

While this data could be interpreted to imply that an ABB could move 95 miles [0.62 (mean nightly movement) X 154 days (May 20 – September 20)] during the active season, the Service does not believe this is an accurate interpretation. Mark and recapture data at Camp Gruber and Fort Chaffee did not find any ABBs that moved between these installations, a distance of about 54 miles (Schnell and Hiott, 1997-2003). Even if ABBs moved such long distances, the Service assumes it is unlikely ABBs move in such a consistently linear direction.

The group of ABBs at Camp Gruber has persisted for at least 11 years. While the numbers and high density areas of ABBs have changed annually or biennially, indicating ABBs are typically a cyclic species (Schnell and Hiott, 2003), they appear to be self-sustaining. The Service assumed it was not likely that all, the majority, or even a single ABB on these installations moved from 54 to 95 miles away from Camp Gruber. Further, for a species to survive it cannot exert more energy than it consumes and would only expend the minimal amount of energy needed to secure necessary resources.

Minimum Survey Effort

To effectively determine presence or absence of ABBs in a given area, surveys need to be conducted for a minimum of 3 consecutive nights [or 24 trapnights, 8 traps (or 1 transect) x 3 nights = 24 trapnights] not hampered by rain or temperature as described below. The effective radius of a transect is 0.5 miles. So to effectively survey a particular area, transects should be spaced at 0.5 mile increments across the project area until the entire project area is within the effective trapping area of at least one transect. Each transect deployed should be open for 3 consecutive nights. Keep in mind that a transect does not have to be linear.

For projects with less than a 0.5 mile radius from the center to any point along the perimeter, a minimum of 1 complete transect (8 traps spaced 66 feet apart) is required. One transect with 8 traps for 3 nights results in 24 trapnights (the number of traps times the number of survey nights). Again, the placement of the transect does not need to be linear

Based on ABB movement data described above, the effective trapping area of a transect is a 0.5 mile radius. Creighton *et al.* (1993) and the Service (1991) recommend surveying for a minimum of 3 consecutive nights to adequately determine the presence or absence of ABBs in an area. Bedick *et al.* (2004) recommends a range of 3 to 5 nights, preferably 5 nights. However, after 3 consecutive nights of trapping, surveyor observations report trapping success can decline. If ABBs have not been captured within the 3 consecutive nights of surveying then ABBs are unlikely, although not impossible, to be captured (Personal communication with Ana Hiott, 2003) with additional trapnights.

Minimum project acreage

According to our 2005 analysis of ABB density estimates, projects which disturb less than 1.2 acres would have, on average, no more than a one percent chance of impacting an individual ABB. In addition, the Service evaluates numerous other factors including the project: type, construction/installation duration, permanency, location, land use, implementation methods, habitat, and time/season.

Using recently collected survey data, the Service's Oklahoma Ecological Services Field Office derived densities of ABBs in their known range within Oklahoma. We used all known survey records to determine the total number of ABBs captured and total transects deployed per survey. In using this information, we assumed all captures were obtained using the methodology described by Creighton, *et al*. (1993) unless stated otherwise. Data that were not collected using the Creighton *et al*. (1993) methodology were excluded from the analysis.

The Service then estimated the area each transect would effectively trap. Creighton, *et al*. (1993) determined, based on known movements of ABBs, that transects do not need to be spaced any closer than 0.5 miles. Past and ongoing research demonstrates this trapping recommendation is still appropriate. Schnell and Hiott (1997-2003) annually determined the average nightly movements of the ABB, using marked individuals over a nine-year period at Camp Gruber to be 0.62 miles. The smallest average nightly movement for any given active season over that same period was 0.52 miles. Consequently, we believe each transect effectively traps beetles from an area of 0.5 mile. As such, the effective trapping area (ETA) for one transect is about 153.5 acres. Using the ETA and number of ABBs collected, we estimated average ABB densities to be 0.0084 ABBs/acre for their known range in Oklahoma. The Service then used a standard z test to determine the probability of encountering an individual ABB in a given area. We determined that disturbance of less than 1.2 acres would have, on average, no more than a one percent chance of impacting an individual ABB.

Weather Requirements

An additional night of surveying is required when the temperature falls below 60ºF between 7:00 PM and 7:00 AM and/or when rainfall greater than ½ inch occurs between 7:00 PM and 7:00 AM. All weather data for surveys should be collected using the Oklahoma Mesonet website, www.mesonet.org. Directions for using the Oklahoma Mesonet website are provided below. All additional nights of surveys conducted due to weather need to be specified in the "*ABB Survey Data Collection Form*" and the "*ABB Survey Summary Report*".

Bedick et al. (1999) reported the highest number of ABB captures 3 to 4 hours after sunset. However, captures occurred from 1 to 11 hours after sunset during this study. In Oklahoma, sunset times range from 7:18 PM to 8:44 PM between May 20 and September 20. Based on Bedick *et al*.'s (1999) findings, the peak timeframe for ABB captures in Oklahoma would be from 10:18 PM to 12:18 PM and the nightly timeframe of ABB activity would be from 10:18 PM to 7:24 AM.

This is just one study and the study site was in Nebraska, so to err on the side of the species, the Service has determined that the nighttime active period for ABBs to be between 7:00 PM to 7:00 AM in Oklahoma. The Service also considered the limiting factors of this type of survey effort, specifically we considered the fact that this type of survey provides only the presence or absence data of the ABB in a given area and that the minimum duration of the survey effort is 3 nights. To err on the side of the species, all feasible variables that could result in a false negative survey need to be eliminated if possible. Temperature and rainfall are variables that can be easily monitored and adjusted for.

Oklahoma Mesonet Instructions:

1. At www.mesonet.org, click on "Past Data and Files" under "Mesonet Data" (Left side of the screen)
2. Click on the Mesonet station closest to the survey site. Then under the "Station Monthly Summary" heading select the month and year of the survey. Then click "Get summary."

   Temperature:
   - In "Summary Report" of this Mesonet page, find the date of the survey. Daily Mesonet data is measured from midnight to midnight, so if traps are set on June 3rd, temperature data from both the 3rd and the 4th will be needed to address the entire trapping night, which is between 7:00 PM to 7:00 AM, and because the nightly low temperature most often occur past midnight.

   Rainfall:
   - In "Summary Report" of this Mesonet page, find the date of the survey. Once again, if the traps are set on June 3rd, Mesonet data from the both the 3rd and 4th need to be reviewed to address the entire trapping night, which is between 7:00 PM to 7:00 AM. Rainfall over ½ inch during a trap night requires further analysis and reporting. The time of the rainfall needs to be determined. This Mesonet page only reports the entire rainfall that occurred in a 24 hour period (midnight to midnight). To determine when during a 24 hour period rainfall events occurred and how much rain fell, proceed to the paragraph below for instructions to navigate through Mesonet to the proper page.

   - Click on "Past Data and Files". Then under the heading "Data Files" on the bottom right of screen click on "Mesonet MTS Files". Then click on the relevant date. Then select the Mesonet station nearest to the survey area. Rain totals are given in 5 minute increments on this Mesonet page. Remember that daily Mesonet data is provided for a 24 hour period, beginning at 12:00 AM and ending at 12:00 AM. So the date the traps were set and the following date need to be reviewed to determine the rainfall for the entire trapnight.

Transect spacing

Transects should be spaced a minimum of 0.5 mile apart on small to medium sized projects and a maximum of 1 mile apart on large projects to achieve reliable survey results. The Service defines large projects as those that are over 20 square miles or over 20 linear miles.

Bedick *et al.* (2004) recommended that 0.31 mile be used as a minimum transect spacing for traps with large bait. Creighton *et al.* (1992) concluded that transects less than 0.5 mile apart were not required. In large sample areas, Creighton *et al.* (1992) stipulated that transects can be located as much as 1 mile apart. The Service's rationale considered these recommendations and the ABB movement data discussed previously in determining an effective transect spacing.

Transect Placement

Transects should be placed in a configuration that best represents the different habitat types present in the survey area and on the highest spots in the survey area. Transects are not limited to linear arrangements, they can be aligned to suit the shape of the project area for which you are surveying. For example, if a project is kidney bean shaped, transects can be curved to fit a kidney bean shape. However, transect spacing of 0.5 mile needs to be followed.

American burying beetles are feeding habitat generalists (Creighton *et al,* 1993). Consequently, it is recommended that transects be placed in all the different habitat types present in a survey area. Bedick *et al.* (2004) reported ABBs were

significantly more attracted to traps placed on ridges than those placed in valleys. They believed that increased ABB captures on ridge tops may be a result of increased odor movement, thus increasing the possibility of detection by ABBs.

Ants

Traps should not be placed within 23 feet (7 meters) of ant hills. If ants are discovered in a trap it should be relocated at least 23 feet away. Ants can swarm and kill an ABB that is trapped in a pitfall trap (Creighton *et al,*. 1993 and Bedick *et al,*. 2004).

Transect

A transect is defined as 8 pitfall traps, spaced 66 feet (20 meters) apart (Figure 1), for a total length of 460 feet (140 meters). This definition is based on the transect protocol described in Creighton *et al.* (1993) and Bedick *et al.* (2004) which all utilize or recommend the same type of transect. Transects are not limited to linear arrangements, they can be aligned to suit the shape of the project area for which you are surveying. For example, if a project is kidney bean shaped, transects can be curved to fit a kidney bean shape. However, the above described quantity of traps per transect and the spatial arrangement (traps 66 feet apart) of traps must be followed.

Traps

The Service recommends using baited pitfall traps for ABB presence/absence surveys. Each pitfall trap consists of a trap cup, bait cup, wire, and cover. The traps are designed to utilize carrion to attract ABBs, keep captured ABBs alive, minimize bait and ABB contact, and prevent ABBs from escaping until traps are checked. The ABB flies toward the bait odor, lands near the trap, and crawls under the cover and into the trap cup. Once in the trap, the slick sides of the cup prevent the ABB from crawling out, and the cover and suspended bait cup keep the ABB from flying out of the trap cup. Figures 2 and 3 display the baited pitfall trap setup. If the utilization of other trap design and equipment is proposed this must be coordinated with and approved by the Service.

Traps in the form of 24 oz (0.7 L) plastic cups (similar to Solo cups) have proven effective. The Service recommends that the trap cup consist of two 24-oz Solo cups. Cups must have smooth sides, free of any texture or ridges to prevent ABBs from climbing out. American burying beetles can climb a surface with textured/ridged sides but cannot climb a smooth, slick surface. The 2 cups are stacked together and placed in an appropriate sized hole in the ground. Stacking the cups one inside the other facilitates removal of trapped insects. The top cup can easily be pulled out and replaced while the second cup remains in the ground to maintain the integrity of the hole. The lip of the trap cups should be 0.5 to 0.75 inch above ground level. This prevents water runoff from filling the cup. The cup should not exceed 0.75 inches from the ground because this could prohibit ABBs from being able to crawl over the lip and into the trap. A 1 to 2 inch squared piece of wetted sponge soil should be placed in the bottom of the trap cups. This has been shown to decrease mortality by desiccation of ABBs and providing a floatation device should the cup be inundated with water.

The bait cup consists of a plastic cup about 5 – 6 ounces (20 milliliters) in size. Examples of bait cup types that have proven effective are cups similar to those used in restaurants for carry out of salad dressing or styro-foam coffee cups with the top portion cut off leaving only the bottom 1 inch of the cup. The type of bait cup used is not as important as the trap cup; however the size of the bait cup is important. The bait cup should be large enough to hold the proper amount of bait (described below) but small enough to be suspended over the trap cups and still allow ABBs to crawl into the trap cup. Bait suspended over the pitfall trap via skewer or similar device is not recommended. The bait dries out and the odor emitted is greatly weakened.

Wire is used to secure and suspend the bait cup over the trap cup. To accomplish this, the wire needs to be hand malleable but sturdy enough to support a full bait cup. The wire is inserted into one side of the bait cup near the top and pushed all the way through the cup and out the other side of the cup; about 3 inches of wire should extend on either side of the exterior of the bait cup. Bend wire down and push into the ground to suspend and secure the bait cup over the trap cup. The reason for separate bait and trap cups is to protect the ABB from coming in contact with the bait. As the bait liquefies or becomes gummy ABBs could be harmed if they come into contact with the bait.

The cover should be hard, not transparent or opaque, weighted or secured to the ground, at least 6 inches in depth, at least 12 inches in diameter at its widest point, and raised off the ground about 1 to 2 inches. A hard, plastic dome structure has proven effective at protecting the trap (e.g. inverting nursery plant containers with holes on the side, or small gray paint

buckets). A hard structure, secured to the ground is needed to prevent scavenger and rainfall from accessing the trap cup, and to provide shade to captured insects to avoid desiccation. Scavengers absconding with bait is common and potentially results in harm to ABBs. In addition, bait loss during trapping reduces the effectiveness of the trapping effort and therefore ABB capture success. The cover structure should be raised off the ground about 1 inch or holes should be cut along the lip of the container flush to the ground to allow ABBs to crawl into the trap. At least 40% of the lip should be open to allow ABBs access to trap. In lieu of a plastic dome structure, other similar structures can be used. For example, a piece of wood raised on legs can be used. However, all covers must be secured to the ground. Shingles or other such flimsy materials are not to be used.

In areas where scavengers are a significant problem wire mesh can be installed between the pitfall trap and the cover (Appe). The piece of wire mesh should be a minimum of 6 inches squared and mesh size should be at least 1 inch to allow ABBs access to trap but prevent larger animals from stealing the bait. The wire mesh should be secured to the ground with stakes, and a hard cover will still need to be used.

Exposure to full sunlight and temperatures over 77ºF for even a few hours can result in ABB mortality (Service, 1991). According to Bedick *et al.* (2004) wetted soil in the bottom of the trap helped maintain high humidity. This improved the longevity of ABBs and therefore decreased the mortality of ABBs from desiccation. They found this was feasible to use with stacked cup traps. However, saturated soil in the bottom of a trap cup can also pose a threat to ABBs. The Service (2008) found that saturated soil can result in mortality of ABBs through clogging of spiracles or drowning. Other permittees have used a 1 to 2 inch squared piece of wetted sponge in the bottom of traps. The Service recommends utilization of wetted sponges. Soil can still be placed in the bottom of the trap cup; however, this soil should not be wetted.

Bedick *et al.* (2004) found the primary cause of ABB mortality was drowning due to traps flooding with water. However, on multiple occasions, floating and apparently dead beetles were removed from traps, and they subsequently recovered after 10 to 20 minutes. Consequently, ABBs that appear dead or are lethargic should be held for at least 20 minutes to determine actual condition. Monitored ABBs should be placed in a roomy, open container, with air circulation, out of direct sunlight.

Bedick *et al.* (2004) evaluated six types of pitfall traps for capturing ABBs ranging from stacked cups, to PVC pipe, to buckets. They determined buckets with a dome cover had the greatest trapping success because it allowed for the largest piece of bait. However, they realized that this was not the most practical or economically feasible method to implement. They rated stacked cups as the second best trapping method. Creighton *et al.* (1993) also determined that stacked cups as baited pitfall traps proved effective at capturing ABBs and recommended this method.

Creighton *et al*. (1993) recommended using traps that are smooth, free from any bump or ridge to prevent ABBs from climbing out of the trap. Metal cans should be avoided because as soon as any rust appears, ABBs may be able climb out of the trap (Service, 1991). Creighton *et al.* (2004) also recommended the lip of the cup be flush with the ground. However, Bedick et al. (2004) and Hiott (2002 personal communication) recommend the lip of the pitfall cup trap be a 0.5 to 1 inch above the ground surface to prevent water runoff from filling up the trap. Bedick *et al.* (2004) took additional measures by building a berm around the raised portion of the cup.

Creighton *et al*. (1993) and Bedick *et al.* (2004) recommend suspending bait cups over trap cups to lure ABBs, and prevent contact between ABBs and the bait. While carrion beetles are seemingly well-adapted to moving around in carrion, Bedick *et al.* (2004) found that under some conditions spiracle blocking could occur. Bait placed in a small container with a water-tight bottom can decay into a near liquid state. Bait in this liquid form could adhere to ABBs, harden, and then clog spiracles. They did not think this was a common occurrence but could potentially occur.

Bedick *et al.* (2004) recommends using weighted, hard plastic rain-shields larger than the opening of the trap cup to protect the trap from rain. The cover over the pitfall trap should be secured to the ground to effectively protect the trap from rainfall and predators (Creighton *et al.,* 1993). Bedick *et al*. (2004) also recommended using wire mesh secured to the ground between the trap and the cover (Figure 4) to prevent scavenge of bait. Mesh was secured to the ground with three to four bent wire stakes, 4 inches (10 cm) long, driven into the ground. Covers were raised between 1-2 inches above the ground to allow ABBs access to trap.

Bait

Any type of carrion is suitable for use as bait for ABB pitfall traps. However, un-skinned chicken is preferred by multiple surveyors because it is inexpensive and remains moist longer than other baits due to the fat content of the skin. Others have successfully used liver, gizzard, or road kill. The only requirements are that the bait must be the appropriate size in correlation with trap size and must produce a pungent odor that ABBs are able to detect. The appropriate size of bait for stacked cup traps is between 0.5 to 0.7 ounces (15-20 grams). The bait must be rotten and emit a pungent odor to be effective. Adding a small amount of water to the bait cup is effective at prolonging the moisture content and odor. During trapping efforts any bait that has dried out or no longer emits a pungent odor must be replaced with new bait.

Fresh bait is not an attractant to ABBs (Creighton *et al.,* 1993). To prepare bait for use, cut into cubes about 0.5-0.7 ounces (15-20 grams) in size. Place the cubes into a sealed container or bag. Do not fill the container or bag completely full, as the bait rots gas pressure is increased and the extra room is need for this expansion. Place the container or bag in the sun for a minimum of one day (Creighton *et al.,* 1993). If the day is relatively cool (less than 85ºF [29ºC]), the bait should stay in the sun longer.

Once bait is prepared, the packaged (container or bag) bait should then be further enclosed in a larger sealed container, such as an ice chest or bucket with lid. The bait should be used within the next few days. Use of the larger sealed container prevents odor from escaping into unwanted areas and is ideal for transporting bait. The Service recommends that the bait or any containers holding bait not be placed inside a vehicle. You will never get the smell out of your vehicle! Instead, place the containers in the bed of a pick-up or secure to outside of vehicle. In addition, discarded or old bait should not be left at or near the current trapping area. This could lure ABBs away from the baited pitfall traps.

Bedick *et al.* (2004) reported no significant difference between capture rates of ABBs using various types of bait (Appendix 1). However, they did find a significant difference between the sizes of bait used and the number of ABBs captured. A large piece of bait positively correlated with an increase in the number of ABBs captured. Bedick *et al.* (2004) recommended that bait of 7 ounces (200 grams) be used. This amount of bait is feasible if a bucket trap is used but not if a cup is used. Creighton *et al.* (1993) and Service (1991) recommend that 0.5-0.7 ounces (15-20 grams) of bait be used.

Setting and Checking Traps

Each trap must be checked by 10:00 A.M. each morning. Checking traps entails: collecting all trapped ABBs, recording and releasing other *Nicrophorus* species; replacing any missing or dry bait, re-moistening sponge in trap cup if needed, replacing floatation device if needed, and replacing/resituating any disturbed parts of the trap.

Any injured or lethargic ABBs should be released immediately. ABBs that appear to be dead should be collected and monitored for at least 20 minutes, as described below under *Processing ABBs*, to accurately determine their condition. Any dead ABBs should be handled as described below under *Accidental Death of ABBs*.

The Service recommends using a 5-gallon bucket or similar container to carry the needed equipment used during trap checking. The items you will need to carry include: a container to hold ABBs, prepared bait, water, a trowel for digging, tongs and the data sheet. Use a hard, plastic container with a lid and air holes to hold ABBs collected along a transect. Carry a small container of prepared bait (and tongs to handle bait) to replace missing or dried bait. Carry a 20 oz plastic bottle of water to re-moisten sponge in the bottom of the cup trap, and the bait. Replace or re-situate any disturbed traps (this is where you may need the trowel to re-dig the hole for the trap). Record the species and number of any other *Nicrophorus* captured and then immediately release. The other *Nicrophorus* species should be released several feet away from a transect to avoid being crushed by foot traffic. Once all the traps along a transect have been checked, proceed in processing all the captured ABBs either at the end of the transect or at the vehicle. If processing occurs at the vehicle, the vehicle must be within 500 feet of the transect. This is to minimize handling time and for ABBs to be released in the area they were captured.

All traps must be in place and baited by 5:00 P.M. each night. Traps should be cleared of ABBs by 10:00 A.M. every day. Exposure to full sunlight and temperatures over 77ºF (25ºC) for even a few hours can result in ABB mortality (Service 1991). Traps can be baited at the same time they are checked each morning provided the bait does not dry out.

Since ABBs are nocturnal, there is not a risk of baited traps capturing ABBs during the day.

Disturbed bait or traps

Additional nights of trapping will need to be implemented if 4 or more traps and/or bait are disturbed, and no ABBs have been captured during a 3 night survey period. Predators or scavengers can cause bait loss and/or trap disturbance during ABB surveys. This can affect the results of the trapping effort. Disturbed traps or traps missing bait, reduces or eliminates the effectiveness of attracting and/or containing ABBs and therefore ABB capture success. Any negative results from these traps are not reliable. The Service calculated that a trap disturbance percentage of 20 was acceptable and still allowed for surveys that provided valuable data results.

The specific number of additional nights of trapping that will be needed is dependent on the number of traps and/or bait disturbed. The table below outlines the amount of additional trapping needed. Transects in which ABB have been captured, regardless of whether or not any traps have been disturbed or are missing bait, do not require additional nights of trapping since ABB have been confirmed detecting and finding baited pitfall traps along a transect.

# of traps &/or bait disturbed	# of additional nights to survey
0-4	0 additional trapping needed
4-8	1 transect for 1 night
9-16	2 transect for 1 night
17-24	3 transect for 1 night

All trap disturbances must be recorded on the "*ABB Survey Data Form*". There are specific sections on this form pertaining to bait disturbance and any additional nights of survey required. In addition, the amount of disturbed bait and/or traps needs to be summarized in the "*ABB Summary Report*".

Processing ABBs

Processing includes sexing, aging, taking measurements, marking (if authorized) and data recording.

Captured ABBs should only be held for a maximum of 30 minutes, preferably much less than this. ABBs held for longer than 10 minutes should be placed in a hard, plastic container with a damp sponge and then the container placed in an iced cooler. ABBs are sensitive to prolonged heat exposure.

An efficient method to process ABBs is to collect all the ABBs from all 8 traps along a transect and then process all the ABBs at one time. Processing of ABBs can then be completed at the end of the transect or at the vehicle. Multiple permittees find processing ABBs at their vehicle facilitates the task. This eliminates the need to carry all of the equipment during trap checking, quicker processing of ABBs, availability of a cooler if needed, and other advantages.

Clipping of the elytra is only applicable for mark and recapture surveys and is not appropriate without specific authorization from the Service. The survey protocol described here is to determine the presence or absence of ABBs only. Clipping of elytra causes hemoglobin to be secreted by ABBs. Although, there is currently no conclusive evidence that this is a direct or indirect adverse impact to the ABB, it is not recommended. It is the Service's responsibility to err on the side of the species. Further based on past survey reports, recaptures are highly unlikely during such a short survey effort. If a research project is being conducted and identification of individuals is needed then this research project must be approved by the Service.

Measuring the pronotum is voluntary; however the Service would appreciate the collection of this data. Measuring of the pronotum should be done with digital calipers.

Sexing

The sex of ABBs can be distinguished based on the orange-red marking located between the frons and mandibles on the head. These markings are rectangular on males and triangular on females (Figure 5).

Aging

Adults that have pupated during the current active season are known as newly eclosed. Newly eclosed ABBs (young) can be distinguished from ABBs produced the previous year (old) by their softer bodies and more shiny appearance (Creighton *et al.,* 1994). Also, the orange-red pronotum appears to be lighter and more orange in color in newly eclosed adults. Older adults often are missing body parts, especially legs or antennae. In addition, the mandibles of older adults appear to be a bit more worn at the tip.

ABB Release

ABBs should be released along transects where they were captured or within about 500 feet of the transect. Further, ABBs should be released a minimum of about 100 feet away from vehicle or foot traffic and outside of the pathway of vehicle and foot traffic to avoid trampling.

Identification and Other Nicrophorus Species

There are 6 other *Nicrophorus* species in Oklahoma that resemble the ABB. The ABB can usually be distinguished from other *Nicrophorus* species by the large orange-red spot on its pronotum (body segment between the head and abdomen) and on the frons (Figure 6). No other mature *Nicrophorus* species has an orange-red marking covering the pronotum and frons. However, newly eclosed (within 2 weeks after emerging from the ground) *N. orbicollis* can have a burnt orange marking on the pronotum. However, red-orange frons present on the ABB should allow for distinction from new *N. orbicollis*. The *N. orbicollis* has black frons. A description of the other *Nicrophorus* species in Oklahoma and an identification key is located in Appendices 2 and 3, respectively. In addition, photos of other *Nicrophorus* species in Oklahoma are available on our website for comparison.

Accidental Death of ABBs

The handling of all endangered species is strictly regulated by the Service. All accidental mortalities of ABBs must be accounted for and an "*ABB Accidental Death Form"* must be completed for each individual specimen and submitted within 14 calendar days to the Oklahoma Ecological Services Field Office. An "*ABB Accidental Death Summary Report"* must be completed in electronic and hardcopy formats and submitted to the Oklahoma Ecological Services Field Office by October 15 of each year and to the Regional Permit Coordinator along with your annual report.

Dead ABBs should be placed in cotton within a sealable, rigid container to prevent jostling of the ABB causing limb and antennae damage. Each specimen must have a unique alphanumeric name assigned. This alphanumeric name should be the first letter of the first 2 words of the permittee company or individual (e.g. Acme Company, first dead ABB = AC001). A label with the date found dead, permittee, legal description (down to quarter section at least), and specimen alphanumeric name should be placed inside each container to ensure future identification. Only place one ABB specimen per container to avoid mixing up specimens. Place the container on ice until the ABB can be prepared. Dead ABBs are to be submitted to the Service or a Service approved facility with their corresponding "*ABB Accidental Death Form"*.

Reporting

The Service has prepared a standard "*ABB Survey Data Collection Form*" (Appendix 4). Use of this form ensures that all of the needed data is recorded by all permittees. This form is to be completed for each transect, each night during a survey effort. Copies of all forms are to be submitted to the Oklahoma Ecological Services field office (see address in heading).

In addition, an "*ABB Survey Summary Report*" (Appendix 5 and 6) is to be completed for each survey effort. This is to be submitted electronically in excel file format to ABBcontact@fws.gov. Additionally, a hardcopy form is to be mailed to the Oklahoma Ecological Services Field Office along with the corresponding "*ABB Survey Data Collection Forms*". A description of the required fields to complete in the "*ABB Survey Summary Report*" is provided in Appendix 7.

All latitude and longitude data should be reported in decimal degrees and the coordinate system/projection should be in NAD 83. If a survey is conducted in compliance to the Endangered Species Act or the National Environmental Protection Act, project names and numbers need to correctly correspond. Only complete and accurate reporting forms will be accepted. Incomplete and/or inaccurate forms will be returned and the surveys will be considered invalid until the forms are corrected and/or properly completed, and submitted. When sending corrected forms, indicate that it is a correction,

what specifically has been corrected, and the project name.

Protocols and Forms
All forms can be downloaded from the Oklahoma Ecological Services Field Office's website <http://www.fws.gov/southwest/es/oklahoma/beetle1.htm>.

References

Bedick, Jon, Brett Ratcliffe, and Leon Higley. 2004. A new sampling protocol for the endangered American burying beetle, *Nicrophorus americanus* Olivier (Coleoptera: Silphidae). The Coleopterists Bulletin 58(1):57-70.

Creighton, Curtis, Mark Lomolino, and Gary Schnell. 1993. Survey methods for the American burying beetle (*Nicrophorus americanus*) in Oklahoma and Arkansas. Unpublished.

Creighton, Curtis, and Gary Schnell. 1998. Short-term movement patterns of the endangered American burying beetle *Nicrophorus americanus*. Biological Conservation 86:281-287.

Schnell, Gary, Ana Hiott. 1995. 1995 Annual report of trapping and relocation activities concerning the endangered American burying beetle (*Nicrophorus americanus*). Sam Noble Oklahoma Museum of Natural History, University of Oklahoma. Unpublished.

Schnell, Gary, Ana Hiott. 2003. 2003 Annual report of trapping and relocation activities concerning the endangered American burying beetle (*Nicrophorus americanus*). Sam Noble Oklahoma Museum of Natural History, University of Oklahoma. Unpublished.

U.S. Fish and Wildlife Service. 1991. American burying beetle (*Nicrophorus americanus*) recovery plan. Newton Corner, Massachusetts. 80 pp.

This guidance was developed from the above references, U.S. Fish and Wildlife Service's July 14, 2005, "ABB Survey Guidance" and U.S. Fish and Wildlife Service Working Group on May 6, 2004, and other meetings between Service personnel and permittees in March and April 2009. The Oklahoma Ecological Services Field Office, in coordination with other Field Offices, update this survey protocol as necessary due to new findings. This guidance strives to streamline and update American burying beetle survey recommendations among the Arkansas, Oklahoma, Kansas, Nebraska, South Dakota, and Arlington, Texas Field Offices. However, due to the current habitat, land-use, development, other environmental considerations, and etc. there is variation among the different states. However, each state protocol may be different in some manners due to the land use and actions that occur in the different states. Each state Service office should be contacted for their most current protocols.

Appendix 1. Carrion Types Tested and Found Effective at Attracting ABBs

Appendix 1. Carrion types used in this study and the number of American burying beetles (ABB) attracted.

Carrion type	Trap-nights	ABB	ABB per trap-night*	Recaptures	Total ABB trap-night†
Badger	7	4	0.571	0	0.571
Cat (domestic)	19	13	0.684	3	0.842
Coyote	7	0	0	0	0
Jackrabbit	36	18	0.500	6	0.667
Opossum	5	0	0	0	0
Pig (domestic)	9	2	0.222	0	0.222
Rat (white lab rat)	178	149	0.837	28	0.994
Squirrel (gray)	27	56	2.074	34	3.333
Badger & squirrel	6	2	0.333	1	0.500
Cat & rat	3	3	1.000	0	1.000
Total: Mammals	**297**	**247**	**0.832**	**72**	**1.074**
Snake (rattlesnake)	6	10	1.667	5	2.500
Snake (bull snake)	12	13	1.083	5	1.500
Toad (*Bufo* species)	13	16	1.231	1	1.308
Turtle (ornate box turtle)	25	33	1.320	12	1.800
Toad & snake	14	11	0.786	7	1.286
Total: Herptiles	**70**	**83**	**1.186**	**30**	**1.614**
Dove (mourning dove)	30	31	1.033	9	1.333
Turkey (giblets)	3	1	0.333	0	0.333
Total: Birds	**33**	**32**	**0.970**	**9**	**1.242**
Fish (scraps)	6	6	1.000	3	1.500
Cat & green racer	2	1	0.500	0	0.500
Rat & ornate box turtle	4	2	0.500	0	0.500
Rat & bull snake	47	36	0.766	6	0.894
Rat & rattlesnake	36	39	1.083	15	1.500
Squirrel & rattlesnake	4	9	2.250	2	2.750
Squirrel, snake, box turtle	2	3	1.500	0	1.500
Mixed carrion (other)	55	80	1.455	26	1.927
Total: mixed carrion	150	170	1.133	49	1.460
Total: all carrion types	**562**	**538**	**0.957**	**163**	**1.247**

* ABB per trap night includes only first captures.
† Total ABB per trap-night includes recaptures with first captures.

attractiveness, the overall capture rate for *N. americanus* using the lab rats was comparable to other types of carrion (Table 1).

Trap Effectiveness and Topography. Sampling from paired bucket traps on ridge-top and valley locations produced a total of 83 *N. americanus* over a six day sampling period. The captures include recaptures, and the mean totals for six days are shown in Figure 5. Thirty *N. americanus* were captured in the valley and 53 on the ridges. Analysis of variance over time using SAS showed no significant difference for the effect of time ($F_{1,5} = 1.76$, $P = 0.15$). The traps placed on the ridges attracted significantly more beetles than the traps placed in the valley ($F_{1,3} = 4.37$, $P = 0.0451$).

Greater trap captures on ridge tops may have resulted from increased movement of odors associated with bait decay than occurred in valleys, thus improving the possibility of detection by beetles. In addition, beetle activity could be favored by warmer temperature on the ridge tops. During one session of nocturnal trapping, several

Appendix 2. Description of Nicrophorus Species in Oklahoma

TABLE 1. Description of burying beetles found in eastern Oklahoma and western Arkansas.

Nicrophorus americanus: Four elytral spots. Orange-red pronotum and frons distingiush this species from all other North American burying beetles.

Nicrophorus orbicollis: Black pronotum with some texturing to it. Four orange spots on elytra (two/elytron) that do not extend to edges of elytra. Typically, it is the most common species in wooded habitats.

Nicrophorus marginatus: Similar to *N. orbicollis* except that each pair of elytral spots on is connected along lateral edge of elytron. Species found almost exclusively in grassland areas.

Nicrophorus sayi: Very similar to *N. orbicollis* except femur of each back leg is distinctly curved instead of straight. Also, proximal pair of elytral spots extend to lateral edge of the elytra. Active in early spring and quite rare after late June.

Nicrophorus tomentosus: Pronotum covered with fine, golden hairs. Easily distinguished from all other species by this characteristic. Found in variety of habitats.

Nicrophorus pustulatus: Relatively dark appearance with faint or absent elytral spots. Four small, orange spots may be visible at distal end of elytra (two spots/elytron).

Nicrophorus carolinus: Similar to *N. orbicollis* except that pronotum very smooth and domelike. Usually found near large rivers.

Appendix 3. Identification Key to Nicrophorus Species in Oklahoma

Table 2. Key to burying beetles of eastern Oklahoma and western Arkansas.

1A. Pronotum covered with fine, golden hairs..... *tomentosus*
1B. Pronotum not covered with hairs.....2

2A. Pronotum and frons red-orange..... *americanus*
2B. Pronotum and frons black.....3

3A. Elytral spots faint or absent..... *pustulatus*
3B. Elytral spots present.....4

4A. Pronotum round, smooth and domelike..... *carolinus*
4B. Pronotum not round, smooth or domelike..... 5

5A. Femur of back leg distinctly curved..... *sayi*
5B. Femur of back leg straight..... 6

6A. Spots on each elytron connected on lateral edge of elytron..... *marginatus*
6B. Elytral spots distinct..... *orbicollis*

AMERICAN BURYING BEETLE SURVEY DATA COLLECTION FORM

Project Name:_____Time[1]:_____ Date[1]:_____ Transect #:_____ Survey Night: 1 2 3 4 5 6
M/D/Y

Survey Company: _____ Surveyor:_____ Project Proponent:_____
(Spell out)

State:_____ County:_____ Legal Description[2]:_____ General Location:_____
(Sec Township Range) (nearest town, city, landmark)

Decimal Degrees[2]:_____/_____ Coordinate System[2]:__NAD83_

Vegetation Type:_____ Primary Soil Type:_____
(Prairie, woodland, forest, pasture) (Refer to County Soil Survey)

Temp[3]: Min_____ Max_____ °F Wind[4]:_____mph Cloud Cover[4]:_____%

Rain > 0.5 in.?[5] **yes** *or* **no** Additional survey night(s) required because of rain?[6] **yes** *or* **no**

Trap No.	*americanus*	*orbicollis*	*tomentosus*	*pustulatus*	*marginatus*	*carolinus*	*sayi*	*Other carrion beetles*
1. U D[7]								
2. U D								
3. U D								
4. U D								
5. U D								
6. U D								
7. U D								
8. U D								
Totals								

Number of disturbed traps and/or bait (D):_____

Additional survey night(s) required because of disturbance?[8] : **yes** *or* **no**

List each individual American burying beetle captured below and complete the appropriate columns.

ABB	Male	Female	Old[9]	New[9]	Age Unknown[9]	Recapture[10]	Newly Marked[11]	Tag #	Death	Pronotum Width
1										
2										
3										
4										
5										
6										
7										
8										
9										

Comments:_____

1. Date and time refer to when trap checked;
2. Check that legal description fits decimal degrees location. Lat/long MUST be in decimal degrees, NAD 83
3. Max/Min temp for previous 24-hour period prior to checking traps, must use data from www.mesonet.org
4. Wind and cloud cover data refer to current conditions.
5. Rain for previous 24 hour period starting at midnight of the night trapped, must use data from www.mesonet.org
6. Additional trapping required if > 0.5 in. of rainfall occurs between 7pm and 7 am on the night of survey, must use data from www.mesonet.org
7. U= trap undisturbed, bait present; D= trap disturbed AND/OR bait gone;
8. Determine total number of disturbed traps over all 3 survey nights. If between 4 and 8 traps are disturbed over the 3 survey nights, 1 additional night of surveys are required. If between 9 and 16 traps are disturbed, 2 additional nights required. If between 17 and 24 traps are disturbed, 3 additional nights required.
9. OLD=breeding adult; NEW=newly enclosed adult; UNK=age cannot be determined.
10. Recaptures refer to color and number of bee tag on beetles that have been previously marked.
11. Newly marked males and females refers to color, number of bee tag, and age of beetle (e.g. R54[old]).

American Burying Beetle Survey Summary Report (Electronic)

An electronic copy (in excel format, *NOT* PDF) of this is to be submitted to the Oklahoma Ecologica survey effort. In addition, a hard copy (previous worksheet) along with the corresponding ABB Sur Oklahoma Office within 30 days.

The data for each transect should be summarized and entered in the report below.

Project Information			Date			Location							
Transect	Proj_name	Proj_desc	month	day	year	county	state	T	R	S	lat (dec. degrees)	long (dec. degrees)	coordsyst (NAD 83)

* An ABB Trap and Relocate Reporting Form needs to be submitted to the Service, in addition to this data s

ıl Services Field Office within 30 days of each
vey Data Forms are to be submitted to the

	Involved Parties			Survey Information							
location	company	surveyor	proj_proponent	survey_method	survey_type	bait_type	area	Tabb	pos_neg	recap	male_total

ıheet.

ABB Capture Data											
male_young	male_adult	Munkage	female_total	female_young	female_adult	Funkage	unknsex	dead	Adult	YOY	unknage

Trap Effort					Habitat Data			Other Nicrophorus captured						
tot_trap_night	tot_bait_distub	TTN_tbd	abbptn	abbptn_tbd	soil	GenSoil	veg	orb	tom	pust	marg	caro	sayi	abb_released

Relocation Effort*								
gen_rel_site	rlsmonth	rlsday	rlsyear	abb_died	lat	long	coorsys	Notes

American Burying Beetle Survey Summary Report

A hardcopy of this is to be submitted to the Oklahoma Ecological Services Field Office withi
the electronic copy (next worksheet) along with the corresponding ABB Survey Data Forms a
within 30 days.

The data for each transect should be summarized and entered in the report below. In additio
totaled (where stated).

	Project Information		Date		
Transect	Proj_name	Proj_desc	month	day	year
1					
2					
3					

	Location					
Transect	county	state	T	R	S	lat (dec)
1						
2						
3						

	Involved Parties			Survey Information		
Transect	company	surveyor	proj_proponent	survey_mentod	survey_type	bait_type
1						
2						
3						

	ABB Capture Data					
Transect	Tabb	pos_neg	recap	male_total	male_young	male_adult
1						
2						
3						
TOTAL						
Transect	female_adult	Funkage	unknsex	dead	Adult	YOY
1						
2						
3						
TOTAL						

	Trap Effort					
Transect	tot_trap_night	tot_bait_disturb	TTN_tbd	abbptn	abbptn_tbd	soil
1						
2						
3						
TOTAL						

	Other Nicrophorus captured					
Transect	orb	tom	pust	marg	caro	sayi
1						
2						
3						
TOTAL						

	Relocation Effort*				
Transect	abb_released	gen_rel_site	rlsmonth	rlsday	rlsyear
1					
2					
3					

Transect	lat	long	coorsys	abb_died
1			NAD 83	
2			NAD 83	
3			NAD 83	

Transect	Notes
1	
2	
3	

* An ABB Trap and Relocate Reporting Form needs to be submitted to the Service, in addition to this

n 30 days of each survey effort. In addition, are to be submitted to the Oklahoma Office

on, the data of all the transects should be

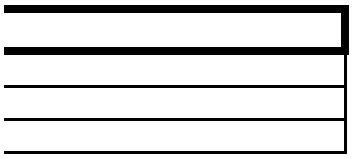
long (deg)	coordsyst	location
-	NAD 83	
-	NAD 83	
-	NAD 83	

area

Munkage	female_total	female_young

unknage

Habitat Data	
GenSoil	veg



s data sheet.

Title Descriptions

Code	Meaning	Definition
abb_died	# ABBs died during transport	The total number of translocated ABBs that died during transport to new release location.
abbptn	ABBs per Trap night	Total number of ABBs trapped divided by the total number of trap nights = ABBs per trap night
abbptn_tbd	ABBs per undisturbed trap night	Total number of ABBs trapped divided by the total number of undisturbed trap nights = ABBs per undisturbed trap night
abb_released	# ABBs Captured to Relocate	The total number of ABBs captured to be translocated offsite.
adult	Adults	Total # of ABBs that were born the previous year.
Area	Approximate Survey Area (Acres)	Total number of acres of project area and/or survey area. For surveys conducted specifically to determine the presence/absence of ABBs in an area where a project is proposed then provide the total acreage of the project size. If surveys are being conducted for monitoring or research purposes, provide the total area of your research or monitoring area.
bait_type	Bait Type	Type of bait used in traps during surveys.
caro	Nicrophorus carolinus	provides the total number of this species captured
company	Company	Company/Institution that conducted the survey
coordsyst	Coordinate System	Type of coordinate system your lat/long is provided in.
county	County	County(s) where survey was conducted
day	Day	The last day of the survey.
dead	Dead/Killed	Total number of dead or injured ABBs encountered during survey. This includes ABBs killed while in the trap or during handling.
female_adult	female adult	total number of adult females captured
female_total	female total	total number of females captured
female_young	female young	total number of young females captured
Funk age	female unknown age	total number of females of unknown age captured
GenSoil	general soil	
gen_rel_site	general relocation site	A reference point to locate the survey site.
lat	Decimal Degree Latitude	Decimal Degree Latitude for relocation sites

location	Location	A reference point.
long	Decimal Degree Longitude	Decimal Degree Longitude for relocation sites
male_adult	male adults	total number of adult males captured
male_total	male total	total number of males captured
male_young	male young	total number of young males captured
marg	Nicrophorus marginatus	provides the total number of this species captured
month	Month	Month survey started.
Munk age	male unknown age	total number of males of unknown age captured
notes	notes	this is a blank cell available for comments not appropriate for the provided columns
orb	Nicrophorus orbicollis	provides the total number of this species captured
pos_neg	positive or negative	Results of survey. If any ABBs were captured, write "positive". If no ABBs were captured, write, "negative."
Proj_desc	Project description	description of the type of project to be implemented
Proj_name	Project name	name of the project
proj_proponent	Project Proponent	Company that funded or contracted out survey.
pust	Nicrophorus pustulatus	provides the total number of this species captured
R	Range	Range of legal description.
recap	Recaptures	Number of ABBs that were recaptured during this survey effort. Recaptures may be from your marking efforts or from a prior marking effort by someone else. Choices: Not a recapture, a recapture with a tag, or a recapture with a clipped elytra. If the recapture has a tag, note the tag number here.
rlsday	release day	
rlsmonth	release month	
rlsyear	release year	
S	Section	Section of legal description.
sayi	Nicrophorus sayi	provides the total number of this species captured
soil	Soil	Soil type as defined by Soil Survey Book.
state	State	State where project was conducted.
surveyor	Surveyor/Researcher Name	Name of individual(s) that conducted the survey.

survey_method	Survey Method	Type of approved survey protocol used. The Service has used 3 approved ABB survey protocols. One is from the recovery plan and one is from Creighton et al. The Service has recently provided a April 2005 survey guidance that we recommend be used. However, if you are doing research on a different type of survey method, list that here.
survey_type	Survey Type	Type of results trying to achieve.
T	Township	Township of legal description.
Tabb	Total # ABBs	Total number of abbs captured during the survey effort.
tom	Nicrophorus tomentosus	provides the total number of this species captured
tot_bait_disturb	Trap or Bait Disturbance	Total number of trapnights that were disturbed or where bait was missing during entire trapping effort. Any traps with bait missing need to be included in this category. Plus any traps where the cover, bait cup or pitfall trap were disturbed need to be included in this category.
tot_trap_night	Total Trap nights	Total number traps x total number of nights surveyed=total trap nights
TTN-tbd	Trap or bait disturbance minus the total bait disturbed.	The accurate amount of trapnights is dependent on the bait being present in the trap the entire night. When bait is removed or disturbed this eliminates the effectiveness of the trap. Consequently, the capture rate of ABBs is less and this needs to be considered.
Transect	Transect Number	Number designated when there are multiple transects for one project
unkn age	Age unknown	Total number of ABBs from the survey effort where age could not be determined. Including recaptures.
unkn sex	Sex unknown	Total number of ABBs from the survey effort where sex could not be determined. Including recaptures.
veg	Vegetation	Type of vegetation present at site. The Habitat Inventory Protocol established by Creighton et al should be used to determine this, unless new research is being conducted. If you are not collecting habitat data then provide a general description of the vegetation at the survey site.
year	Year	Year survey started.
YOY	Young of year	# of ABBs that were born the current year.

Example

55/72=0.76

Should always be NAD 83

If the survey was conducted from August 9 to August 13, 2004, then 13 should be entered into this field.

(i.e. sandy loam, etc.)

(i.e. nearest city, mountain, state wildlife management area, state park, refuge, etc)

(i.e. nearest city, mountain, state wildlife management area, state park, refuge, etc)

i.e. New oil well

i.e. Martin oil well

i.e. Oklahoma Department of Transportation

ABBs can be marked with a bee tag or by making a small cut on one of their elytra.

i.e. hectorville complex, etc.

One of 4 choices is available. 1-Recovery Plan, 2-Creighton et al, 3-Service April 2005, or new research method.

i.e. presence/absence, density, abundance

55

One trapnight equals 1 open trap for night. So if 3 traps were disturbed for 3 nights, the total traps or baits disturbed equals 9 trapnights
24 traps (3 transects with 8 traps) x 3 nights = 72

48 trap nights - 12 traps disturbed = 36
i.e. Project name: Tahlequah pipeline, Transect: 4

5

3

General Description: Open oak-hickory woods with herbaceous understory; thick pine woods with shrubby understory; native prairie; non-native pasture; cropland; bare soil; Bermuda grass; mostly native grasses with scattered trees; or etc.

Figure 1. Diagram of survey transect.

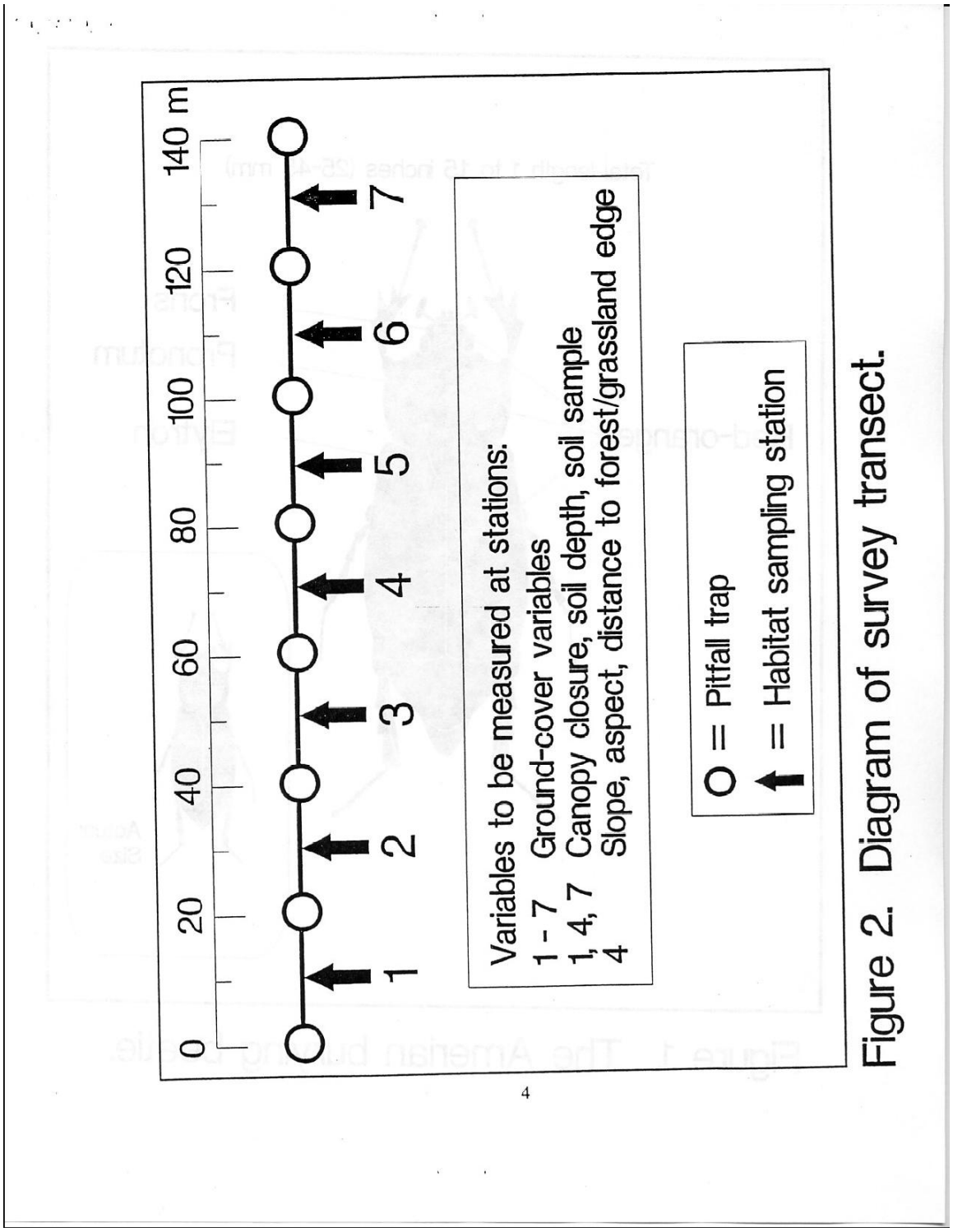


Figure 2. Diagram of survey transect.

Figure 2. Bucket Pitfall Trap with Wood Cover

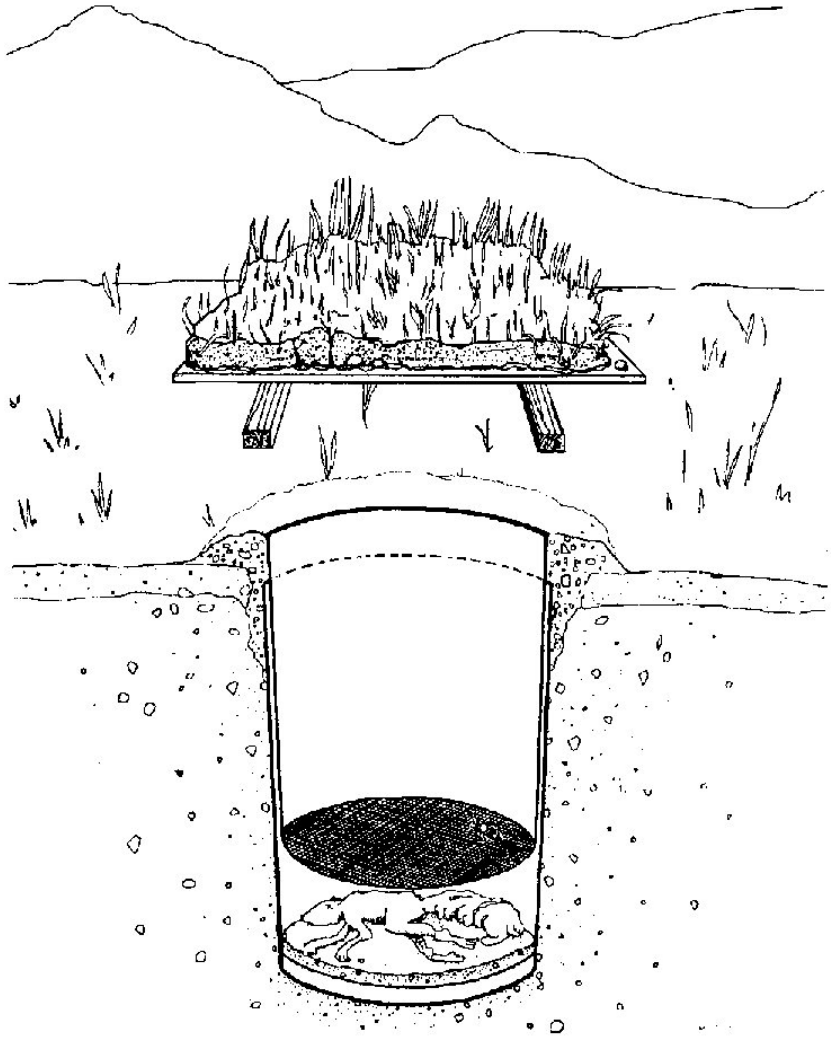


Fig. 2. Double bucket trap. The bottom of one bucket was removed and replaced by window screen; the screen bucket was placed within the second bucket containing whole carrion.

valley in Lincoln County) and along the ridge tops surrounding it. Eight pitfall buckets were used, and each pair was baited with the same carrion mixture. The pitfalls were paired: one trap in the valley and one trap on an adjoining ridge (Fig. 4). Four replicates were placed in a north-south direction. The pairs were alternated to the east side of the valley/west ridge and then the west side of the valley/east ridge. Each pair of traps was placed 200–400 m apart. Each set of traps was placed a minimum of 1 km apart. Trapping continued for six consecutive days (14–19 August 1996). The traps were checked each morning, and the beetles were quantified as previously described.

Figure 3. Diagram of pitfall trap.

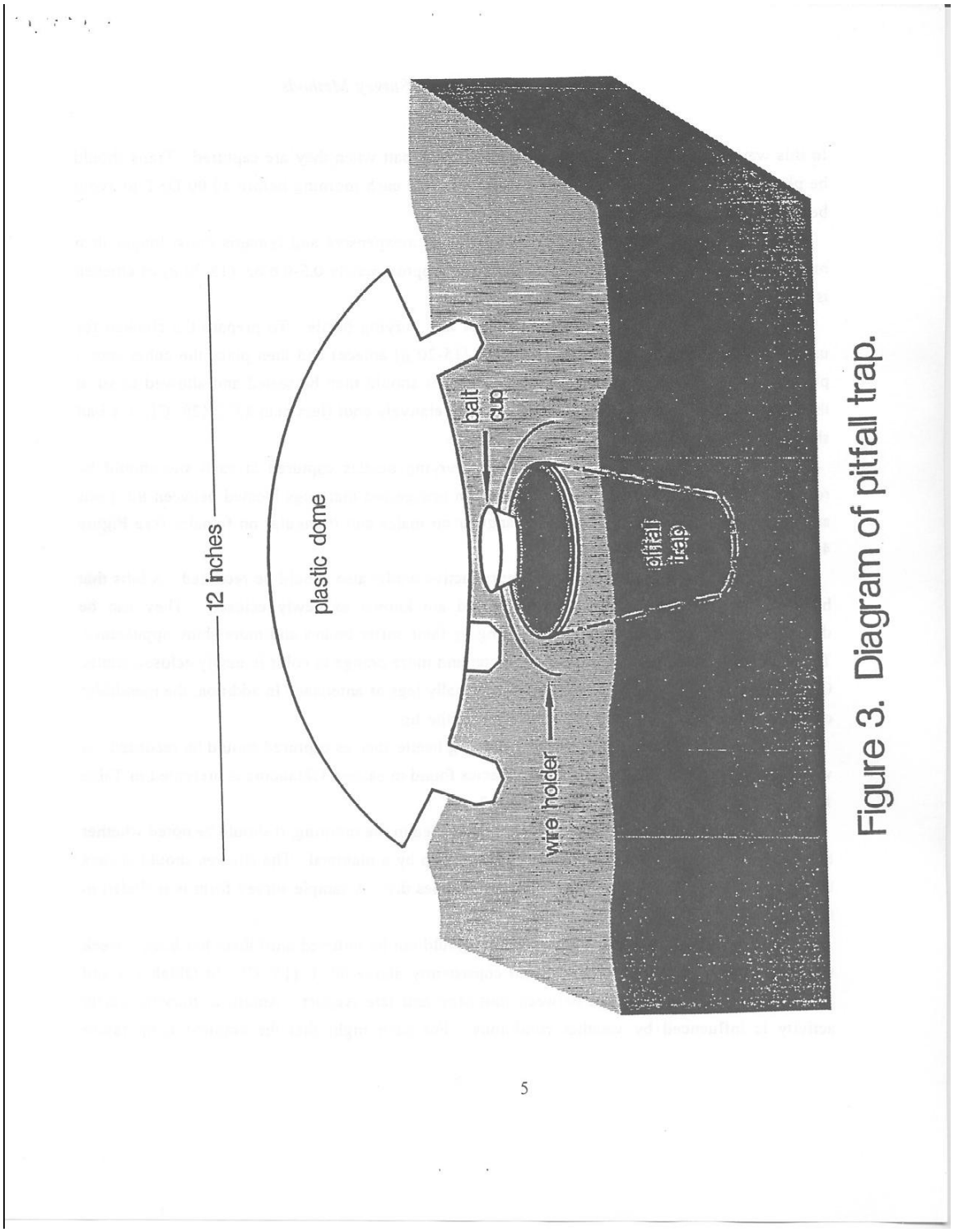


Figure 3. Diagram of pitfall trap.

Figure 4. Bucket Trap with Wire Mesh Vertebrate Exclusion Cover

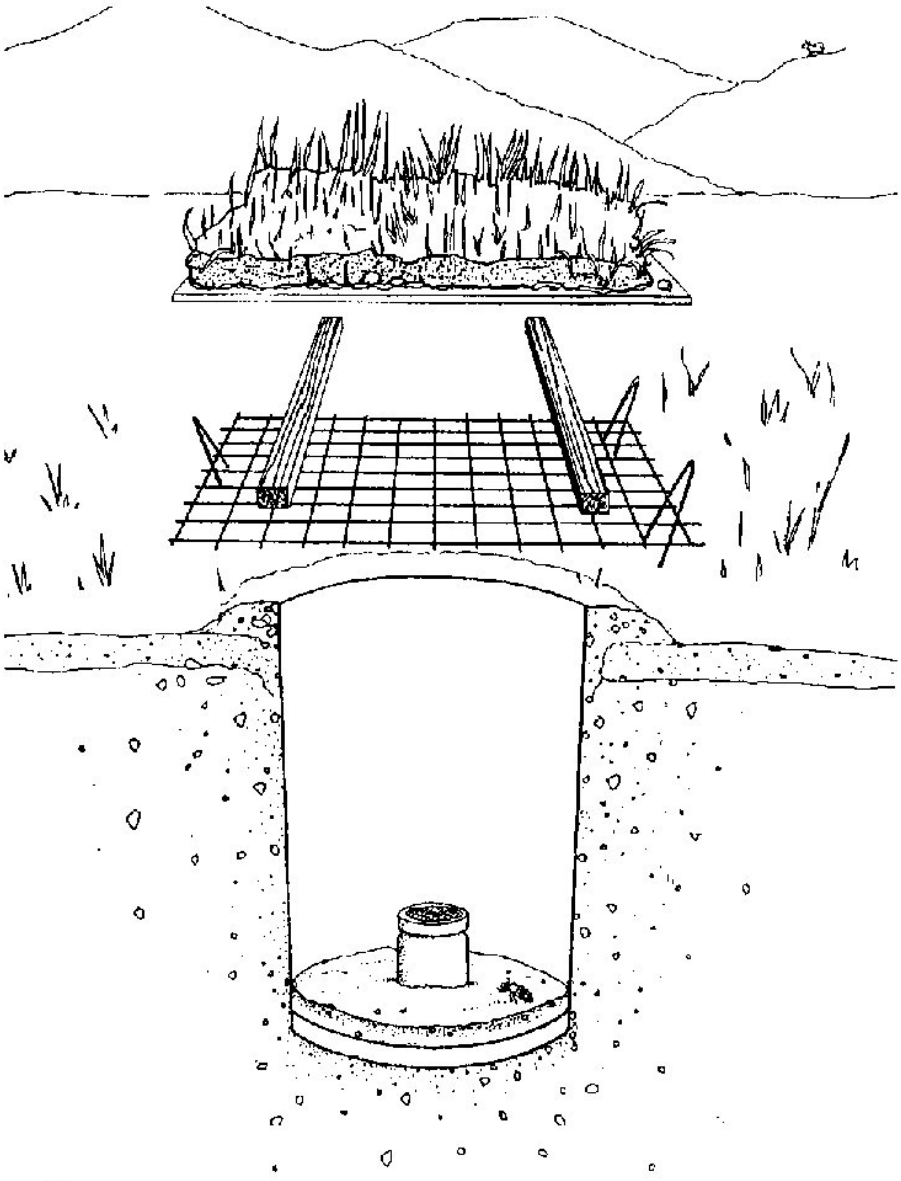


Fig. 4. The 18.9 liter bucket used for the majority of this study. The bucket was buried in the ground and a berm of soil (6–8 cm) was formed around the bucket lip. Bait is placed in the screen container. A plastic rain cover is placed over the bucket and supported by wood or stones. Wire screen is used over the bucket in areas with vertebrate scavenger activity.

Results and Discussion

Trapping Techniques. For most insect sampling, the key issue is sampling efficiency and numbers collected per unit of effort. However, in sampling an endangered species, minimizing mortality during sampling is a key requirement. In evaluating trapping methods for *N. americanus*, we needed to weigh both efficiency and survivorship with emphasis on survivorship.

With these requirements, trapping results indicated that a five-gallon bucket was the best, although perhaps not the most practical, pitfall trap. Small diameter cups and pipe

Figure 6. Characteristics distinguishing male from female American burying beetles.

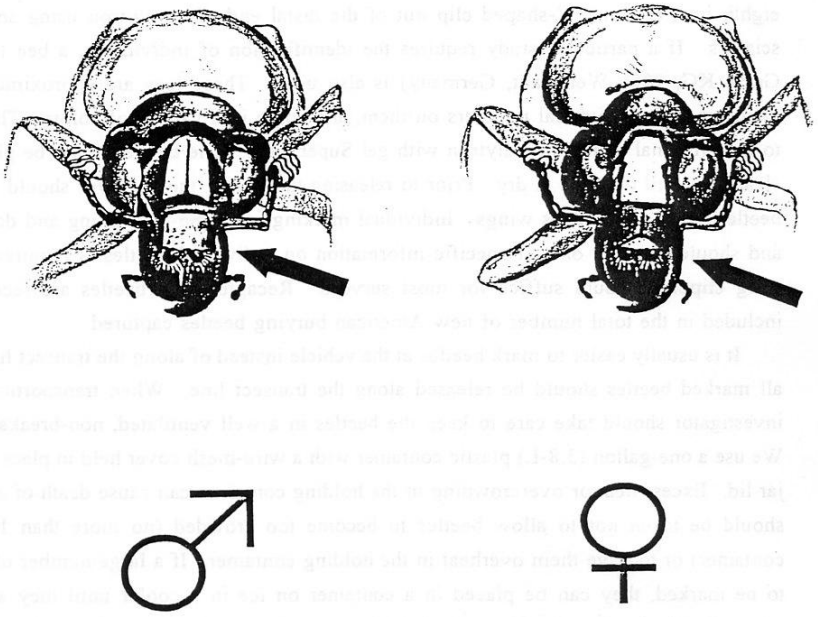


Figure 4. Characteristics distinguishing male from female American burying beetles.

Figure 5. Diagram of the American burying beetle.

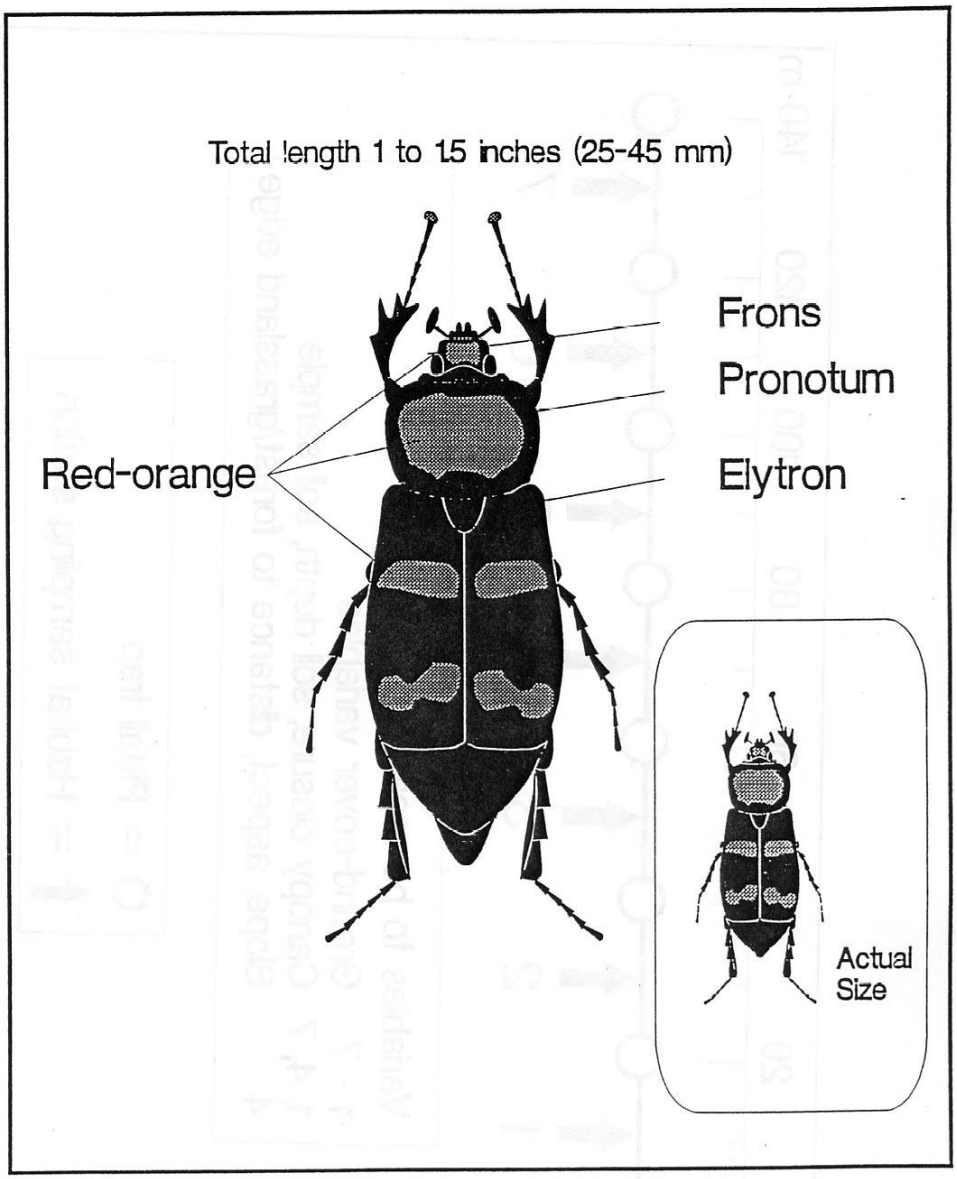


Figure 1. The Amerian burying beetle.

Attachment L-23

American Burying Beetle Baiting Away Guidance
May 20, 2009

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129-1428
918/581-7458 / (FAX) 918/581-7467

American Burying Beetle *Nicrophorus Americanus*
Baiting Away Guidance for Oklahoma
Updated May 20, 2009

Introduction
The goal of this document is to provide guidance in implement baiting away actions for the ABB as a means of complying with section 7 and 9 of the Endangered Species Act (ESA). Section 9 of the ESA prohibits all persons from the taking of federally listed species. Take includes harming, harassing, or killing. Section 7 of the ESA requires federal agencies to consult with the Service if a project they authorize, fund, or carry out may adversely affect a federally listed species. Baiting away is a technique to remove ABBs from a given area prior to soil disturbance without handling the ABB or physically relocating them to another area. Implementing other temporary relocation measures, not recommend by the Service, may not result in avoidance of impacts or take of the ABB.

Time
Bait away should be implemented during the ABB's prime active period in Oklahoma, May 20 to September 20. Refer to the Services "ABB Survey Guidance" for additional information.

Timing
Bait away should be implemented during the ABB's prime active period in Oklahoma, May 20 to September 20. Although the capture rates of ABBs are known to be higher during certain dates within their prime active period, the Service is not recommending restricting bait away implementation to specific dates during this prime active period. Refer to the Services "ABB Survey Guidance" for additional information.

Minimum Bait Away Effort
To have confidence in avoiding impacts to ABBs, a minimum of 3 consecutive days of baiting away must occur prior to soil disturbance. Additional baiting away may be necessary if soil disturbance does not commence or is not completed the day immediately following the conclusion of baiting away (day 4).

*Timeframe a Baiting Away Effort is Valid**
Bait Away Conducted for Projects Implemented During the **Active Period**:
The Service recommends bait away commence at least 3 days prior to the disturbance of soil. This bait away effort is only valid for the present. After the 3 days of baiting away, soil disturbance must commence on the 4th day. If soil disturbance is not concluded for the entire project area by day 4, then additional days of baiting away are needed until all the areas that are to be disturbed are removed of topsoil. The Service's definition of completed soil disturbance is when all the topsoil in the project area has been removed or all the vegetation has been removed leaving only soil. If project construction will occur in phases and therefore soil disturbance will occur in phases, then baiting away can also occur in phases. However, any newly disturbed areas will still need to be baited away 3 days prior to soil disturbance.

Bait Away Conducted for Projects Implemented During the **Inactive Period:**
During the ABB's inactive period, September 21 to May 19, ABBs bury in the soil to overwinter. Projects to be implemented during the ABBs inactive season should plan to address the ABB just prior to the onset of their inactive season since baiting away cannot be implemented at the time of the proposed project disturbance. The objective of implementing bait away just prior to the ABB's inactive period is to lure ABBs to a disturbance free area where they will then bury in the soil and overwinter safely. Luring ABBs to overwinter outside the project area allows the commencement of project construction during the inactive period. Baiting away must commence

on September 14 and continue for 6 days.

*Bait Away Effective Radius**
Bait away efforts are only valid for the specific project site where ABBs are being lured from. The effective radius of a bait away effort is dependent on the number of bait stations deployed. Specific spacing guidelines are explained below.

Minimum Project Size
Projects with a radius equal to or less than 0.5 mile from the center to any given point along the perimeter are suitable for baiting away to be implemented.

Projects with a radius greater than 0.5 mile from the center to any given point along the perimeter are not suitable for baiting away to be implemented. Project areas greater than 0.5 miles from the center to any point along the perimeter are too large to deploy bait stations outside the project boundary and be effective at luring ABBs. Trapping and relocating should be implemented. Please refer to the Service's May 20, 2009 "*ABB Trap and Relocation Guidance*".

The average nightly movements of ABBs are around 0.5 miles. So, to err on the side of the species a maximum project radius size of 0.5 miles is necessary to ensure ABBs are effectively removed from the proposed disturbance area.

Weather Requirements
An additional night of baiting away is required when the temperature falls below 60ºF between 7:00 PM and 7:00 AM or when rainfall greater than ½ inch occurs between 7:00 PM and 7:00 AM. If any additional nights of baiting away are required and conducted because of weather, this needs to be noted and explained in the "*ABB Bait Away Form*". Refer to the Services "ABB Survey Guidance" for additional information.

Weather data for all surveys should be collected using the Oklahoma Mesonet website, www.mesonet.org. Directions for using the Oklahoma Mesonet website are provided below.

Oklahoma Mesonet:

1. At www.mesonet.org, click on "Past Data and Files" under "Mesonet Data" (Left side of the screen)
2. Click on the Mesonet station closest to the survey site. Then under the "Station Monthly Summary" heading select the month and year of the survey. Then click "Get summary."

   Temperature:
   - In "summary report" of this Mesonet page, find the date of the survey. Daily Mesonet data is measured from midnight to midnight, so if traps are set on June 3rd, temperature data from both the 3rd and the 4th will be needed to address the entire trapping night, which is between 7:00 PM to 7:00 AM, and because the nightly low temperature most often occur past midnight.

   Rainfall:
   - In "summary report" of this Mesonet page, find the date of the survey. Once again, if the traps are set on June 3rd, Mesonet data from the both the 3rd and 4th need to be reviewed to address the entire trapping night, which is between 7:00 PM to 7:00 AM. Rainfall over ½ inches during a trap night requires further analysis and reporting. The time of the rainfall needs to be determined. This Mesonet page only reports the entire rainfall that occurred in a 24 hour period (midnight to midnight). To determine when during a 24 hour period rainfall events occurred and how much rain fell, proceed to the next paragraph for instructions to navigate through Mesonet to the proper page.

   - Click on "Past Data and Files". Then under the heading "Data Files" on the bottom right of screen click on "Mesonet MTS Files". Then click on the relevant date. Then select the Mesonet station nearest to the survey area. Rain totals are given in 5 minute increments on

this Mesonet page. Remember that daily Mesonet data is provided for a 24 hour period, beginning at 12:00 AM and ending at 12:00 AM. So the date the traps were set and the following date need to be reviewed to determine the rainfall for the entire trapnight.

Baiting Location
For nonlinear projects bait stations should be deployed at 1,000 foot intervals and 500 feet outside the project perimeter.

For linear projects with a width from 0.35 to 0.5 mile, bait stations should be deployed along both long sides of the project at 1,000 foot intervals and 500 feet outside the project perimeter. For projects with a smaller width, less than 0.35 mile, bait stations should be deployed alternately along both sides of the projects long boundaries at 1,000 foot intervals. (Meaning one bait station should be deployed on side A and then another bait station deployed 1,000 linear feet away on side B, and so on.)

Projects with a width greater than 0.5 mile or a diameter greater than 1 mile will need to implement trap and relocation.

Ants
Bait stations should not be placed within 23 feet (7 meters) of ant hills. If ants are discovered on bait it should be relocated at least 23 feet away. Ants can swarm and kill an ABB (Creighton *et al,*. 1993 and Bedick *et al,*. 2004).

Bait
Bait roughly the size of a whole chicken (3-5 pounds) needs to be used at each station. Bedick *et al*. (2004) found higher capture rates of ABBs when larger bait was utilized.

Bait Enclosure and Cover
Bait needs to be enclosed, secured to the ground, and covered. The enclosure and cover must allow ABBs access to bait, permit ABBs to easily exit, allow ABBs access to soil under bait, allow bait odor to escape, and protect ABBs from desiccation but prevent access by other non-target scavengers. Enclosures and covers need to be secured to the ground with rebar, stakes, or other such item to prevent removal by vertebrate scavengers. All materials used to enclose and cover bait, and to secure the enclosure and cover to the ground must be able to withstand weather conditions and vertebrate scavengers. Enclosures and covers must allow for visual inspection of the bait to determine replacement needs.

Some enclosure examples are: Havahart traps, wire mesh, expanded metal, and metal baskets. Enclosures must contain holes large enough to allow ABBs access to bait but prevent access by other non-target vertebrate scavengers. Typically ABBs fly to an area, land and then crawl to carrion. So, bait enclosures need to have holes at ground level to ensure ABBs will have access to the bait. ABBs have been reported to remain under the bait or in the soil under the bait throughout the daytime. Preliminary data suggest that *Nicrophorus* species could be adversely affected or killed via desiccation as a result of exposure to temperature extremes from remaining with the bait and not being able to bury in the soil (Hoback 2007, personal communication). Consequently, enclosure bottoms must permit ABBs access to the soil. The ABB is vulnerable to desiccation due to overexposure to heat and direct sun. Enclosed bait placed in a dense, forested habitat type where shade is provided the entire day will not require any additional protective covering for shade. However, enclosed bait that is not shaded by dense, forested vegetation will require additional covering for shade. The covers must not prevent ABBs from readily accessing the bait or exiting the enclosure, or prohibit the escape of bait odor.

Checking Bait Stations and Disturbed Bait
Each bait station must be daily. Any bait that no longer emits a pungent odor, has desiccated, has been scavenged or otherwise not effective needs to be replaced. When 20 percent or more of the bait stations are missing bait, an additional night of baiting away is needed prior to soil disturbance.

Reporting
The Service has prepared a standard "*Bait Away Reporting Form*" (Appendix A). Use of this form ensures that all of the needed data is recorded. This form must be completed and submitted to the Oklahoma Service Field

Office within 30 days of completion of each bait away effort.

This form is to be completed for each bait away effort for each night during the bait away effort. The "*Bait Away Reporting Form*" must be completed in Excel. This is to be submitted electronically in excel file format to ABBcontact@fws.gov. The Service will then review the form and provide a response, via electronic mail, regarding our acceptance or non-acceptance of the bait away effort as sufficient.

If bait away effort is conducted in compliance to the Endangered Species Act or the National Environmental Protection Act, project names and numbers need to correctly correspond. Each row in the spreadsheet should represent an individual bait station. All latitude and longitude data should be reported in decimal degrees and the coordinate system/projection should be in NAD 83. Only complete and accurate forms will be accepted. Incomplete and/or inaccurate forms will be returned and the bait away effort will be considered invalid until the forms are corrected and/or properly completed, and submitted. When sending corrected forms, indicate that it is a correction, what specifically has been corrected, and the project name.

Protocols and Forms

All protocols and forms can be downloaded from the Oklahoma Ecological Services Field Office's website http://www.fws.gov/southwest/es/oklahoma/beetle1.htm

Bait away radius and validity, and placement and spacing are more restrictive for "ABB Baiting Away Guidance" than the Service's "ABB Survey Guidance" because ABB surveys are only aimed at determining the presence or absence of ABBs. Baiting away is aimed at removing all ABBs from the project area.

Portions of this guidance were developed from the U.S. Fish and Wildlife Service's July 14, 2005, "ABB Survey Guidance" and a U.S. Fish and Wildlife Service Working Group on May 6, 2004, and other meetings between Service personnel and permittees in March and April 2009. The Oklahoma Ecological Services Field Office, in coordination with other Field Offices, update this protocol as necessary due to new findings. The purpose of this guidance is to streamline and update American burying beetle bait away recommendations among the Arkansas, Oklahoma, Kansas, and Arlington, Texas Field Offices. However, each state protocol may be different in some manners due to the land use and actions that occur in the different states. Each state Service office should be contacted for their most current protocols.

American Burying Beetle Bait Away Hardcopy Reporting Form

This form is to be submitted to the Oklahoma Ecological Services Field Office electronically within 30 days of each bait away effort.
The data for each bait station should be summarized and entered in the report below

Project Name	Project Description	Month	Day	Year	Nights Baited	Project Soil Disturbance Date	BA Company	BA Surveyor	Land owner	Project Proponent	County	General Location	State

Section	Township	Range	Lat	Long	Coord Sys	Bait Type	Bait Size (lbs)	Bait Spacing (ft)	Perimeter Distance (ft)	# Bait Station	Project Size	Bait Checked	Bait Replaced	ABBs Present
					NAD 83									

Other Nicrophorus Present

Attachment L-24

American Burying Beetle Trapping
And
Relocating Guidance May 20, 2009

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129-1428
918/581-7458 / (FAX) 918/581-7467

American Burying Beetle *Nicrophorus Americanus*
Trapping and Relocating Guidance In Oklahoma

Updated May 20, 2009

Introduction

The goal of this document is to provide guidance in designing and conducting trapping and relocation efforts for the ABB as a means of complying with section 7 and 9 of the Endangered Species Act (ESA). Section 9 of the ESA prohibits all persons from the taking of federally listed species. Take includes harming, harassing, or killing. Section 7 of the ESA requires federal agencies to consult with the Service if a project they authorize, fund, or carry out may adversely affect a federally listed species. Trapping and relocating is a technique to remove ABBs from a given area prior to soil disturbance. Implementing other relocation measures, not recommend by the Service, may not result in avoidance of impacts or take of the ABB. Trapping and relocating methods primarily follow the Service"s "ABB Survey Guidance", but any captured ABBs are relocated elsewhere. The "ABB Survey Guidance" is available at http://www.fws.gov/southwest/es/oklahoma/beetle1.htm The following "Trapping and Relocating Guidance" takes precedence over conflicting guidance in the "ABB Survey Guidance".

Time

Trapping and relocating should be implemented during the ABB"s prime active period in Oklahoma, May 20 to September 20. Refer to the Services "ABB Survey Guidance" for additional information.

Timing

Trapping and relocating should be implemented during the ABB"s prime active period in Oklahoma, May 20 to September 20. Although the capture rates of ABBs are known to be higher during certain dates within their prime active period, the Service is not recommending restricting bait away implementation to specific dates during this prime active period. Refer to the Services "ABB Survey Guidance" for additional information.

Minimum Trap and Relocate Effort

To have confidence in avoiding impacts to ABBs, a minimum of 3 consecutive nights of trapping where no ABBs are captured is needed. Trapping and relocation more than 4 nights may be required if ABBs continued to be captured. Once 3 consecutive night"s pass in which no ABBs are captured, the project/soil disturbance can commence. Once the area is disturbed (*i.e*., topsoil and vegetation cleared) it is assumed that the ABB would not be attracted to the disturbed area.

*Timeframe a Trap and Relocate Effort is Valid**

Trapping and Relocating Conducted for Projects Implemented During the **Active Period**:
Trapping and relocation efforts conducted during the ABBs active period are only valid for 5 days after the 3rd night of trapping in which no ABBs are captured. After 5 days have passed and the project soil disturbance has not commence additional trapping and relocation will be needed.

Trapping and Relocating Conducted for Projects Implemented During the **Inactive Period**:
As stated above, 3 consecutive trapping nights where no ABBs are captured is needed to avoid impacts to the ABB. The Service does not recommend conducting trap and relocation at the end of the ABBs active season as a means of removing ABBs from a project site so soil disturbance can commence during the ABBs inactive season. We do not recommend this because it is impossible to predict when or if 3 consecutive nights of trapping with no ABB captures will occur. It is possible that the ABBs inactive period will commence before 3 consecutive nights of no ABB captures is reached.

*Trap and Relocate Effective Radius**

The effective radius of a trap and relocate effort is dependent on the number of transects deployed. Each transect has an effective trapping radius of approximately 0.5 mile. Refer to the Services "ABB Survey Guidance" for additional

information.

*Transect Spacing and Placement **
Transects should be spaced 0.5 mile apart on all projects and about 500 feet outside the perimeter of the project for both linear and non-linear, irregardless of the project size. Transects should be placed in a configuration that best represents the different habitat types present in the survey area and on the highest spots in the survey area.

Nonlinear projects with a radius equal to or less than 0.5 mile from the center to any given point along the perimeter should deploy transects outside the project boundary so ABBs are not lured into the project site.

For linear projects with a width equal to or less than 0.5 mile, transects should be deployed alternately along both sides of the projects long boundaries at 0.5 mile intervals. (Meaning one transect should be deployed on side A and then another transect deployed 0.5 linear mile away on side B, and so on). For linear projects with a width between 0.5 and 1 mile, transects should be deployed length-wise along both long sides of the project at 0.5 mile intervals.

There are some projects where the rights-of-way or areas outside the project boundary are unavailable or too small for transect deployment. In these cases, transects can be deployed at 0.5 mile intervals inside the project boundary so the entire project area is within the effective trapping area of at least one transect. Transects must be deployed in areas where no soil disturbance will occur or where soil disturbance has already occurred and will not be disturbed again.

If none of the above can be applied, then additional coordination with the Service is recommended.

Transect
Same as the Service‟s "ABB Survey Guidance".

Traps
Same as the Service‟s "ABB Survey Guidance".

Bait
Same as the Service‟s "ABB Survey Guidance".

Setting and Checking Traps
Same as the Service‟s "ABB Survey Guidance".

Disturbed bait or traps
Same as the Service‟s "ABB Survey Guidance".

Processing ABBs
All ABBs captured and relocated must be marked with a numbered, colored bee tag. No other type of marking is allowed unless specifically authorized by the Service, this include clipping of the elytra. Bee tags should be attached to the elytra with superglue gel (not liquid, this is too runny). Tagged ABBs must be monitored until glue dries (about 5 minutes) to ensure wings are not glued together and they are able to fly.

Holding and Transporting ABBs
ABBs to be held for transport must be confined in a hard plastic container. The container must contain a damp paper towel, meal worms for food, and puncture holes for air. Containers must be placed in a cooler with sufficient coolant to keep the temperature at approximately 60 to 65 degrees Fahrenheit. Each ABB should have 6 square inches of surface area. Each ABB should be kept in an individual container. Keep coolers out of the sun while in the field and during transport. During transport the cooler should be in air-conditioned vehicle. ABBs can only be held in this manner for 3 hours.

ABB Release
All relocations of ABBs must be coordinated and approved by the Service prior to initiating any trap and relocation effort. Release locations must have documented current occurrences of ABBs. Prior written approval from the

landowner must be obtained before ABBs can be released. Release ABBs should be provisioned with carrion at the release site. If the release occurs May or June the a male and female ABB should be paired and placed on a 200 gram carcass. If the release occurs after June then each individual ABB should be provided a piece of carrion. The size of carrion can be as small as 5-7 oz during this time period.

Reporting
The Service has prepared a standard „*Trapping and Relocating Form'* (Appendix 1). Use of this form ensures that all of the needed data is recorded. This form must be completed and submitted to the Oklahoma Service Field Office within 30 days of completing the relocation effort.

This form is to be completed for each trap and relocation effort for each night during the trap and relocation effort. The "*Trapping and Relocating Form*" must be completed in Excel. This is to be submitted electronically in excel file format to ABBcontact@fws.gov. The Service will then review the form and provide a response, via electronic mail, regarding our acceptance or non-acceptance of the bait away effort as sufficient.

If trap and relocation effort is conducted in compliance to the Endangered Species Act or the National Environmental Protection Act, project names and numbers need to correctly correspond. Each row in the spreadsheet should represent an individual bait station. All latitude and longitude data should be reported in decimal degrees and the coordinate system/projection should be in NAD 83. Only complete and accurate forms will be accepted. Incomplete and/or inaccurate forms will be returned and the trap and relocation effort will be considered invalid until the forms are corrected and/or properly completed, and submitted. When sending corrected forms, indicate that it is a correction, what specifically has been corrected, and the project name.

Accidental Death
Same as the Service‟s "ABB Survey Guidance".

Protocols and Forms
All forms can be downloaded from the Oklahoma Ecological Services Field Office‟s website <http://www.fws.gov/southwest/es/oklahoma/beetle1.htm>.

*Trap and relocation radius and validity, and transect placement and spacing are more restrictive for "ABB Trapping and Relocating Guidance" than the Service‟s "ABB Survey Guidance" because ABB surveys are only aimed at determining the presence or absence of ABBs. Whereas, trapping and relocating is aimed at removing all ABBs from the project area.*Transects and trap design should follow the Services "ABB Survey Guidance" dated April 6, 2005.

This guidance was developed from the U.S. Fish and Wildlife Service‟s July 14, 2005, "ABB Survey Guidance" and a U.S. Fish and Wildlife Service Working Group on May 6, 2004, and other meetings between Service personnel and permittees in March and April 2009. The Oklahoma Ecological Services Field Office, in coordination with other Field Offices, update this protocol as necessary due to new findings. The purpose of this guidance is to streamline and update American burying beetle trap and relocate recommendations among the Arkansas, Oklahoma, Kansas, and Arlington, Texas Field Offices. However, each state protocol may be different in some manners due to the land use and actions that occur in the different states. Each state Service office should be contacted for their most current protocols.

AMERICAN BURYING BEETLE RELOCATION DATA REPORTING FORM (Electr

PERMITTE INFORMATION			PROJECT INFORMATION*:*		
Endangered Species Permit #	Permittee Company:	Permittee:	Project Company:	Project Name:	Fish & Wildlife Section 7 Consultation #:

*Weather data refers to current conditions.
Old=breeding adult, born the previous year; Young=newly eclosed adult; Unknown=age or sex cannot be determ
Tag# refer to color and number of bee tag.

Updated 5-20-09

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	SUMMARY INFORMATION				
Project Size:	Trap and Relocation Start Date:	Trap and Relocation End Date:	3 Days With No ABB Captures, Start Date:	3 Days With No ABB Captures, End Date:	Date: State: County: Landowner

ined.

CAPTURE DATA			CAPTURE
General Location:	Legal Description (township, range, section to quarter):	Lat-Decimal Degrees:	Long-Decimal Degrees:

DATA	CAPTURE DATA			
Projection:	Dominant Vegetative Species:	Primary Soil Type (Refer to County Soil Survey) :	Temp* (ºF):	Wind* (mph):
NAD83				

Cloud Cover* (%): Rain: yes or no	Date: State: County: Landowner: General Location:

RELEASE DATA	RELEASE DATA			RE
Legal Description (township, range, section to quarter):	Lat-Decimal Degrees:	Long-Decimal Degrees:	Projection: NAD83	Dominant Vegetative Species:

CLEASE DATA					LIST EACH ABB CA		
					Tag# *	Sex*	Age*
Primary Soil Type (Refer to County Soil Survey) :	Temp* (ºF):	Wind* (mph):	Cloud Cover* (%):	Rain: yes or no			

PTURED AND TRANSLOCATED		
Time Captured	Time Released	Death (Y/N)