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# BE A BUG DETECTIVE

### ACTIVITY BOOK

#### COLORING, PUZZLES, DOT-TO-DOT, AND MORE!

AGE

5-9

YEARS

# Whoa!!

Did you know that insects are older than DINOSAURS?!

The first group of insects emerged about 480 million years ago, but the insects we see today are very different from the ones back then. Insects develop through a process called **evolution**.

Evolution is how plants, animals, and other living things change over a very long time. These changes help living things survive and thrive in their **environment**, or the place they live.

We can identify insects by their **species**. A species is a group of living things that are the same in many ways. They can have babies that grow up to be like them.

Different insect species live in different parts of the world. Occasionally, though, an insect can make a home in a new place that is very far from where it used to live. When this happens, things get tricky!

In Kentucky, there are some insects that don't belong here and they cause problems. These are called **exotic** or **invasive** insects. They eat crops we grow for food or harm the trees in our forests.

This activity book will teach you all about invasive insects here in Kentucky. Some of them might even be in your own backyard! If you track them down, you'll help protect our crops and forests. You can make a difference!



# Fun facts about insects

#### • All insects have:

- 3 body parts: head, thorax, and abdomen
- 1 pair of antennae
- 6 legs
- The number of insect species worldwide is thought to be between 6 and 10 million.
- Insect poop is called frass. Eww!
- If a flea were a human, it could jump over a 480-foot-tall building.
- Some cicadas can make sounds at nearly 120 decibels. That's as loud as a nearby thunderclap!
- Insects do not breathe through their mouth or nose, but through special holes in their body called spiracles.
- Bees are found on every continent except Antarctica.
- Dragonflies are estimated to have been on earth for 300 million years.
- A bee's wings beat 190 times in a second. That's 11,400 times in a minute.
- Monarch butterflies are toxic to birds because, as caterpillars, they feed on milkweed plants.
- Male mosquitoes do not bite; so when you get a mosquito bite, it is from a female.
- Some aphids give birth to live young.
- It is estimated that for every human in the world, there are 1.4 million ants.
- Insect and human eyes see colors differently. For instance, an insect cannot see the color red.
- Flies have sticky pads on their feet that allow them to walk on walls and ceilings.

# Major invasive insects









### Asian longhorned beetle (ALB)

- Attacks hardwood trees such as maple and elm.
- Grows inside trees and feed on the living tissues that carry nutrients.
- ALB has not been found in KY

### Spongy moth

- Can defoliate 300 species of trees and shrubs.
- Currently established in 21 states, but hasn't made it to KY.

### Emerald ash borer (EAB)

- As of 2024, EAB has been found in 36 states and has killed millions of ash trees!
- It can be found in almost all of the 120 counties in KY.
- Known as a "jewel beetle" because of its shimmering colors.

### Spotted lanternfly (SLF)

- Not actually a "fly" flies only have two wings and SLF has four!
- Feeds on grapes, tree fruits, and hardwood trees.
- Populations have now spread to 17 states, recently including KY.

# Major invasive insects





### Hemlock woolly adelgid (HWA)

- A tiny soft-bodied insect that attacks hemlock trees.
- First detected in KY in 2006.
- The white "wool" on hemlock shoots is actually wax secreted by HWA for protection.

### Fruit flies

- Cause damage to many types of fruits and vegetables, especially citrus.
- Able to spread quickly in new habitats.



# larvae adult

### European grapevine moth

- Eats grape flowers, grapes, berries, and other berry-like fruits.
- Its native habitat is Italy, a country filled with large vineyards.
- So far, it has only been found in one US state: CA.

### Imported fire ant (IFA)

- IFAs are related to bees and wasps and can sting repeatedly, causing painful bumps on the skin.
- This pest is currently established in 18 US states.
- Established in southeastern KY in 2022.

# MOST BUGS ARE GOOD!







lady beetle

lady beetle larva

green lacewing larva

It's true, there are some insects that really "bug" us. These types of insects are called pests.

Pests cause problems for plants. They might eat the leaves, roots, or fruits, making it hard for plants to grow strong and healthy. Just like how we don't like bugs biting us, plants don't like insect pests munching on them!

BUT... not all insects are pests! In fact, only 1-3% of the over 1 million named insect species are considered pests. There are many insects actually help us defend against pests. We call these insects **beneficial**.

One well-known beneficial insect is the **lady beetle**, or **ladybug**. Although they may not look like it, these little beetles are fierce **predators**, meaning they're a bug that eats other bugs. Beneficial insects eat pests, and then pests don't eat plants! Just like how a superhero saves the day, insect predators help keep our plants safe and healthy.



assássin bug



parasitoid wasp



praying mantis

### Beneficial insects are our friends

Lady beetles are little garden helpers that eat pests and keep plants happy. Color in the picture below and make it as bright as a garden!





Although butterflies and moths look similar, they are different in many ways! One main difference is their **antennae**.

Butterflies have thin, skinny antennae that look like little clubs. These antennas help them smell things and keep their balance.

Moths have antennae that look like tiny combs or feathers. Like butterflies, they use their antennae to find their way around. Moths also use their antennae to smell food and find mates. Their sense of smell is very strong. Some male moths can smell a female moth from over six miles away!



Each part of a moth has a name! Although there are at least 160,000 different species of moths, they all share similar **anatomy**, or body parts. Using the diagram of the luna moth above, label the parts of the spongy moth below.







# Outdoor adventure: Local tree ID

Kentucky is home to over 300 native species of trees as well as around 145 invasive tree species. A tree species is considered **native** if it has always lived in a certain place. For example, trees that are native to Kentucky have always lived in Kentucky. On the other hand, **invasive** species were brought here from somewhere else.

Visit your backyard or other green spaces close to where you live. Choose a tree you like, find a leaf from that tree, and sketch it below. You'll use this to help identify your tree.





## Life cycle of the Asian longhorned beetle

The Asian longhorned beetle (ALB) completes its life cycle inside a tree!

ALB starts as a tiny **egg** on a tree trunk. Then, the egg hatches into a small white worm called a **larva**. The larva eats the wood of the tree creating a tunnel, then goes inside and grows bigger. Next, it changes into a **pupa** where it rests and develops. After some time, the pupa turns into an **adult** beetle. The adult beetle chews its way out of the tree and flies to new trees. The life cycle keeps going when the beetle lays new eggs.



ALBs feed on living tissues inside the tree, causing damage the tree cannot heal from. Eventually, the tree will die. This is bad! Trees are very important parts of nature, providing food and shelter to many living things. They also help keep our air clean.

We have to do everything we can to preserve our trees and forests!

Diagram: Michael Bohne, University of Vermont, Bugwood.org

# Maple Maze

Think about the life cycle of the Asian longhorned beetle. It's a lot like a maze! The ALB begins as an egg, hatches as a larva inside the maple tree, grows, and exits as an adult.



### Spotted lantern... fly?

The spotted lanternfly isn't actually a fly at all! Flies have two wings, but the spotted lanternfly has four wings. That's one reason why it's not a true fly!

Flies and spotted lanternflies also have different patterns on their wings and body. If you look very closely, you'll be able to see the differences!

Study the pictures on the next page. Using the key below, can you tell the difference between a spotted lanternfly and a true fly?



Spotted lanternfly

- Four wings
- Hops and glides more than flying long distances
- Has a long tube-like mouth resembling a tube or straw
- Feeds on plant sap, or the liquid inside plants
- Short, orange antennae that are often mistaken for eyes
- Small, compound eyes on the sides of its head



- Two wings
- Flies quickly and smoothly over long distances
- Has sponge-like mouthparts to absorb liquids, or sharp mouthparts for piercing
- Eats sugary liquids, fruits, or sometimes blood!
- Some have short, bristle-like antennae while others are long and segmented
- Large, compound eyes that provide a wide field of vision

### True fly or lanternfly?





Pest and Diseases Image Library , Bugwood.org



Paul Langlois, USDA APHIS PPQ, Bugwood.org





ebekah D. Wallace, University of Georgia, Bugwood.org



#### Insect Word Search Words may be diagonal, horizontal or vertical



ANT APHID BEETLE BUTTERFLY CATERPILLAR CECROPIA MOTH CICADA COCKROACH CRANE FLY CRICKET DRAGONFLY FIREFLY FLEA GRASSHOPPER HONEY BEE HORNET

HORSE FLY LACEWING LADYBUG MOSQUITO PRAYING MANTIS STINK BUG TERMITE WEEVIL





#### I SPY INSECTS Count the number of each type of creature and write it below!







© Christine Elder. All drawings created by observing live specimens from local creeks

**Streams are ecosystems!** These natural areas are important habitats for insects and other wildlife. They're also beautiful! Color this picture and watch it come to life.













#### ANSWER KEY



#### pg. 10 - Insect scouting: How many?



#### pg. 11 - Insect scouting: How many?



#### pg. 15 - Maple Maze



#### pg. 17 - True fly or lanternfly?

lanternfly
fly
fly
lanternfly
lanternfly
fly

#### pg. 18 - Insect word search

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#### pg. 20 - Which two dragonflies are exactly alike?



#### ANSWERS AND DESCRIPTIONS FOR ACTIVITY ON BACK COVER

**SPOTTED LANTERNFLIES** are a new invasive insect in America and have a long, straw-like mouthpart that they use to suck juice out of trees, plants, and fruits. They are closely related to aphids. Unfortunately, SLF is now spreading throughout Kentucky. Help us monitor their spread by taking a picture, collecting them, or contacting your local county extension office!

**DRAGONFLIES** are an important predator in the ecosystem and one of the oldest insects for which we have records. Some fossils of dragonflies have wingspans of over 2 feet!

**SPONGY MOTHS** were brought to this country in the 1800's by a man who thought he would make silk out of their cocoons. That plan did not work, and now they are an invasive pest of oak trees. The caterpillars gather together and eat oak leaves, making the tree weak over time.

**JAPANESE BEETLES** came to America around 1916, and have been destroying rose gardens ever since. There are people that inspect planes leaving the east coast to make sure this invasive insect does not hitchhike to the west coast and eat all of the grapes!

The **VICEROY** butterfly is nearly identical to the Monarch butterfly. A black line across the hind wing distinguishes it from a Monarch butterfly. Did you know that the Viceroy is Kentucky's state butterfly? It is also the butterfly pictured on the Kentucky Nature's Finest specialty license plate.

**MAYFLIES** are aquatic insects. Adults emerge in masses, only live for about a day, and do not eat a thing!

The **TWICE-STABBED LADYBEETLE** is an excellent hunter, eating aphids and other pests we do not want in the garden. It is a beneficial insect.

**ASIAN LONGHORNED BEETLE** is an invasive beetle from Asia. This insect eats the wood of maple trees, destroying the tree's ability to take up water and nutrients. If found, please collect the insect, or take a picture, and contact your local county extension office!

The **HONEY BEE** is thought by many to be a native insect, but it is actually from Europe. European colonists brought hives with them in the 1600's. It took about 200 years for honey bees to reach the west coast. They are now an important pollinator of many crops, and are farmed much like cattle in some areas. Kentucky has many other native pollinating bees as well.

The **BROWN MARMORATED STINK BUG** is the one you might find crawling on your ceiling! This insect was accidentally introduced from Asia, and quickly became invasive in some parts of North America. It is simply a nuisance in the home, but can damage many crops.

**PRAYING MANTIDS** are fun to find! They are a predator, and eat many different insects that are pests in the garden. If you see one, consider yourself lucky, and leave it be!

