



BeetleBusters

COMMUNITY LEADERS

Middle School and High School Unit

As **Beetle Busters**, your students will be **community leaders** as they meet content standards while building scientific-inquiry, leadership, and civic engagement skills.

Get started with the lessons beginning on page 19, or take a moment and review the **Cross-Curricular Connections** on the next page. Any subject can serve as an opportunity to learn about, search for, and raise awareness about the invasive ALB!

SPECIAL NOTE

for High School Science Educators

Biology Extensions at the end of each lesson challenge high school biology, ecology, and environmental science students to explore topics in-depth and show their understanding in complex ways.



Cross-Curricular Connections

The inquiry-based lessons in this unit are designed to address the core subject areas of **Science** (biology, ecology, and environmental science) and **Language Arts** (persuasive writing, public speaking, and communications). The following are suggestions for extending your students' exploration into all subject areas.



Social Studies/History:

Discuss how trade (transportation) is one of the main ways invasive species are introduced to a new environment. Examine the current global and interstate trade regulations that are intended to stop ALB and other invasive insects from coming to the United States and to limit the spread of existing ALB infestations. Invite a local business owner to speak with the class about the impact that the ALB and ALB regulations have had, or could have, on that business.

English Language Arts:

Have students write letters to the editor, detailing how young people are addressing this issue by making a difference in their community and encouraging other community members to follow suit. Develop a puppet show or short play with your students that teaches younger children about the ALB. Check out "Lesson 4: New Recruits" for more ideas!

Art:

Play the ALB PSA/TV ad that shows symbols in place of the ALB's characteristic spots. Have students create their own symbols for things that have been, or will be, affected in their community as a result of ALB infestation. Have them add these symbols in place of spots to an otherwise accurate depiction of an ALB they create. Publish their images on the school's Web site or blog. In addition, you could share them with other teachers on the ALB Facebook Page.

Music:

Have students create jingles that raise awareness about the ALB and how to "search and report." Play the jingles on your school radio station, or stream them over the Internet on your school's Web page. Create a music video, and post it on the ALB Facebook Page to help other teachers empower their own Beetle Buster classes.

Computer/Digital Media:

Create a Web page, wiki, or blog that highlights the ALB work being done at your school. Link this page to the school's Web site, and update it regularly with stories, photos, informational reports, and seasonal suggestions.



Health:

Research the health benefits of trees in a neighborhood. Discuss the health issues that increase as the number of trees decreases. Have students create flyers outlining the health benefits of trees and how to stop the ALB, and then distribute them at a local health-related event, such as a blood drive.

Physical Education/Sports:

Before, during, or after outdoor physical activity, take an "ALB break" to check for ALBs and signs of ALB activity. Bring a camera to record sightings and signs and jars to capture live beetles. (Freeze them for later identification.) Report any ALB sightings or signs using the **USDA Reporting Form**.

Languages:

Have students create ALB posters in the language they are studying. If possible, bring students to a neighborhood in which this language is spoken, and raise awareness about the ALB by hanging the posters and talking to residents.

Service Learning:

Work with your local USDA/APHIS representative or a grassroots organization to have your class assist in an organized ALB search or in the planting of new trees.

Vacations:

Summertime and other school breaks are the perfect times for students to look for the ALB (and signs of the ALB) far from their own backyards. Encourage your students to search for (and report) ALBs wherever they go!



INTRO LESSON: CALL TO ACTION



Time Estimate:
One Class Period



Understanding Goals:
UG1, UG2, UG3

ADVANCE PREP

Materials

- Classroom Poster
- PSA/TV ad: Under “Get Involved” at www.AsianLonghornedBeetle.com

Tasks

- Create a **Wanted Wall**. Designate a bulletin board or wall space and label it with the words “Wanted: ALB.” Post local articles or other information about the ALB.
- *Optional:* For articles and videos on the ALB and how it came to the United States, check out www.AsianLonghornedBeetle.com.

INTRO ACTIVITY

Explain to your students that USDA/APHIS needs their help. USDA is encouraging them to be Beetle Buster Community Leaders. Your students have the opportunity to make a real impact in their community by searching for, reporting, and raising awareness about the Asian longhorned beetle (code name: ALB), an invasive tree-killing pest.

ALB: An Invasive Pest

If you have reliable computer access, show your students the **PSA/TV ad** from www.AsianLonghornedBeetle.com. If not, show them the “**Find the ALB**” quadrant of the classroom poster. Discuss what they know and questions they have about the ALB and its presence in your community or a neighboring community.

Have students create a classroom **Wanted Wall**. Encourage each student to find information about the ALB from at least two different sources—including (but not limited to) newspaper articles, flyers, stories from neighbors, videos or photos, Web sites, and Facebook pages.

Have students also post the questions they would like answered about the ALB on the **Wanted Wall**.



TEACHER TIP

➤ As you complete the other lessons in this unit, have your students revisit and answer the questions they posted on the **Wanted Wall** during this Intro Lesson. They can also post new questions as they arise!

How Students Can Help

Share the “**Report: Be a Beetle Buster**” quadrant of the poster with your students. Explain that, as Beetle Buster Community Leaders, they will:

- Search for and report the ALB and the signs it leaves behind, and mobilize the community to join in the search.
- Be ALB experts for their communities, sharing key ALB information with a wide audience.

ASK: *Why do you think USDA/APHIS is asking students to get involved? What makes you uniquely qualified to help stop the ALB?*

Have each student respond in writing by completing the following statements:

- I am uniquely qualified to help stop the ALB because ...
- I want to help stop the ALB because ...

I am uniquely qualified to help stop the ALB because ...

I want to help stop the ALB because ...

Discuss their responses and add them, along with the “**Report: Be a Beetle Buster**” quadrant, to the **Wanted Wall**.



LESSON 1: SEARCH AND REPORT—FIND THE ALB



Time Estimate:
One Class Period



Understanding Goals:
UG2, UG3

ADVANCE PREP

Materials

- Classroom Poster
- ALB ID Cards
- USDA's "ALB Identification and Look-Alikes List":
www.aphis.usda.gov/publications/plant_health/content/printable_version/alb_look_alikes.pdf

Tasks

- Research those insects, including the white spotted sawyer, with which the ALB is commonly confused. Identify the ones that are present in your own community using the **USDA's ALB Identification and Look-Alikes List**.
- Make sure you have an **ALB ID Card** for each student. A template card that can be printed and laminated is available online.

INTRO ACTIVITY

Share with students that their most important task as Beetle Buster Community Leaders is to search for the ALB and report what they've found.

Identifying the ALB

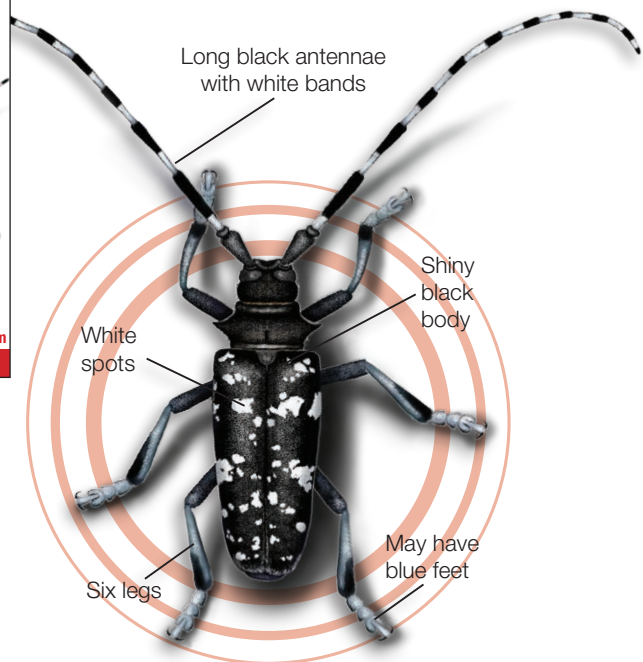
Explain to students that, to find the ALB, they need to know exactly what they are looking for.

Using their **ALB ID Card** as a reference, have students create scientifically labeled diagrams of the ALB, highlighting the characteristics that make it a **beetle** (the elytra, or hard wing casing over the wings), a **longhorned** beetle (antennae as long or longer than the body), and uniquely an **ALB** (white and black banded antennae, shiny black body with white spots).

Have students compare their diagrams to the one on the "**Search for the ALB**" quadrant of the poster. Have students describe any key characteristics they noticed that are not already labeled on the quadrant.

TEACHER TIP

➤ Students may want to use the Asian longhorned beetle (*Anoplophora glabripennis*) classification (<http://bugguide.net/node/view/18855>) as a resource when labeling their diagrams!



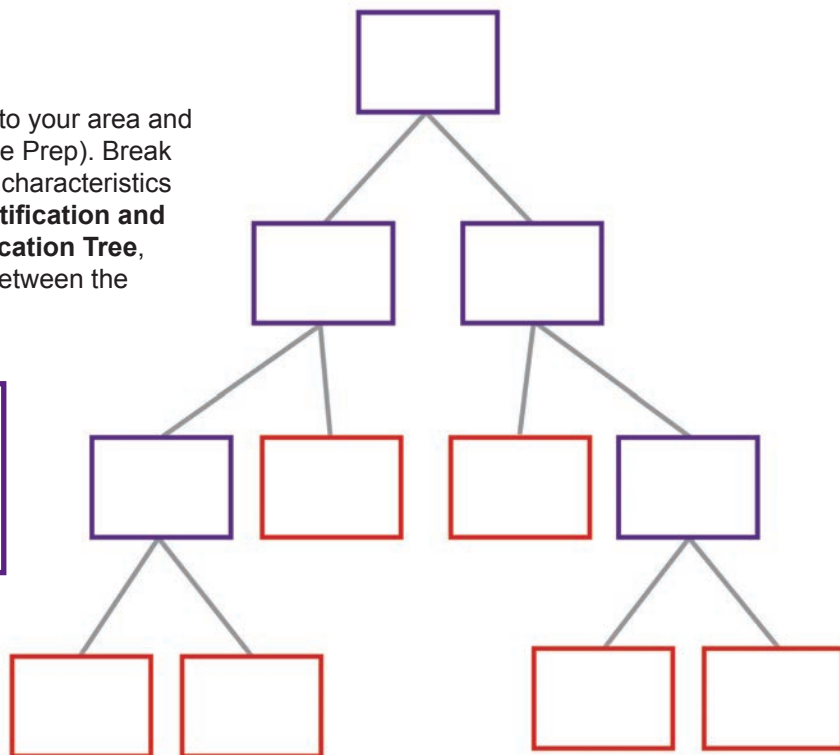
GUIDED INQUIRY

Classifying the ALB

Introduce students to three insects that are native to your area and are commonly confused with the ALB (see Advance Prep). Break students into groups, and have them research the characteristics of these local beetles using the **USDA's ALB Identification and Look-Alikes List**. Have them complete a **Classification Tree**, outlining the physical similarities and differences between the other beetles and the ALB.

TEACHER TIP

➤ If you don't have reliable student computer access in the classroom, print copies of the **USDA's ALB Identification and Look-Alikes List** and the images of the beetles you've chosen ahead of time.



High School Biology Extension

Have students do their own research about insects that are present in their area and are commonly confused with the ALB. Students can compare these beetles to the ALB using physical characteristics and Linnaeus's classification system. Have students create a **Classification Tree** that shows how these beetles are related to each other.



TAKE ACTION!



Search for the ALB

Encourage your students to search for the ALB in the summer and fall. Remind them to bring cameras to record the signs and jars to capture live beetles (and freeze them for later identification). Beetle Busters should always report sightings using the **USDA Reporting Form**.



Beetle Busters Connect

Have students scan and post the diagrams they made in the Intro Activity of this lesson on the **ALB Facebook Page** or on the class/school Web site. This will help others to identify the ALB.

Beetle Busters Educate

Have students create a "Red Light/Green Light"-type game to teach younger grades about how to distinguish the ALB from other beetles. Correct characteristics allow the students to run toward the caller, and incorrect characteristics keep them frozen in place. *Examples: Black-and-white antennae (run!); brown back (freeze!).* The game ends when someone reaches the caller ("the ALB") and tags him or her.





LESSON 2: SEARCH AND REPORT—FOLLOW THE SIGNS



Time Estimate:
One Class Period



Understanding Goals:
UG1, UG2, UG3

ADVANCE PREP

Materials

- Classroom Poster
- ALB ID Cards
- University of Vermont's ALB Biology page: www.uvm.edu/albeetle/biology/index.html
- ALB Year-Round Calendar (see back cover)
- USDA's "ALB Identification and Look-Alikes List": www.aphis.usda.gov/publications/plant_health/content/printable_version/alb_look_alikes.pdf
- Paper or pre-printed blank calendar pages for "Search Calendars"
- USDA's article on the white spotted sawyer: http://na.fs.fed.us/spfo/pubs/fidls/ws_sawyer/ws_sawyer.htm

Tasks

- Make enough copies of the "Follow the Signs" quadrant of the poster to have one for each student group.
- Make sure you have an **ALB ID Card** for each student. A template card that can be printed and laminated is available online.

INTRO ACTIVITY

Share with students that—in order to be good Beetle Buster Community Leaders—they need to not only know what the ALB looks like, but also how, where, and when to find it. In addition, they need to be able to recognize the signs of ALB activity, so they can report those as well.

ALB: Destroying Trees

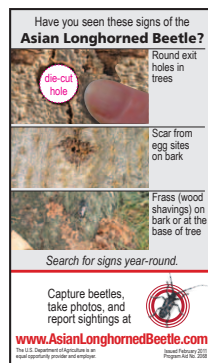
Break students into groups, and have them review the signs side of their individual **ALB ID Cards** and a group copy of the "Follow the Signs" quadrant.

ASK: *How does the ALB's life cycle cause the destruction of trees?*

Have each group create its own hypothesis, drawing on the information on the card and the quadrant, as well as their prior knowledge of how trees circulate water, minerals, and nutrients.

Using the ALB ID Card, the "Follow the Signs" quadrant, and the information on the **University of Vermont's ALB Biology Page**, have students research the different phases of the ALB life cycle, and how each sign pictured is created, in order to prove or disprove their hypotheses.

Have groups share their results with the class and discuss how the ALB is a particularly harmful invasive species.



GUIDED INQUIRY

ALB—All Year Round

Adult ALBs are only visible in the summer and fall (until the first frost), but you and your students can search for signs all year long!

ASK: *Why is it important to search for signs in the winter and spring, when the ALB isn't visible?*

- The majority of the trees the ALB favors are deciduous. When they lose their leaves in the fall, it makes it easier to spot signs, particularly exit holes and egg sites. ALBs usually start at the tops, or crowns, of trees and work their way down,

so you and your students may be able to spot signs high in the branches. Also, if a tree can be identified and removed before the pupae inside become adults, you have prevented even more devastation!

Have students show their knowledge of the ALB life cycle and signs by creating personal **Search Calendars**. Each student's calendar should highlight the different life cycle phases of the ALB, the signs the ALB creates, and the damage to the trees. Students should also include reminders of when they should be searching for the ALB and its signs and events in their own lives that would provide excellent opportunities for searching—including walks home from school, outdoor sports events, and camping trips.

Post the **ALB Year-Round Calendar** on the **Wanted Wall**, and have students compare it to their **Search Calendars**. (See "Intro Lesson: Call to Action" for more about the Wanted Wall.) Have students add to their personal calendars events from the **ALB Year-Round Calendar** that they would like to participate in.

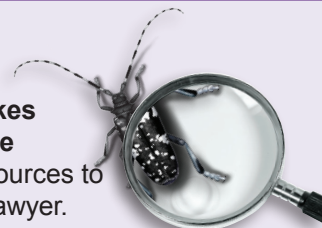
TEACHER TIP

➤ Make the calendars a multimedia experience! Students can use images from the Worcester infestation to represent the signs in detail (<http://massnrc.org/pests/albimages/20080802-Worcester/>). Students could also work together to create an online calendar to link to your class blog or school Web site!



High School Biology Extension

Have students compare the ALB and white spotted sawyer life cycles (and signs of activity) using the **USDA's ALB Identification and Look-Alikes List**, the **University of Vermont's ALB Biology Pages**, and **USDA's white spotted sawyer article** (see Advance Prep). Have students use these resources to explore why the ALB is much more harmful to trees than the white spotted sawyer.



TAKE ACTION!

Search for the ALB—All Year Round!

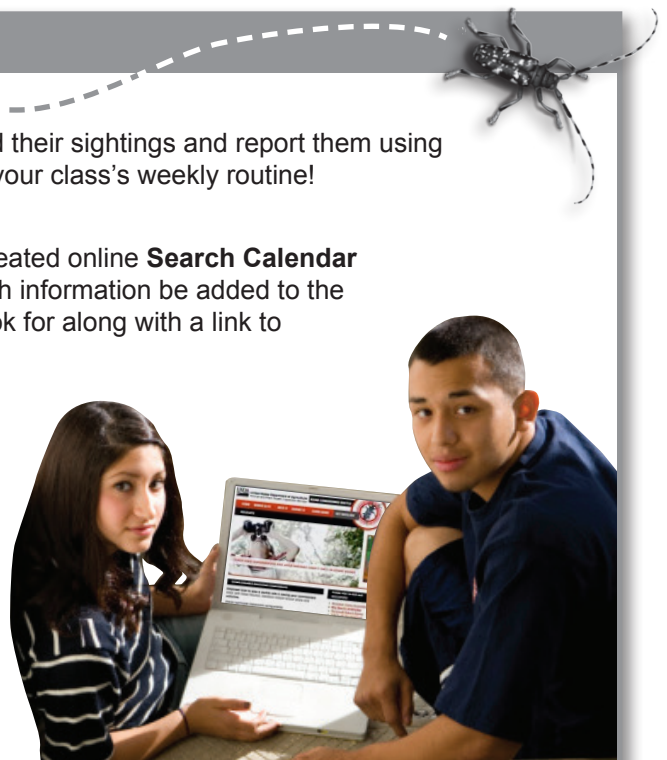
Search for signs of the ALB. Have students bring cameras to record their sightings and report them using the **USDA Reporting Form**. Make searching and reporting part of your class's weekly routine!

Beetle Busters Connect

- Post a version of the **ALB Year-Round Calendar**, or the class-created online **Search Calendar** (see Teacher Tip) on the school's Web site, or ask that ALB search information be added to the school's official calendar. Be sure to include images of what to look for along with a link to www.AsianLonghornedBeetle.com for reporting.
- Upload .jpgs or .pdfs of your students' **Search Calendars**, or the class-created online Search Calendar on the **ALB Facebook Page**. Show other Beetle Busters around the country what your class will be doing throughout the year!

Beetle Busters Educate

Have students share their **Search Calendars** with their families and discuss how the ALB destroys trees. Encourage searching at home for signs or for beetles, depending on the season.





LESSON 3: SAVE OUR TREES!



Time Estimate:
One Class Period



Understanding Goals:
UG1, UG2, UG3

ADVANCE PREP

Materials

- Classroom Poster
- The Arbor Day Foundation's Tree Guide: www.arborday.org/trees/treeGuide/index.cfm
- Tape measures, string, and paper/pencils (for tree surveying)
- National Tree Benefits Calculator: www.treebenefits.com

Tasks

- Plan this lesson for a time when leaves are on the trees. Check the **ALB Year-Round Calendar** (back cover) for suggestions!
- Collect one tape measure and one 8-foot length of string for each student group.
- Familiarize yourself with the **National Tree Benefits Calculator** (see "Guided Inquiry: Tree and Ecosystem Services").

INTRO ACTIVITY

Explain to students, that as Beetle Buster Community Leaders, their primary goal is to protect their community's (and our Nation's) trees from the ALB.

ALB Host Trees

Share the list of trees that the ALB likes to attack from the "**Search for the ALB**" quadrant of the classroom poster. Explain that one of the reasons the ALB is a particularly harmful invasive species is that it likes so many *different kinds* of hardwood trees. Scientists call these trees "host trees" because the beetles are able to complete their life cycle in these trees. The ALB is the guest that stays too long and keeps coming back!

Break students into groups, and assign each group a host tree to research from the list. Have students use **The Arbor Day Foundation's Tree Guide** to discover more information about that particular tree, including how common it is in areas infested with the ALB, and what products, if any, are made from it.

Students should find trees that are made into baseball bats (ash), give us maple syrup (sugar maple), and one that early doctors used for anti-malaria medicine (mountain ash)! Have students share what they've found with the class and post key information about each tree on the **Wanted Wall**. (See "Intro Lesson: Call to Action" for more about the Wanted Wall.)



Maple



Elm



Willow



Horsechestnut

TEACHER TIP

➔ If students do not have reliable computer access in class, you can easily print the materials needed for the Intro Activity, and then have students complete the Guided Inquiry work with the **National Tree Benefits Calculator** on a home or library computer.

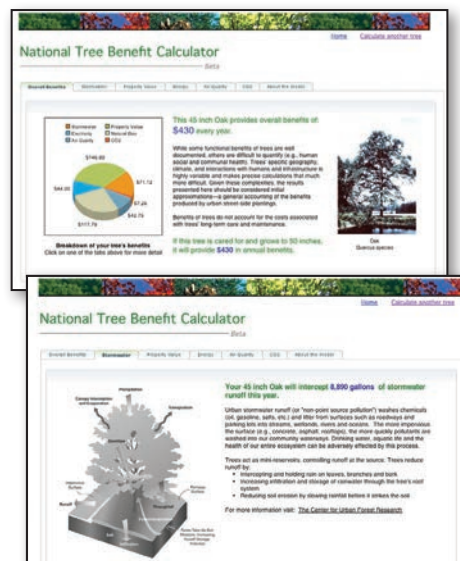
GUIDED INQUIRY

What We Could Lose

Explain that we benefit from having trees in our communities, in more ways than just from the products we make from them. Share with students that they will be surveying their schoolyard (or local park, if your schoolyard has few trees) to calculate the benefits trees provide that can't be held in our hands.

Break students into groups, and assign each group a separate area. Have students use their previous research to identify the host trees in their assigned area. For each tree, have them record the species and the diameter, taking the measurement approximately 4.5 feet up from the ground. (See Teacher Tip below for measurement information.)

After returning to the classroom, have students input the data they've collected into the **National Tree Benefits Calculator** and record the results for each tree. Then, have students compile their results and find the total value of the benefits of all of the trees they measured. Discuss the impact the ALB could have on your community if it is not stopped.



TEACHER TIP

➤ Students should calculate the diameter ($\text{diameter} = \text{circumference} / \pi$) of a tree by first finding the tree's circumference. Students can wrap a length of string around the trunk, using fingers to keep track of the point where the string overlaps. Next, they can straighten the string, and measure from point to point with a tape measure to determine the tree's circumference. Then, they can use the formula to determine the tree's diameter.

High School Biology Extensions

- In addition to calculating the overall benefit of the trees in their area, have students calculate the storm water, electricity, air quality, property value, natural gas, and CO₂ breakdowns. Discuss the impact of these potential losses on the community.
- Have students explore the **ALB Quarantine Map(s)** on the Web site. Have students prepare a list of "talking points" about ALB quarantine zones to share with their parents.



TAKE ACTION!



Beetle Busters Connect

Encourage students to share a link to the **National Tree Benefits Calculator** using their Twitter and/or Facebook accounts. Have them encourage their friends to calculate the benefits of their own trees, and work to protect them by becoming Beetle Busters at AsianLonghornedBeetle.com.

Beetle Busters Educate

Have students use what they have learned to calculate the benefits trees give to their own homes and neighborhoods. Have them share this information with their families and encourage their families to protect their trees by searching for the ALB and not moving firewood.

In communities already infested with ALB, have students make recommendations for how their families could rebuild their ecosystem services to pre-ALB levels by identifying non-host trees for replanting.





LESSON 4: NEW RECRUITS—ACTION CAMPAIGNS



Time Estimate:
One Class Period



Understanding Goals:
UG1, UG2, UG3

ADVANCE PREP

Materials

- Beetle Buster campaign messages on the Web site
- Beetle Busters Action Campaign Plan Worksheet (see p. 29)
- Paper for “Outreach Webs”

Tasks

- Make enough copies of the **Beetle Busters Action Campaign Plan** worksheet for student groups.
- *Optional:* Check out current Beetle Busters TV, radio, and print ads online.

INTRO ACTIVITY

As **Beetle Buster Community Leaders**, students should strive to raise their community’s awareness of the ALB, and mobilize their community to take action to stop the ALB’s spread. As socially and virtually connected young people, they are in a unique position to have a lasting impact on the success of the Beetle Busters campaign!

Community Leaders

Discuss with students how an effective ALB Action Campaign needs to be more than just a one-time advertisement or event. An effective ALB campaign should change the behavior of the people the campaign is trying to reach.

Brainstorm the many different ways in which people get new information. These can include flyers, postcards, brochures, television/radio advertisements, Web sites, blogs, social networking platforms (such as Facebook and Twitter), and word of mouth.

ASK: Which of these methods will get you to remember the message and pass it on? Why?

Discuss reasons why a person may be motivated to take on a new activity, and why a person may keep doing that activity once they’ve tried it. Use specific scenarios. *Examples: Why does a child keep playing basketball for many years? Why would a family start—and continue—to recycle?*

ASK: What makes you try new things? What makes you embrace something as a part of your regular routine?

Have students discuss specific advertising or awareness campaigns that have convinced them to change their behaviors.



TEACHER TIP

Remind students that, in every case, it was a local resident who first spotted the signs of ALB in a community. In fact, Illinois and New Jersey are now “ALB free,” thanks to the people in those communities—residents, elected officials, businesses, and Federal, State, and local government agencies. In addition to searching, getting the word out about the ALB is the most important thing your students can do!

GUIDED INQUIRY

Beetle Busters Action Campaign Plans

Share the core **Beetle Buster Campaign Messages** with your students:

- “Don’t Move Firewood.”
- “Learn the Signs. Look For It. Report It.”
- “Allow State and Federal Officials Access to Your Property To Survey for the ALB.”
- “Don’t Plant Host Trees in Infested Areas.”


Break students into groups, and have them discuss the best “target audiences” for each message. Have them consider specific groups that are well connected in their community, like heads of community organizations, coaches, and hairdressers. Also, have them consider groups for whom the message is particularly urgent, like homeowners, yard work companies, and those who love nature.

Have groups create an **Outreach Web**, linking the message in the center to the target audiences they brainstorm. Suggest that they put the more important audiences closer to the message/center, and the less critical (but still relevant) audiences farther away.

Have groups choose the top three target audiences for each message. For each target audience, have the group complete a **Beetle Busters Action Campaign Plan Worksheet**.

BeetleBusters ACTION CAMPAIGN PLAN WORKSHEET	
1 MESSAGE What is your message? This is not your “slogan”; it’s the basic information you want your audience to know.	5 GOALS List the things you would like your campaign to get your target audience to do.
2 TARGET AUDIENCE Who is your target audience? Why is this an important message for them, specifically?	6 YEAR-LONG PLAN Indicate when and how you would like your target audience to take action. Hint: Think about what they should do in different seasons!
3 METHOD What are the different ways to reach your target audience (flyers, videos, events, etc.)? Think about your target audience, and be creative!	7 MEASURING SUCCESS Look at the goals you’ve listed. Write how you plan to measure that you accomplished all of your goals.
4 SLOGAN(S) Write one or more fun, simple sentences or phrases that your target audience will like and remember.	

www.AsianLonghornedBeetle.com



TAKE ACTION!



Beetle Busters Connect

Have students post their campaign slogans and materials for the **ALB Facebook Page** and share the “success stories” from their campaigns!



Beetle Busters Educate

Have students enact their **Beetle Busters Action Campaign Plans** and monitor how effective they are using the methods they identified in their Campaign Plans. Work with students to make these Campaign Plans become more than just a one-time activity; rather, promote long-term community awareness work that creates real results over time.



LESSON 5: NEW RECRUITS—SOCIAL NETWORKING



Time Estimate:
One Class Period



Understanding Goals:
UG1, UG2, UG3

ADVANCE PREP

Materials

- ALB Official Facebook Page
- ALB Official Twitter Profile
- Paper for personal action plans

Task

- Review the **ALB Facebook Page** and **Twitter** profile.

INTRO ACTIVITY

Share with students that, as Beetle Buster Community Leaders, they will make personal action plans that build upon their roles as trendsetters and community leaders (online and in person), in addition to carrying out their larger Beetle Busters Action Campaign Plans.

Community Leaders

Have students discuss how they currently communicate with and organize their peers.

ASK: *What is the best way to tell your friends important information?*

Discuss how the influence they have over their friends and their social networks could make a powerful impact on the success of the Beetle Busters campaign.



GUIDED INQUIRY

Youth ALB Organizing Online

Have students review the social networking and other organizing tools now in use at www.AsianLonghornedBeetle.com.

ASK:

- *How can you contribute to the ALB Facebook and Twitter communities?*
- *How can you use social networking to get your friends involved?*

Have students answer these questions by writing **ALB Online Plans** describing how they will raise awareness about the ALB using social networking. Have students set measurable goals for their plans. *Example: Number of new Facebook page likes or number of tweets over a certain time period.*

ALB Outdoor Outreach

Have students make a list of all of the activities they do outdoors with friends.

ASK: *How can you and your friends search for the ALB during your outdoor activities?*

Have students consult the personal calendars they created in “Lesson 2: Search and Report—Follow the Signs” and develop **Outdoor Outreach Plans**. *Examples: Search before and after sports practice, or conduct daily “tree checks” on the walk home from school.*

Remind students to set plan goals that can be measured. *Example: The number of new people that they enlist to participate in searching.*

TAKE ACTION!

BEETLE BUSTERS EDUCATE AND CONNECT

Encourage students to follow through on these personal plans in their communities—both online and in person. Have daily, weekly, or monthly progress check-ins with the class. Consider giving a prize to the student who has been most successful with his or her personal plan by the end of the school year.

