WE NEED YOUR HELP!

We are glad to provide these materials for free. In order for us to continue receiving funding for new materials, we need to collect information on how they are used.
Thank you for taking the time to answer the following one-minute survey.

There are three ways to complete the survey:

1 Scan this code with your smartphone camera

2 Type the following link into your web browser:
https://plantheroes.org/educator-survey

3 Email your answers to:
plantheroes@publicgardens.org

1) Job title
2) Name of organization you belong to
3) What kind of educator are you?
   - Teacher
   - Summer camp counselor
   - Home schooler
   - Public garden educator
   - Informal educator
   - Other (please describe)
4) What grade level do you teach?
   - Elementary (K–5)
   - Middle School (6–8)
   - High School (9–12)
   - Other (please describe)
5) Specify what subject area you teach:
   - Science
   - Math
   - Language Arts
   - Social Studies
   - Other (please describe)
6) How many students do you teach in a school year?

PLANT HEROES

Field Guide:

Southern Pine Beetle

The southern pine beetle is about the size of a grain of rice, but with the help of its friends, it can greatly damage healthy pine forests.

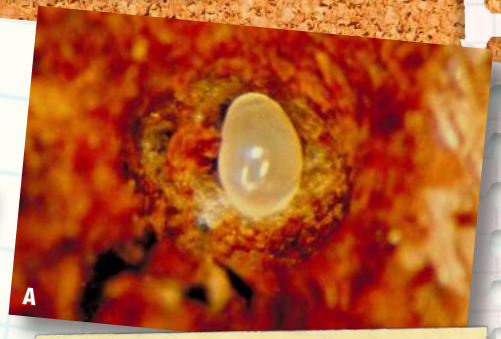
Plant Protection Program

AMERICAN PUBLIC GARDENS ASSOCIATION

Photo: Erich G. Vallery, USDA Forest Service, Bugwood.org

SOUTHERN PINE BEETLE

Identification



Eggs look like small white ovals.

Pupae are translucent white.

Beetle larvae look like little pale yellow grubs. When they are mature, they can be twice as large as an adult beetle. They are still extremely small–only about the size of a pea!

The adult beetle is very small–about the size of a grain of rice! It is black or brown with short legs and a rounded abdomen. >>

PHOTO CREDITS: A: USDA Forest Service, Bugwood.org; B: Erich G. Vallery, Bugwood.org; C: North Carolina Forest Service, Bugwood.org; D: Erich G. Vallery, Bugwood.org

PLANT HEROES

SOUTHERN PINE BEETLE

Life Cycle

Egg

The adult beetle chews its way into a pine tree to mate and then lays its eggs in a tunnel (or "gallery") it digs inside the tree.

Adult

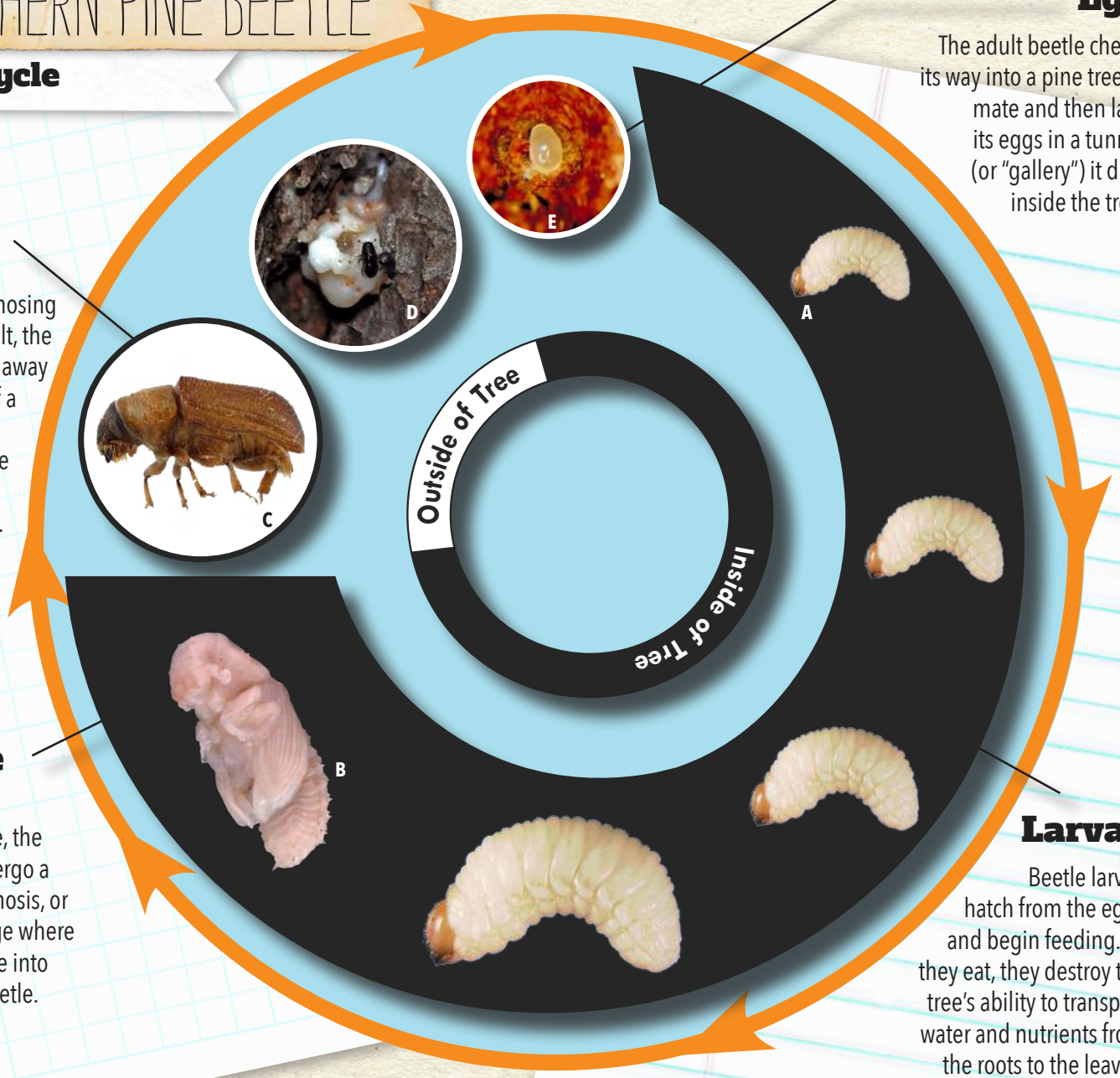
After metamorphosing into an adult, the beetle flies away in search of a mate and another tree in which to lay its eggs.

Pupae

During the pupal stage, the larvae undergo a metamorphosis, or resting stage where they change into an adult beetle.

Larvae

Beetle larvae hatch from the eggs and begin feeding. As they eat, they destroy the tree's ability to transport water and nutrients from the roots to the leaves.



Scan this code with your phone to see a video of the SPB "in action" or visit https://plantheroes.org/bugs/southern-pine-beetle

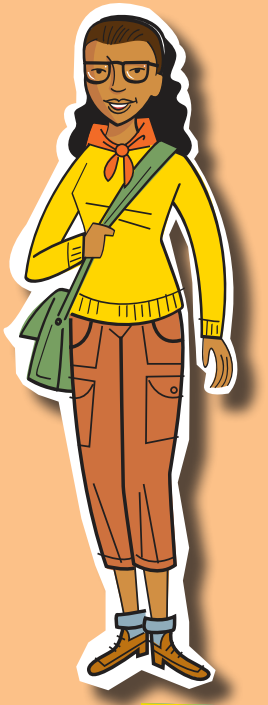


PHOTO CREDITS: A: Erich G. Vallery SRS-4552, Bugwood.org; B: Gerald J. Lenhard, LSU, Bugwood.org; C: Lindsey Seastone, USDA Forest Service, Bugwood.org; D: Erich G. Vallery SRS-4552, Bugwood.org; E: USDA Forest Service, Bugwood.org.

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SOUTHERN PINE BEETLE

Symptoms are visual clues that a tree is suffering from a pest or disease.

Symptoms

^^ Beetles chew through the bark of the tree creating tunnels, or "galleries", in which to mate and lay their eggs.

<< Trees that are attacked will produce pitch (a sticky fluid from inside the tree). The beetles must remove this pitch from their galleries if they are to survive. By moving the pitch to the outside of the tree, the beetles create popcorn-like pitch tubes all over the bark.

<< These weird, dark stripes are caused by one of the types of fungus that is carried by the southern pine beetle (or by tiny mites that hitchhike on them!). The fungus infects the tree and blocks the xylem (water transport cells) of the tree, causing the tree to die from lack of water.

The first beetles find a new tree to call home and then release a pheromone (a chemical scent) to call other beetles to the tree. When there are too many beetles living inside one tree, they spread outward to other nearby pine trees.

^^ If a beetle attack is successful, the beetles will kill the tree. Trees that die from a southern pine beetle attack have loose bark that peels off easily.

PHOTO CREDITS: A: USDA Forest Service, Bugwood.org; B: Tim Tigner, Bugwood.org; C: Matt Bertone, Flickr.com; D: USDA Forest Service, Bugwood.org; E: USDA Forest Service, Bugwood.org; F: USDA, Flickr.com

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SOUTHERN PINE BEETLE

Host Trees

Host trees are trees that the southern pine beetle lives in and feeds on.

^^ Virginia Pine
(Pinus virginiana)

- Short needles (1–3" long)
- The oval-shaped cones have some razor-sharp spines!
- This tree has a scraggly appearance

Loblolly Pine >>
(Pinus taeda)

- Very tall–usually 50 feet or taller!
- Straight trunk with only a few lower branches
- Needles are very long (6–10") and are stiff with little serrations
- Pine cones have some very sharp spines!

<< Pitch Pine
(Pinus rigida)

- Bark is divided into large plates
- Cones are light brown and come in pairs of 3–5
- Do the edges of the needles feel sharp to the touch? The needles of this tree have little teeth, and are 3–5" long.

PHOTO CREDITS: A: David Stephens, Bugwood.org; B: Vern Wilkins, Bugwood.org; C: Alicia Pimenta for Chesapeake Bay Program, Flickr.com; D: Chris M. Morris, Flickr.com; E: Lal Beral, Flickr.com; F: Steven Isaacson, Flickr.com

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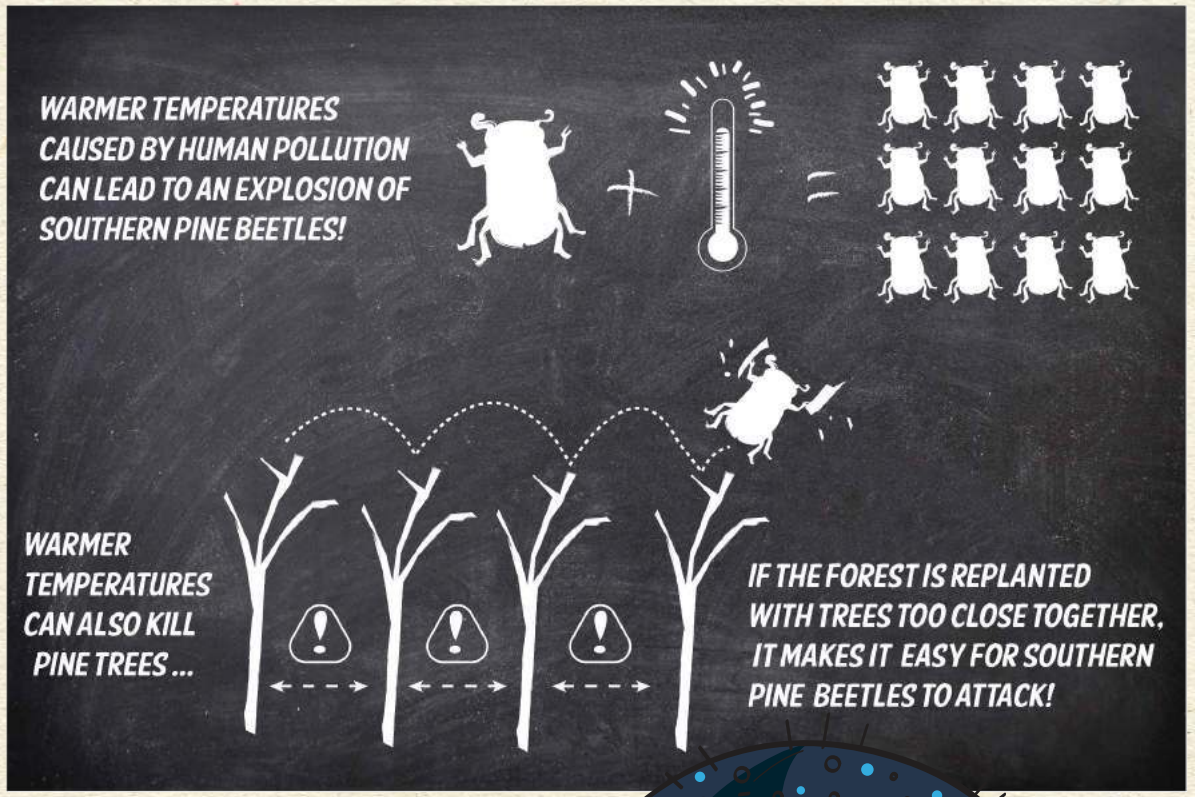
SOUTHERN PINE BEETLE

Ecosystem Balance

An ecosystem is a collection of living organisms (plants, animals, fungi) and the environment they live in.



The southern pine beetle is a native insect that is good for forests when everything is in balance. Beetles usually only attack weakened trees. Unfortunately, because of the ways humans have changed the earth, the number of southern pine beetles is too high, and they are killing even healthy pine trees.

Climate Change

A

Pollution from humans is causing the climate to warm, and in some areas of the world, more severe droughts are occurring. The southern pine beetle loves warmer temperatures and drought-stressed trees!

Logging

B

Most of the land in the United States has been cleared for agriculture and later replanted by humans. When people replant forests, they often plant the same few types of trees too close together. This forest that is completely made up of pine trees of a similar age is at risk of a southern pine beetle attack!

Forest Fires

C

Forest fires aren't always bad! Regular fires actually help a forest resist southern pine beetles by creating space for new, healthy plants. Humans stop forest fires, so beetle numbers are rising.

PHOTO CREDITS: A: Miroslav Petrasko, Flickr.com; B: Matt Bertone, Flickr.com; C: J. Erwert for USDA, Flickr.com

PLANT HEROES

SOUTHERN PINE BEETLE

Control

<< Tree Planting
After a forest has been attacked, foresters replant it with trees that the southern pine beetle doesn't like to eat like longleaf, slash, or eastern white pine.

^^ Forest Thinning
When trees have enough room to grow and don't have to compete with other plants for water and nutrients, they can defend themselves against southern pine beetle attacks. The space between the trees also helps disperse the pheromone plume making it harder for the beetles to call in reinforcements.

Removal ^^
If beetles are found, all the infected trees must be removed immediately.

PHOTO CREDITS: A: Dave Powell, Bugwood.org; B: Will Parson for Chesapeake Bay Program, Flickr.com; C: mksfca, Flickr.com

PLANT HEROES

PLANT HEROES

Join our team of Plant Heroes and learn about trees, forests, and the natural world around you!

PLANTHEROES.ORG

You can be a Plant Hero!
Are you curious about plants and animals? Do you like asking questions about nature? Do you enjoy being outdoors and having fun, climbing trees, balancing on logs, or finding a new butterfly or beetle? If so, you are already on your way to becoming a Plant Hero! We invite you to join forces with Nate, Laura, Aponi, and Frankie to protect the plants and ecosystems we all love.

How can you become a Plant Hero?
Join our team and go on a journey with Nate, Aponi, Laura, and Frankie. As a Plant Hero, you will learn to notice when plants are in trouble. You will also find out ways you can act quickly to help find solutions in your own neighborhood. Follow their adventures and learn how they help plants and ecosystems stay healthy.

On the Plant Heroes website, you will find materials to help you learn about plants, forest health, and ecosystem balance. The more you know, the more you can help protect plants and ecosystems in your own yard, neighborhood, and community!

Plant Heroes strives to spark curiosity about nature and science in all children.
Our program provides hands-on, nature-based learning materials for educators to engage children in topics of plant health, ecosystem balance, and forest health. We also spotlight the amazing work our public gardens do in protecting the plants and ecosystems we all depend on through our website and printed materials. Visit **plantheroes.org** today to learn more!

Plant Heroes is brought to you by the American Public Gardens Association, founded in 1940. Over the last eight decades, the Association has supported the work of public gardens in North America and beyond. Our mission is to champion and advance public gardens as leaders, advocates, and innovators in the conservation and appreciation of plants. Our vision is "A world where public gardens are indispensable" as they provide botanic, conservation, community, education, and economic resources to their community.

The Association is committed to increasing the knowledge of public garden professionals throughout North America through information sharing, professional development, networking, public awareness, and research, so that they have the tools to effectively serve visitors and members.

American Public Gardens Association

PublicGardens.org

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USDA