The Banished Beetle Project

- **My goal is to involve citizen scientists in the pursuit of saving the endangered American burying beetle – I need your help!**
- In this packet you will find background information on the American burying beetle and classroom experiments.
- I introduce pitfall trapping for the amateur entomologist, as well as an advanced activity to trap burying beetles.
- I encourage your students to get outside, get their hands dirty and marvel at the many insects they will find.

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The American Burying Beetle (ABB)

The American burying beetle, Nicrophorus americanus, belongs to the order Coleoptera, and is in the family Silphidae, which groups together all the carrion and burying beetles. ABB are easy to recognize, as they are large, about 25-35 mm in length and have distinctive markings. They are shiny black with two orange-red spots on each elytron, a star shaped orange-red marking on the protonum, as well as an orange facial marking and orange-tipped clubbed antennae. Males and females can be told apart by the facial marking; males have a square and females have a triangle. Adults are fully nocturnal and are most active from May through September, and breed during June and July. They are habitat generalists and have a broad vegetational landscape tolerance and have been found in grasslands, scrublands and forest edges. They require an area with an abundance of bird and mammal carrion, and proper soil to bury the carrion.

They are unique among non-social insects because they display parental care. The male ABB will locate a carcass, and then attract a female with his pheromones. Together they will bury the carcass, clean it of its feathers or fur and excrete oral and anal secretions to delay decomposition. Along with all other beetles, burying beetles are holometabolous with a life cycle consisting of egg, larvae, pupae and adult. Eggs are laid in a tunnel near the carrion, and can range from 3 to 30. At least one adult, but usually both, will provide care for the young until at least the third instar. Even though the larvae have the ability to eat with chewing mouthparts just like the adults, the adults will feed them predigested carrion. They also provide care by protecting their young from predators. Larvae grow rapidly, and in about 10-14 days crawl off and pupate in the nearby soil and emerge as adults in 5-6 weeks.

The American burying beetle has been listed as endangered by the United States Fish and Wildlife Service since July 13, 1981. It is one of only about 30 insects protected under the Endangered Species Act of 1973. Formerly, ABB were found throughout temperate eastern North America, as well as Minnesota, South Dakota, Nebraska, Oklahoma and Texas. There has been a 90% decrease in their original range, and are currently present in Rhode Island, South Dakota, Kansas, Arkansas, Nebraska and eastern Oklahoma. There are many hypotheses for their decline including habitat alteration, competition with vertebrates, lack of appropriately sized carrion, use of pesticides, light pollution and more. The extinction of two appropriately sized carrion, the passenger pigeon and the greater prairie chicken, may also explain a decline in ABB populations. Under section 4 of the Endangered Species Act, it is required that the Fish and Wildlife Service develop recovery plans. The recovery plan for ABB was completed in 1991 and includes monitoring existing wild populations, maintaining captive populations, conducting surveys for additional populations and conducting additional reintroductions. Progress has been made through these efforts, and ABB have even been found in 13 counties of eastern Oklahoma.

This banished beetle plays a vital role in the environment as a recycler and undertaker. They significantly reduce fly populations, saving humans from the filth, diseases and agricultural dilemmas that flies cause. Research is also being done to investigate the oral and anal secretions the beetles produce as a possible antibiotic for humans. The first step to saving this species is knowledge, which is where you come in. Help

Insect Conservation

A look at the American Burying Beetle

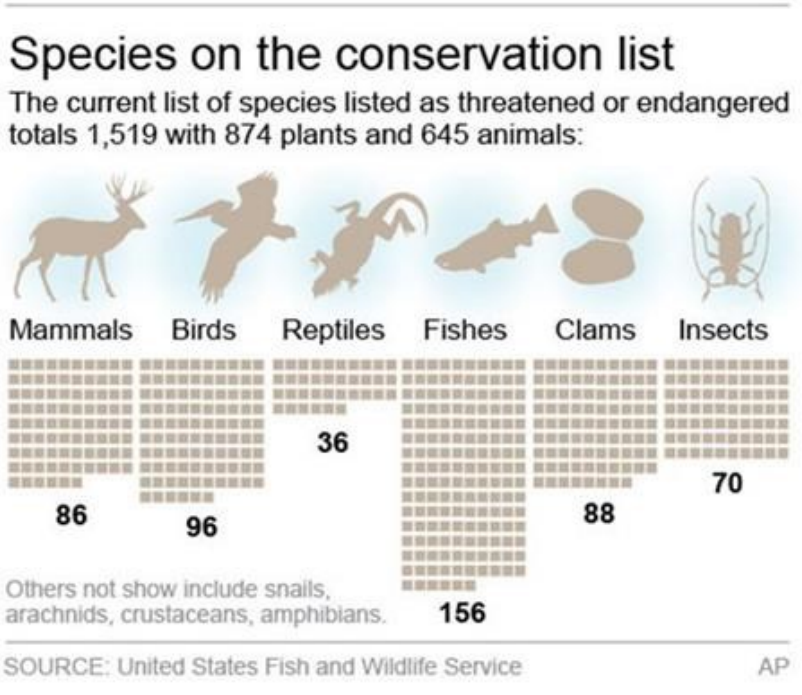
Introduction: Most people understand that wildlife conservation is important, that our own survival may depend on other species that we share the planet with. Some people are even fascinated with wildlife and don't want to see their favorite animals go extinct. But what about insects? Insects make up about four fifths of animal biodiversity of earth, and play a large part in enabling other types of wildlife to survive.

Objectives: Upon completion of this module you shall:

- Learn about the U.S. Fish & Wildlife Service's Endangered Species Act
- Be able to use a pitfall trap
- Be able to identify the American burying beetle

Endangered Species Act

The U.S. Fish and Wildlife Service created the Endangered Species Act after realizing that many native plants and animals are at risk of going extinct. The Endangered Species Acts serves to protect and recover imperiled species. When an organism is placed under ESA, it is defined as threatened or endangered. If it is threatened, that means it is likely to become endangered in the forseeable future. If it is endangered, it means the species is in danger of extinction throughout all or most of its range. There are currently 2,054 species listed under the Endangered Species Act. The ESA protects its listed species by prohibiting the "take" of these animals, deeming it unlawful to collect or harm one.



"The biodiversity crisis is undeniably an insect biodiversity crisis. Yet insect conservation remains the awkward "kid sister" to vertebrate conservation." (Dunn 2005)

DIY Pitfall Trap

What can you do to help conserve insect biodiversity?

- Observation is key
- Go in your backyard or playground and see what insects and arthropods you find!

What you need:

- Two solo cups or similar sized cups (yogurt cup, etc)
- A shovel
- Styrofoam plate
- Chopsticks

Activity TIME!!!!

Pick a spot outside to dig your pitfall trap, preferably away from a lot of activity. Choose an open pasture or a spot in a forest. Dig a hole in the ground with your shovel that's big enough to fit your solo cup (or your cup of choice). Once you have your hole, place both cups securely in the ground so that the top of the cups are flush with the ground. Fill your cup with about an inch of soapy water. Using your styrofoam plate and chopsticks (or similar materials), poke the chopsticks through the plate and secure the chopsticks into the ground so that the plate hovers above your trap. This will stop rain from flooding your trap.

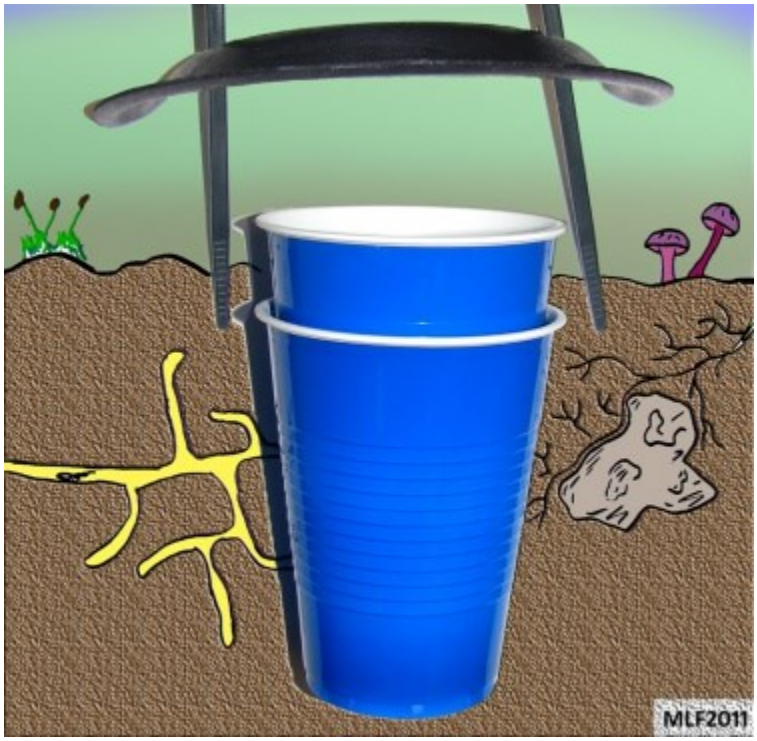
Step 1: Dig a hole

Step 2: Place cups in hole

Step 3: Place soapy water in cup

Step 4: Position rain shield

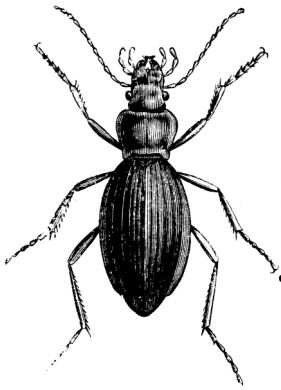
Step 5: Collect some insects!!!



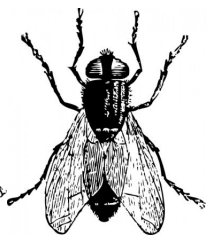
Time to Collect Data!

Now that you have your pitfall trap set up and ready to go, you can start observing what insects you catch in your trap and start collecting data. Check the trap every Monday, Wednesday and Friday for two weeks, fill out this data sheet and look at your results!

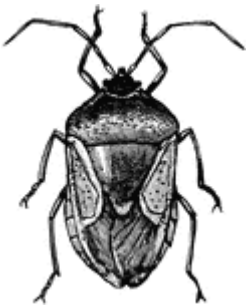
DATE:	Coleoptera (Beetles)	Diptera (Flies)	Hemiptera (True bugs)	Hymenoptera (Ants, bees, wasps)	Orthoptera (Grasshopers, katydids)	Others



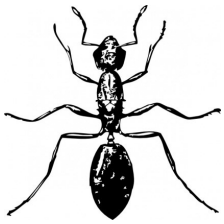
Coleoptera



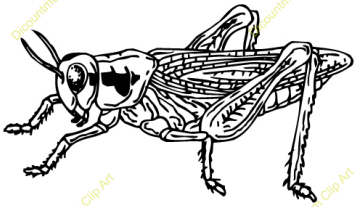
Diptera



Hemiptera



Hymenoptera



Orthoptera

Burying Beetle Baited Trap

Advanced Activity!!!

Use the same pitfall trap, but add a bait to trap for burying and carrion beetles.

- The American burying beetle, like all burying and carrion beetles, use dead animals for their reproduction and food source.
- Using a bait that imitates the smell of dead animal can attract them to your trap!
- Be sure to **NOT** add soapy water to your cups this time, in case of collecting American burying beetles (remember, they are protected under the Endangered Species Act!)

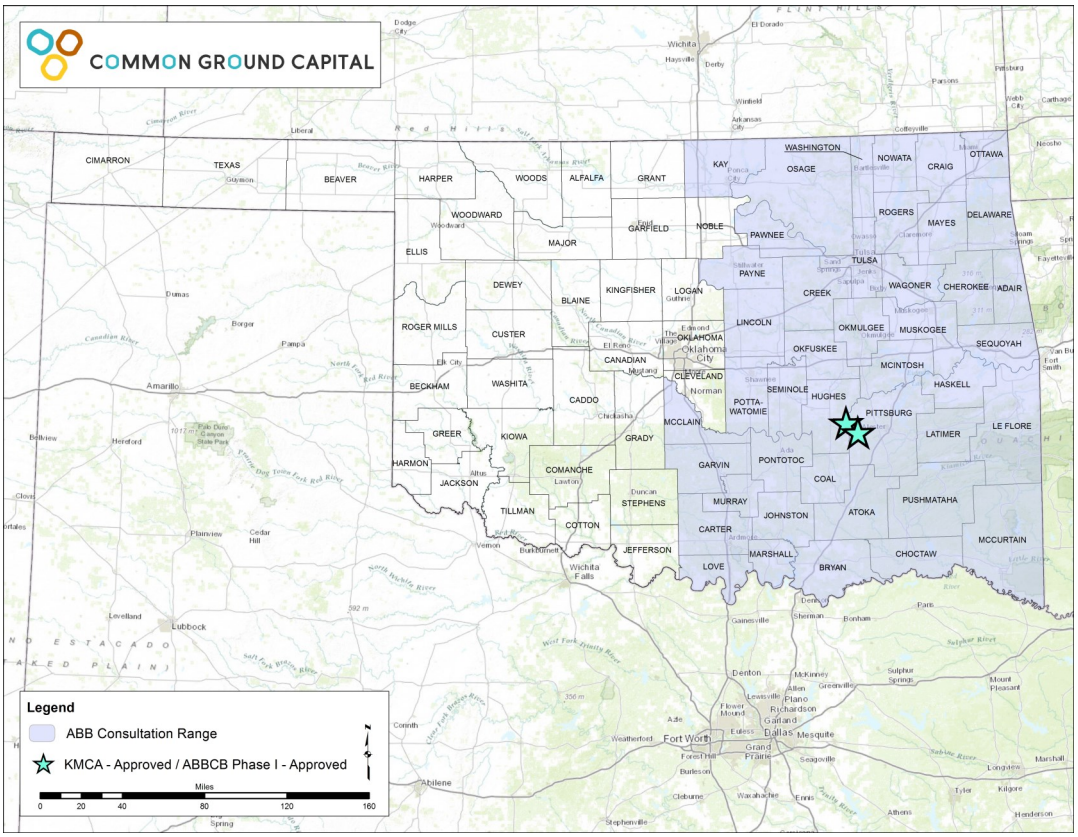
What you need:

- Two solo cups or similar sized cups (yogurt cup, etc)
- A shovel
- Styrofoam plate
- Chopsticks
- Danny King's Catfish Punch Bait (available at Walmart)

This can be added in a smaller cup or a baggie with holes in it, and placed inside your pitfall cups

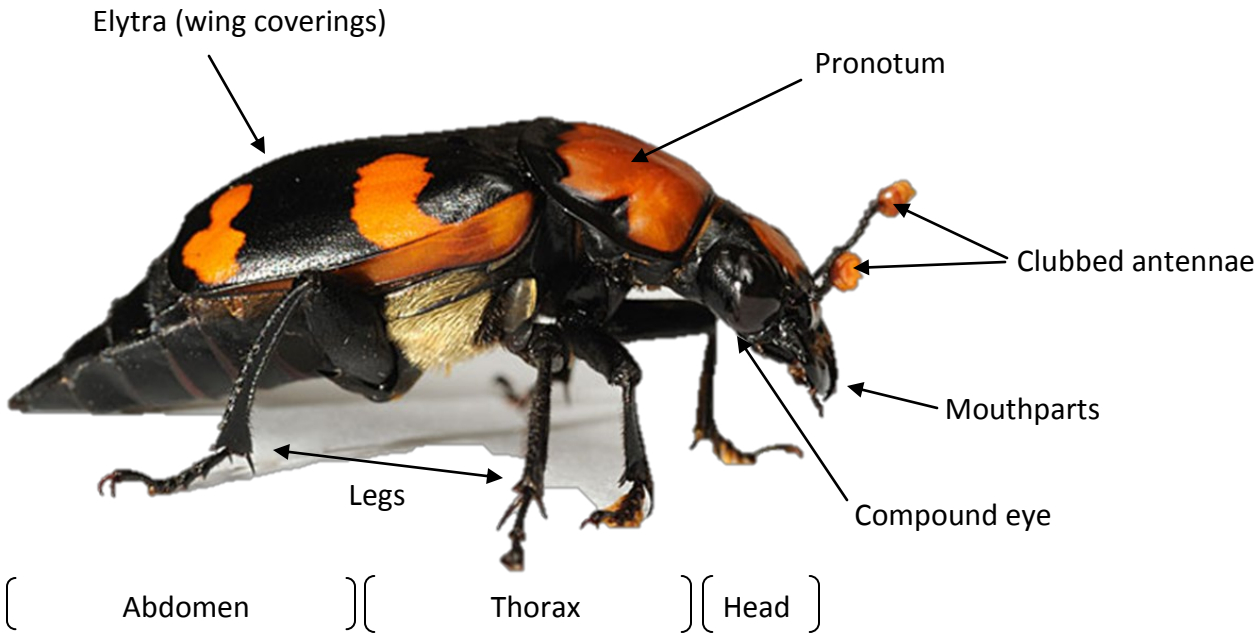
ABB are in OK!

Please be aware of your location and the possibly of catching American burying beetles. If you are in any of the eastern, blue counties of Oklahoma shown below, please use your pitfall trap with caution! Check them frequently, so as not to let the beetles trapped for too long.

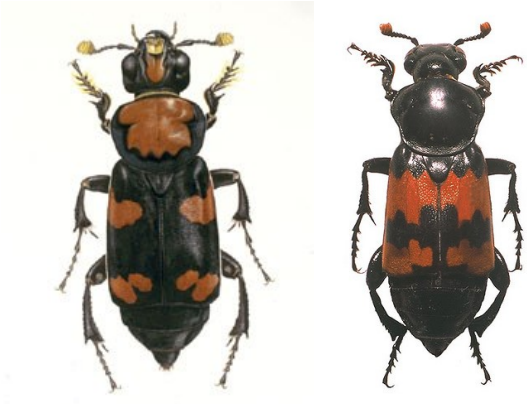


Oklahoma's Brightest Orange!

ABB Anatomy



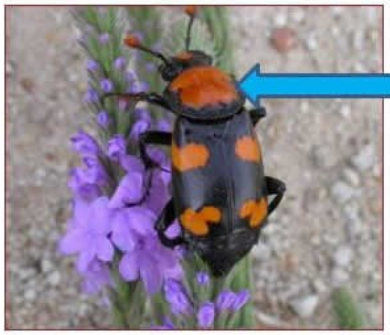
Look Closely!



The **American burying beetle** has distinctive orange markings on its head, pronotum and elytra. But, don't be fooled! Other species have similar markings.

- Can you tell the difference between these two?
- Which one is the American burying beetle?

What color is the pronotum?



American Burying Beetle
Nicrophorus americanus

Nicrophorus marginatus

Common Burying & Carrion Beetle Identification:

Nicrophorus marginatus

“Marg” have bright orange bands that connect on their sides.

Nicrophorus carolinus

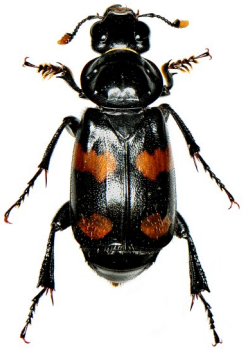
“Carols” have small orange markings, the bottom two in a “C” shape. There is no notch on the pronotum.

Nicrophorus tomentosus

“Toms” also have bright orange bands, but they do not connect. The prontum is yellow and fuzzy.

Necrodes surinemensis

They have a flatter, wider appearance, with tiny orange dots at the bottom of the elytra.



Nicrophorus orbicollis

“Orbies” have smaller orange markings that are more circular. The is a notich in the middle of the pronotum.

Necrophilia americana

They are flattened and round, no orange markings but they have a distinctly yellow pronotum.

Time to Collect Data!

Now, repeat the previous trapping exercise, this time adding stink bait. With your new knowledge on burying and carrion beetles, record what beetles you find. Please do not use water or any substance in the bottom of your traps, keep your beetles alive! Also, keep in mind that the American burying beetle is rare and won't always be found. Any information on burying beetles is a useful contribution to my research—thank you!

What to do if you catch an **American burying beetle**:

- Take a picture!
- **Carefully release the beetle back into the environment**
- Contact the U.S. Fish & Wildlife Service

  Anita Barstow, anita_barstow@fws.gov
- Contact me with pictures and any data

DATE:	*Nicrophorus americanus*	*Nicrophorus marginatus*	*Nicrophorus tomentosus*	*Necrodes surinemensis*	*Necrophila americana*	Other