

# Asian Longhorned Beetle and its Host Trees



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# Asian Longhorned Beetle and its Host Trees

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Cover photo: Melody Keena, U.S. Forest Service

Photo: R. Anson Eaglin, USDA APHIS



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Photo: Jennifer Forman-Orth  
Massachusetts Department of Agricultural Resources

Adult Asian longhorned beetle.

## Introduction

The Asian longhorned beetle (*Anoplophora glabripennis*) has been devastating urban forests in the Northeast since it was first detected in New York City in 1996. Efforts to eradicate this pest have resulted in the removal of tens of thousands of trees in several northeastern communities in the United States and Canada (map 1).

The Asian longhorned beetle has been successfully eradicated from Illinois and several areas of New York and New Jersey. While the eradication battle continues on several other urban fronts, there are growing concerns that this invasive pest could enter natural and managed forests of Eastern North America.

This pictorial guide provides basic information for identifying the Asian longhorned beetle, its injury characteristics, and its common host trees. The guide will help users detect the beetle in both urban and forested settings.



Photo: Patty Douglass, USDA APHIS

Removal of an Asian longhorned beetle-infested tree in Massachusetts.

# Map 1. Asian Longhorned Beetle Infestations in North America

(as of July 2012)



**Illinois**  
First detected in  
Chicago in 1998  
*Declared eradicated in 2008*

**Ontario, Canada**  
First detected in  
Toronto in 2003

**Ohio**  
First detected in  
Tate Township  
on June 17, 2011

**Massachusetts**  
First detected in  
Worcester in 2008

**New York**  
First detected in  
Brooklyn in 1996

**New Jersey**  
First detected in  
Jersey City in 2002

### Map Key

- Maple Forests\*
- ALB Infestations

\* Preferred ALB Host. (USFS FHET, 2012; Yemshanov et al. 2012)





Closeup of adult beetle showing small hairs on the legs and tarsi.  
Photo: Jennifer Forman-Orth

## Description of the Asian Longhorned Beetle

The adult Asian longhorned beetle is a large, “showy” insect that can only be seen from late spring to fall. Detection of the beetle often depends on the ability to identify the signs of injury left by each stage of the insect’s development in or on trees, some of which can be seen throughout the year. This section provides an overview of the insect’s life cycle and descriptions of the signs of damage left behind on trees.



Photo: Connecticut Agricultural Experiment Station



Photo: Melody Keena

Male Asian longhorned beetles have long antennae (left); antennae on females are approximately the same length as the body (right).

## Adults

Adults are glossy black with irregular white spots on the wing covers. Body size ranges from  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches in length, not including the very long black and white antennae. Freshly emerged adults often have a bluish tinge in the form of small hairs, especially prevalent on the legs. Adults are visible between late spring and the first hard frost in the fall, and are often in the tree canopy.



Photo: Melody Keena

Male adult beetle.



Photo: Michael Bohne, U.S. Forest Service

Beetles mating on the limb of a sugar maple.



## *Anoplophora glabripennis* form *nobilis*



Photo: Michael Bohne

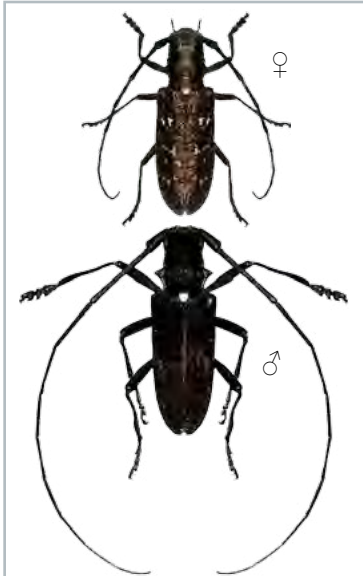


Photo: Michael Smith, USDA Agricultural Research Service

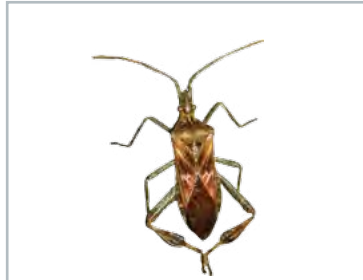
A form of the Asian longhorned beetle with yellowish spots (*A. glabripennis* form *nobilis*) has been detected in some North American infestations, but it is generally rare.

## Common Asian Longhorned Beetle “Look-alikes”

These insects are commonly found in North America and are often misidentified as the Asian longhorned beetle (all insect images are actual size).

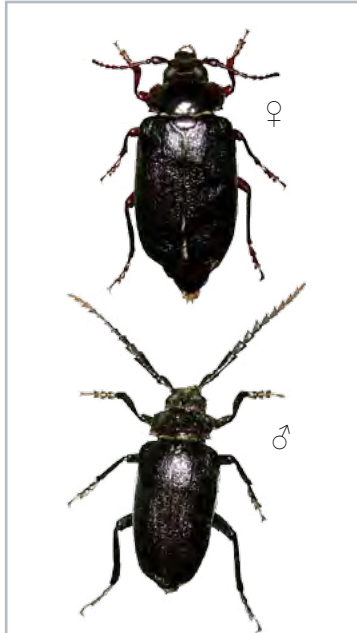


The **whitespotted pine sawyer** is a wood borer of conifer trees. Adults have a characteristic single white spot at the base of the wing covers and are often reported as Asian longhorned beetle in the spring/summer.



The **western conifer seed bug** feeds on conifer seeds and can be found inside buildings during the onset of cold weather in the fall. Adults have a flattened, leaf-like expansion on the hind legs. Adults will give off a foul odor when handled.

The western conifer seed bug is commonly reported as Asian longhorned beetle in the fall.



The **broadneck root borer** feeds on roots of hardwood trees. Adults are visible from May through June and have no white markings.



The **eyed elater** is one of the largest species of click beetles, reaching over 1.5 inches long. This beetle is a predator of many wood-boring insects of hardwood trees. Adults have a salt and pepper-like appearance with two large false eyespots on the top of the pronotum (neck).

## Egg Sites

Egg laying begins soon after adults emerge in mid-summer. Adult females chew an egg site, or “oviposition pit,” for every egg they lay on a tree. The shape of the pits will vary based on the thickness of the outer bark, ranging from circular, to oval, to just a slit on thin-barked trees. Mandible (teeth) marks are often visible on the outer edges of the oviposition pit. The color of the pit depends on the host tree and age of the pit. Generally, freshly chewed pits are easier to see because the inner bark contrasts with the outer bark. The pit color fades to a similar color as the undamaged outer bark with age. Bark splits and callus form around the pits over time; however, pits can still be identified for several years with careful inspection.



Fresh egg sites on a downed red maple branch.

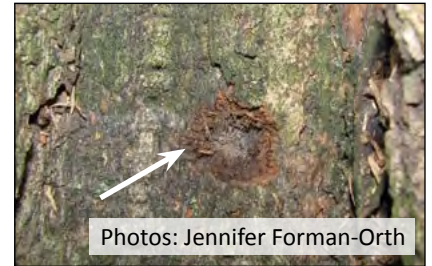


Closeup of an old (left) and fresh (right) oviposition pit.



Photo: Dennis Haugen, U.S. Forest Service

Closeup of oviposition pits showing mandible marks on the margin of the pits (indicated with white arrows).



Photos: Jennifer Forman-Orth



Photos: Michael Bohne

Heavily attacked trees showing fresh and old oviposition pits.

Left: paper birch in the United States; center: sugar maple in the United States; right: hybrid poplar in China.



Bark can split and form callus around oviposition pits over time. Distinctive mandible marks are usually visible on the margins of the callus.

Photos: Kevin Dodds, U.S. Forest Service

# Eggs

Once the pit is chewed, the female inserts her ovipositor and lays the egg between the bark and phloem of the tree, creating an oval stain. The egg is roughly the size of a grain of rice, milky white, and flat, like the seed of a cucumber. Yellowing as it matures, the egg typically hatches 10-15 days after it is laid. The egg and stain are only visible when the bark is peeled back. Females sometimes chew a pit without depositing an egg.



Two eggs removed from the host tree.

Egg and stain made visible after the bark was removed at the oviposition site with an arch punch.

## Early Stage Larvae

Newly hatched Asian longhorned beetle larvae feed on the phloem and outer sapwood of the tree for the first couple of larval stages. This early feeding produces sawdust/excrement (frass) and creates small tunnels leading away from the egg site. The frass and tunneling are only visible when the bark is removed from around the oviposition pit.



Photos: Kevin Dodds

Early larval feeding on the phloem made visible after bark removal at the oviposition site.



## Late Stage Larvae and Pupae

Late stage larvae turn and tunnel into the sapwood, creating an oval sapwood entrance hole. The legless larvae can reach 2½ inches in length and are creamy white in color, with a brown hardened “plate” on the first segment of the dorsal side of the thorax (neck). Late stage larvae feed on the sapwood of the tree, creating long tunnels within the tree. In some cases, larvae return to the outer sapwood, creating larger tunnels that are visible if the bark is removed. Frass from larval feeding may protrude from the egg sites or from cracks in the bark. Once feeding is complete, the larva chews a chamber where pupation occurs. The internal larval tunneling and pupal chambers are only visible when the tree is completely dissected.



Bark removal at the oviposition site reveals a sapwood entrance hole of a late stage larva.



Various late stage larvae.



Photo: PA Dept. of Conservation & Natural Resources

Pupa.



Photo: Michael Bohne

Cross section showing an adult beetle exiting the tree after pupation.



Photo: Linda C. Hubley, USDA APHIS

Tabletop display showing internal damage caused by Asian longhorned beetle development within the tree.



Maple split open to expose internal damage caused by Asian longhorned beetle development within the tree.

Photo: Tom Denholm, USDA APHIS

## Exit Holes

After pupation the new adult beetles begin to tunnel out of the tree, creating perfectly round exit holes. The holes vary in size and are generally slightly smaller than a dime, but large enough to fit the eraser end of a common pencil. The complete life cycle of the Asian longhorned beetle, from egg to mature adult, can take 1 to 2 years depending on climate. Exit holes are visible on the tree for several years and will callus over in time. Callused exit holes are more difficult to see on the tree, but can usually be located with careful examination.

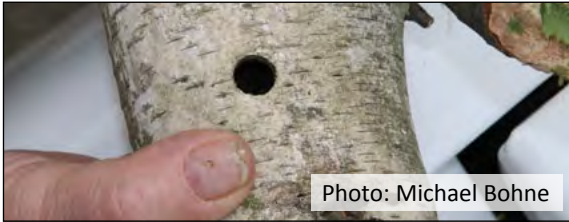


Photo: Michael Bohne

Exit hole on the limb of a birch tree.



Photo: R. Anson Eaglin

Fresh exit holes and old egg sites on maple.



Photo: R. Anson Eaglin

Exit holes on dead maple trees.



Photo: Kevin Dodds



Photo: R. Anson Eaglin



Photo: Nathan Siegert, U.S. Forest Service



Photos: Kevin Dodds

Photos of callused exit holes.

## Frass



Photo: Kenneth Law

Frass from larval feeding will protrude from the egg sites or bark cracks and will often collect in branch crotches or at the base of the tree.



Photo: Robert Haack, U.S. Forest Service



Photo: Michael Bohne

## Maturation Feeding

After emerging from the tree, adult Asian longhorned beetles disperse, feeding on leaves and the bark of young twigs before seeking a mate. This maturation feeding causes distinct injury along the veins of leaves that can be used to help detect the insect. Leaves attached to trees and sometimes those on the ground show the signs of adult feeding. Maturation feeding on leaves is easy to detect by looking straight up into the tree canopy.



Maturation feeding on leaves and twigs by adult Asian longhorned beetles.

## Other Signs of Asian Longhorned Beetle Infestation



Photo: Fred Borman

Tunneling from beetle development greatly weakens the structure of the tree, which can result in breakage of the limbs, crown, or bole.



Trees stressed by Asian longhorned beetle infestation may show early fall coloration. This infested sugar maple started to show fall color in early August.



Photos: Michael Bohne

Sap exudes from oviposition pits chewed in early summer, which can attract other insects such as beetles, bees, wasps, and flies.





Trees respond to injury by forming large calluses or areas of missing bark. Old egg sites, exit holes, and sapwood entrance holes are usually visible upon closer inspection.

## Asian Longhorned Beetle in Urban Communities

All six unique North American populations of the Asian longhorned beetle began in urban areas with industries involved in importing. Subsequent satellite populations have often been attributed to movement of infested material.

These urban populations of the Asian longhorned beetle tend to disperse slowly. Infestations usually begin in the crown of the tree. Adults often re-infest the same host tree from which they emerged. Injury can often be seen on the lower bole and exposed roots of these heavily infested trees. The tremendous buildup of an infestation can go on for years and eventually kill the tree or weaken it to a point where structural failure occurs.

***When developing survey strategies in urban areas, prioritize efforts and focus on areas of industry where there is known import/export activity that involves wooden pallets, spools, crates, or other wood packaging materials. Also focus on municipal collection yards where there is disposal of tree waste and/or solid wood packing material.***



Surveyors inspect an infested maple with a local resident in Worcester, MA.

## Asian Longhorned Beetle in Forests

Until recently, Asian longhorned beetle infestations in North America were limited to urban environments that were relatively isolated from natural or managed forests. Unfortunately in Massachusetts and Ohio, the beetle has successfully migrated into and infested closed-canopy forests. Observations made in some of these stands showed unique infestation patterns and damage indicators.

- In New England forests, Asian longhorned beetles were found only in maple, even though other host genera were present.
- The beetle attacked larger trees more often than smaller, overtopped trees.
- The beetle was readily dispersed throughout the forest, attacking trees in the interior of stands.
- The beetle attacked red maple more often than other maple species when multiple maple species were present.
- The beetle killed few trees outright; however, trees had serious damage along their boles and in their crowns, and were considered likely to succumb to structural failure.
- Signs of infestation were observed more readily in tree crowns.



Forest stand infested with the Asian longhorned beetle.

***When developing survey strategies in forested areas, prioritize efforts and focus on the upper boles and crowns of large, dominant trees that are preferred host genera of Asian longhorned beetle (p. 26), especially maple if present. Pay close attention to trees with signs of structural failure and survey throughout the stand.***

# Host Trees

The 13 host genera highlighted in this guide were selected based on current literature, host suitability studies in China and the United States, and host abundance data acquired from the Asian longhorned beetle eradication programs in North America.

## Preferred Host Trees

<i>Acer negundo</i> , box elder .....	27
<i>Acer nigrum</i> , black maple .....	28
<i>Acer pseudoplatanus</i> , sycamore maple .....	29
<i>Acer rubrum</i> , red maple .....	30
<i>Acer saccharinum</i> , silver maple .....	31
<i>Acer saccharum</i> , sugar maple .....	32
<i>Acer platanoides</i> , Norway maple .....	33
<i>Aesculus flava</i> , yellow buckeye .....	34
<i>Aesculus glabra</i> , Ohio buckeye .....	35
<i>Aesculus hippocastanum</i> , common horsechestnut .....	36
<i>Betula nigra</i> , river birch .....	37
<i>Betula papyrifera</i> , paper birch .....	38
<i>Betula populifolia</i> , gray birch .....	39
<i>Salix alba</i> , white willow .....	40
<i>Salix babylonica</i> , weeping willow .....	41
<i>Salix nigra</i> , black willow .....	42
<i>Ulmus americana</i> , American elm .....	43
<i>Ulmus parvifolia</i> , Chinese elm .....	44

## Rare Host Trees

<i>Albizia julibrissin</i> , mimosa .....	45
<i>Celtis occidentalis</i> , hackberry .....	46
<i>Cercidiphyllum japonicum</i> , katsura tree .....	47
<i>Fraxinus americana</i> , white ash .....	48
<i>Fraxinus excelsior</i> , European ash .....	49
<i>Fraxinus pennsylvanica</i> , green ash .....	50
<i>Koelreuteria paniculata</i> , goldenrain tree .....	51
<i>Platanus occidentalis</i> , American sycamore .....	52
<i>Platanus x acerifolia</i> , London planetree .....	53
<i>Populus alba</i> , white poplar .....	54
<i>Populus deltoides</i> , eastern cottonwood .....	55
<i>Populus grandidentata</i> , bigtooth aspen .....	56
<i>Populus nigra</i> var. <i>italica</i> , Lombardy poplar .....	57
<i>Sorbus aucuparia</i> , European mountain ash .....	58

NOTE: The species listed here are common representatives of Asian longhorned beetle host trees. Other species may be potential hosts.

# BOX ELDER

*Acer negundo* L.

## Leaves

- Opposite, 3-7 leaflets arranged in two rows along an axis (leaf stalk)
- Coarsely saw toothed
- 2.0-4.8" long

## Twigs

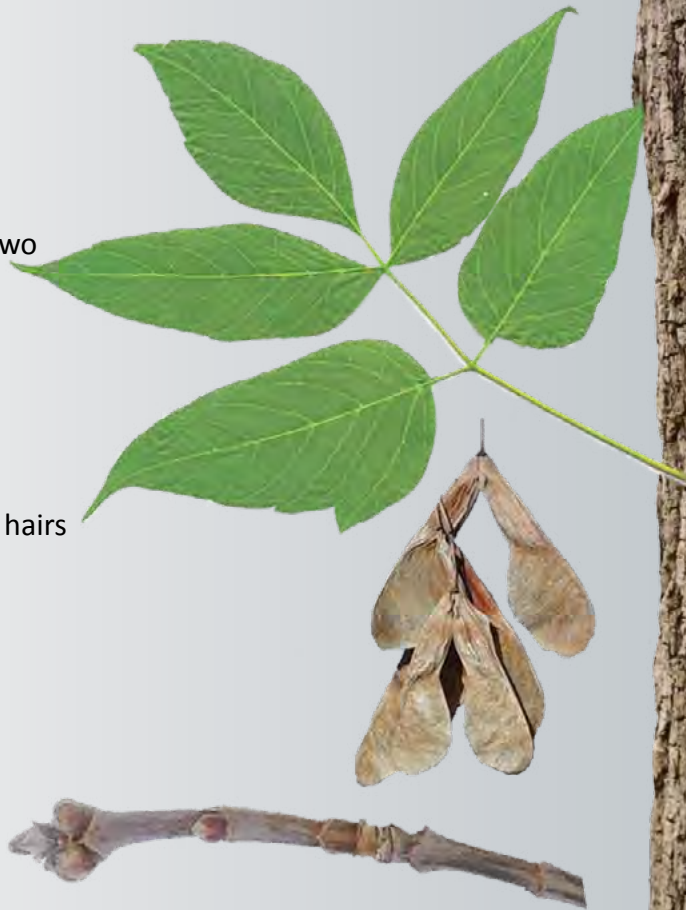
- Purplish green to brown
- Waxy film on new growth
- Buds greenish to reddish with silky hairs

## Fruit

- Samara, matures in autumn
- Approximately 1.5" long
- V-shaped wings when paired
- Appears in dense clusters

## Bark

- Gray brown, ridges and furrows



# BLACK MAPLE

*Acer nigrum* Michx. f.

## Leaves

- Opposite, simple
- 3-5 shallow lobes
- Edge smooth between points

## Twigs

- Brown, shiny, smooth
- Similar to sugar maple; however, older twigs have waxy coating
- Buds dark brown, cone shaped, sharply pointed

## Fruit

- Samara, matures in autumn
- U-shaped wings when paired
- Approximately 1" long

## Bark

- Gray brown
- Becomes deeply furrowed with age



# SYCAMORE MAPLE

*Acer pseudoplatanus* L.

## Leaves

- Opposite, simple, 3-5 lobes
- Dark green above, greenish white beneath
- 2.4-5.5" long

## Twigs

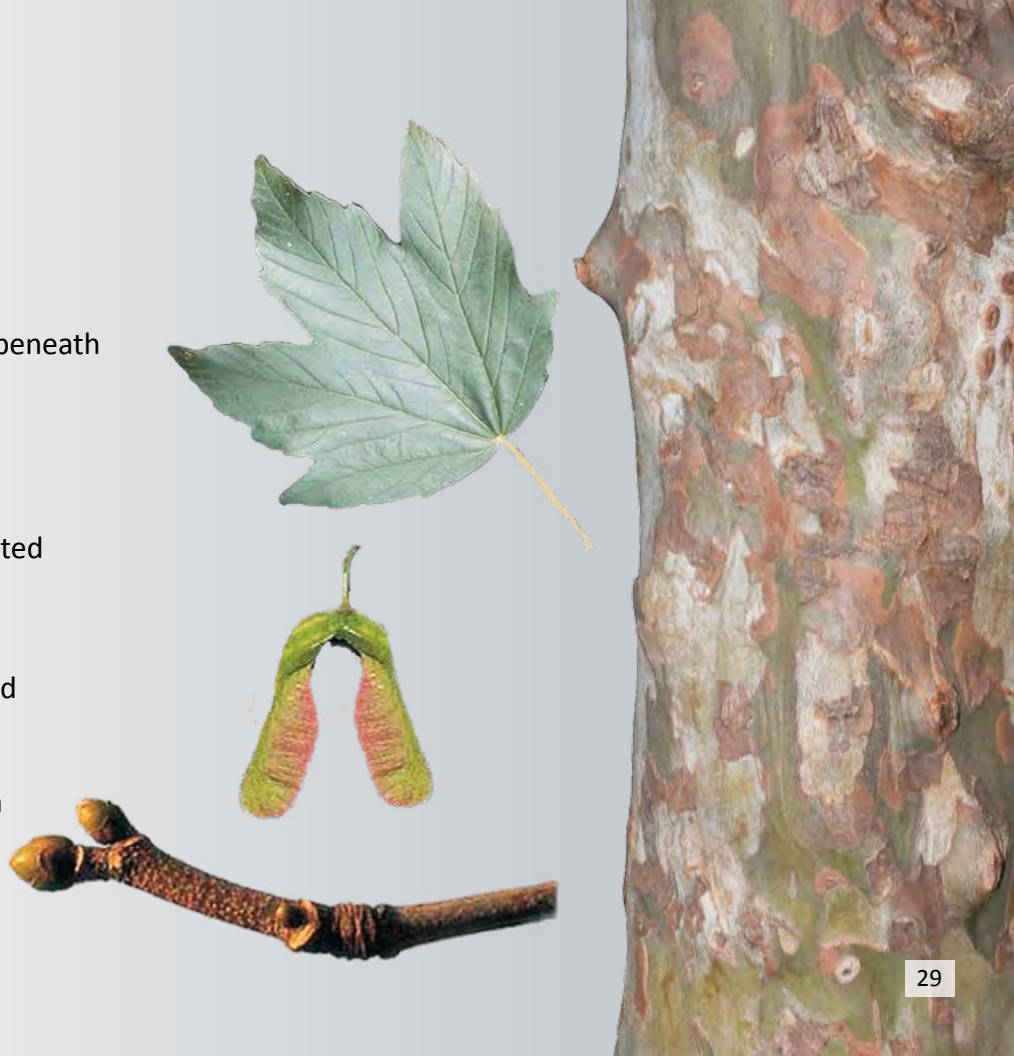
- Smooth, gray brown
- Slightly 4 sided
- Buds are greenish and slightly pointed

## Fruit

- Samara, matures in autumn
- 1.25-2" long, U shaped when paired

## Bark

- Grayish, reddish brown to orangish
- Irregular, rectangular scales



# RED MAPLE

*Acer rubrum* L.

## Leaves

- Opposite, simple, 3 (occasionally 5) lobes
- Medium green above, silvery beneath
- Leaf stalks often red, 2-6" long

## Twigs

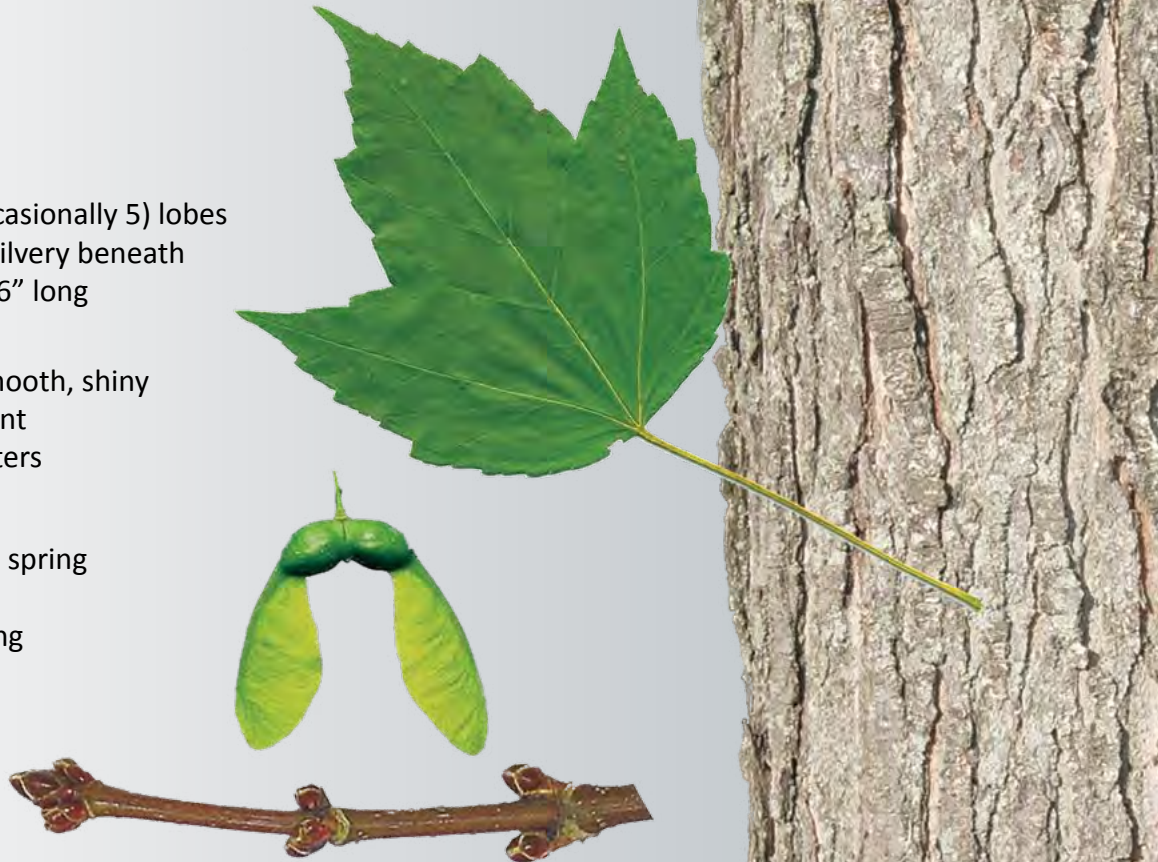
- Greenish red brown, smooth, shiny
- Buds reddish green, blunt
- Red flower buds in clusters

## Fruit

- Samara, matures in late spring
- Green, becoming red
- Approximately 0.75" long

## Bark

- Dark gray, rough
- Scaly, ridged, furrowed





# SILVER MAPLE

*Acer saccharinum* L.

## Leaves

- Opposite, simple, 5 lobes
- Deep sinuses, sharply pointed lobes
- Bright green above, silvery white beneath
- 5.5-7.9" long

## Twigs

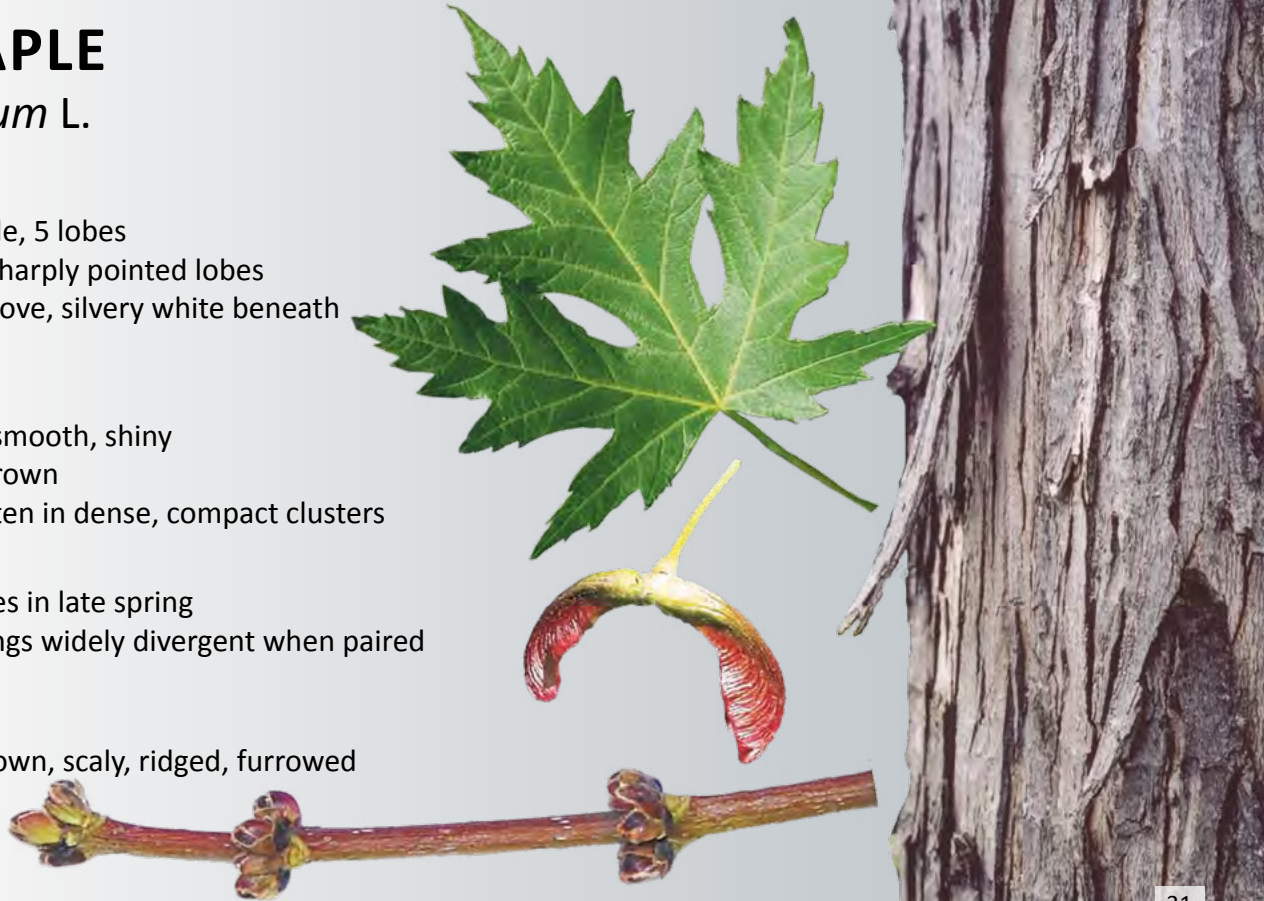
- Red to brown, smooth, shiny
- Buds reddish brown
- Flower buds often in dense, compact clusters

## Fruit

- Samara, matures in late spring
- 1.5-2" long, wings widely divergent when paired

## Bark

- Gray to gray brown, scaly, ridged, furrowed



# SUGAR MAPLE

*Acer saccharum* Marsh.

## Leaves

- Opposite, simple
- Usually 5 lobes, rarely 3
- Edge entire or sparingly wavy toothed
- 3-8" long

## Twigs

- Brown, shiny, smooth
- Buds gray brown, cone shaped, sharply pointed

## Fruit

- Samara, matures in autumn
- U-shaped wings when paired
- Approximately 1" long

## Bark

- Gray brown
- Becomes deeply furrowed with age



# NORWAY MAPLE

*Acer platanoides* L.

## Leaves

- Opposite, simple, 5 lobes
- Lustrous dark green
- Milky sap visible when leaf stalk broken from twig
- 3.2-6.3" long

## Twigs

- Stout, shiny, olive brown
- Buds greenish maroon, oval to round

## Fruit

- Samara, matures in autumn
- Wide-spreading wings, almost parallel
- 1.5-2" long, shiny

## Bark

- Grayish black with ridges and shallow furrows



# YELLOW BUCKEYE

*Aesculus flava* Ait.

## Leaves

- Opposite, 5 leaflets that originate from a common point
- Leaflets are finely toothed
- Medium to dark green
- 4-6" long

## Twigs

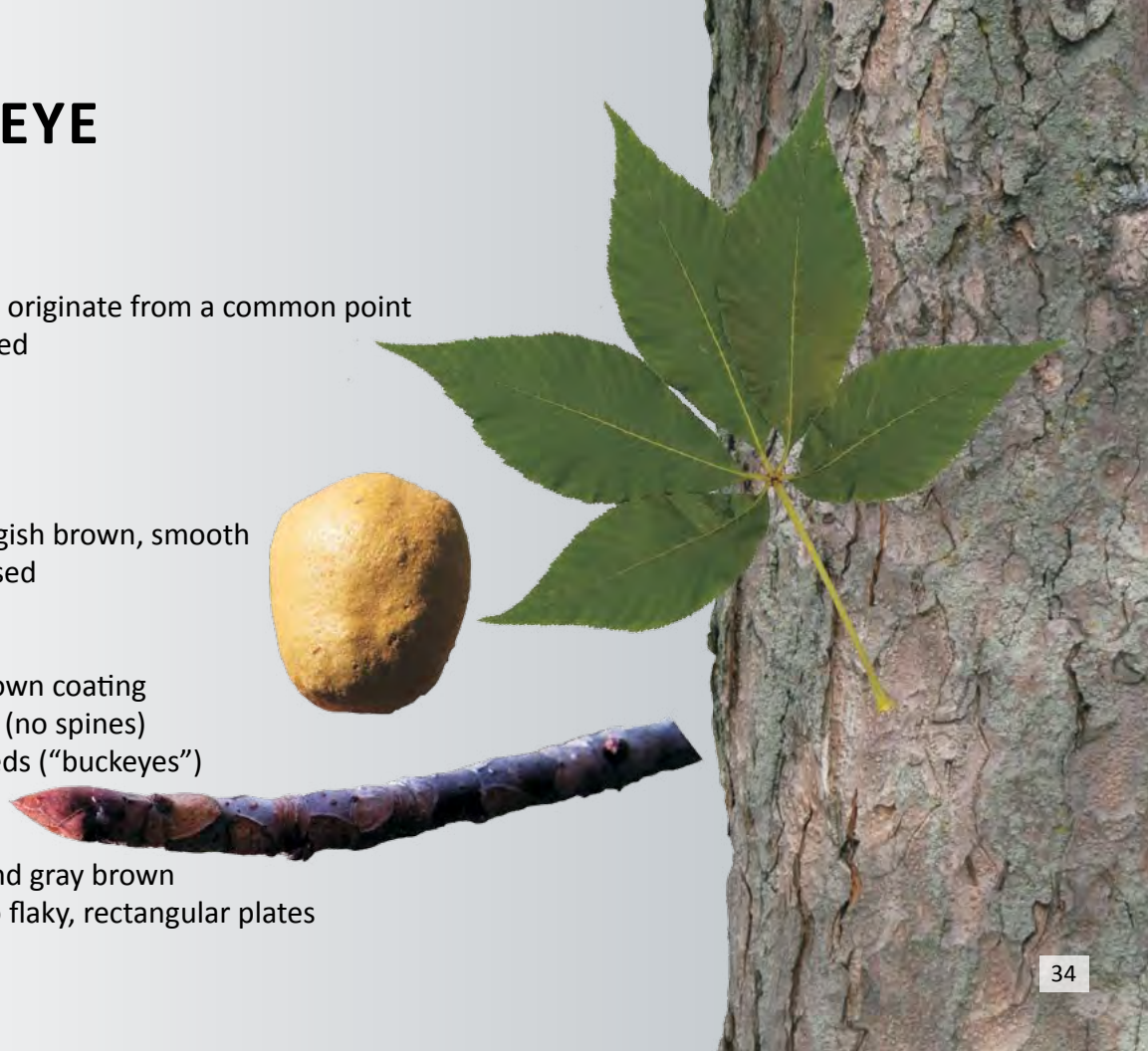
- Thick, ashy gray to orangish brown, smooth
- No foul odor when bruised

## Fruit

- Capsule with golden-brown coating
- Smooth bumpy exterior (no spines)
- One to three nutlike seeds ("buckeyes")

## Bark

- Young bark is smooth and gray brown
- Mature bark breaks into flaky, rectangular plates



# OHIO BUCKEYE

*Aesculus glabra* Willd.

## Leaves

- Opposite, 5 leaflets that originate from a common point
- Leaflets are finely toothed
- Medium to dark green
- 4-6" long

## Twigs

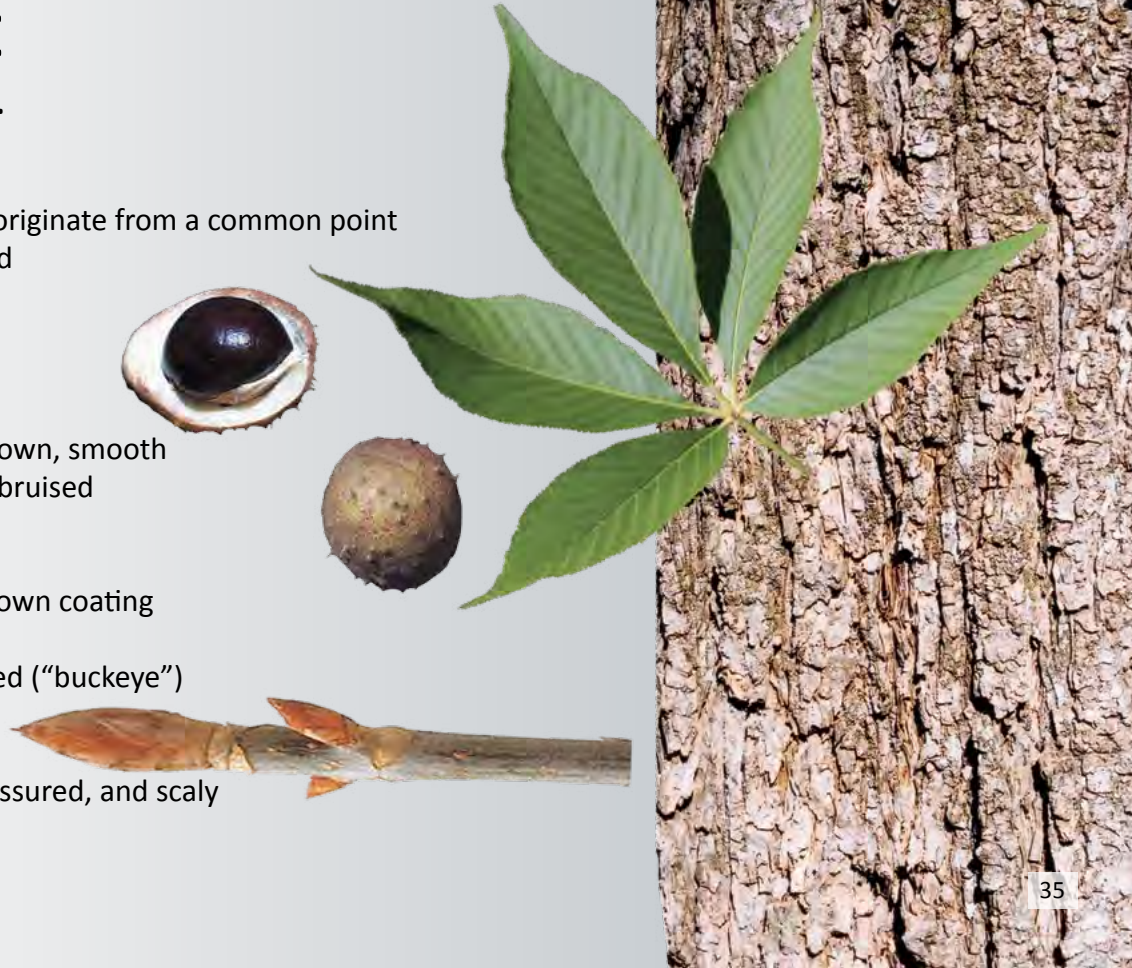
- Thick, ashy gray to red brown, smooth
- Disagreeable odor when bruised

## Fruit

- Capsule with greenish-brown coating
- Round with a spiny cover
- Single brownish-black seed ("buckeye")

## Bark

- Ashy gray, thick, deeply fissured, and scaly



# COMMON HORSECHESTNUT

*Aesculus hippocastanum* L.

## Leaves

- Opposite, 5-7 leaflets that originate from a common point
- Leaflets double toothed, often long pointed
- Medium to dark green
- 4.0-9.8" long

## Twigs

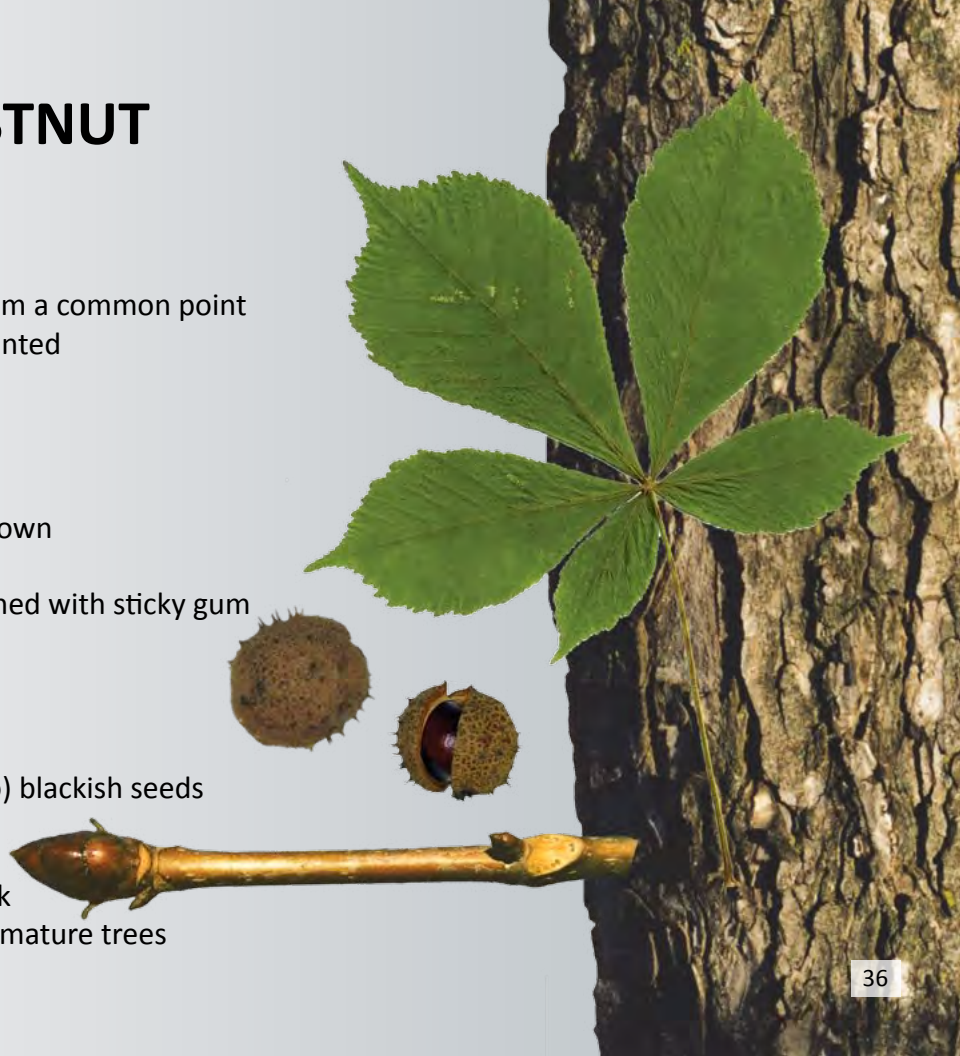
- Very thick, reddish yellow to grayish brown
- Smooth or slightly downy
- Buds large, dark reddish brown, varnished with sticky gum

## Fruit

- Capsule, matures in autumn
- Coating is greenish light brown, spiny
- Capsule contains one (occasionally two) blackish seeds

## Bark

- Dark gray to brown, orangish inner bark
- Bark peels in plates and wide strips on mature trees



# RIVER BIRCH

*Betula nigra* L.

## Leaves

- Alternate, simple, double toothed
- Diamond to oval shaped
- Wedge-shaped leaf base, 1.2-3.0" long

## Twigs

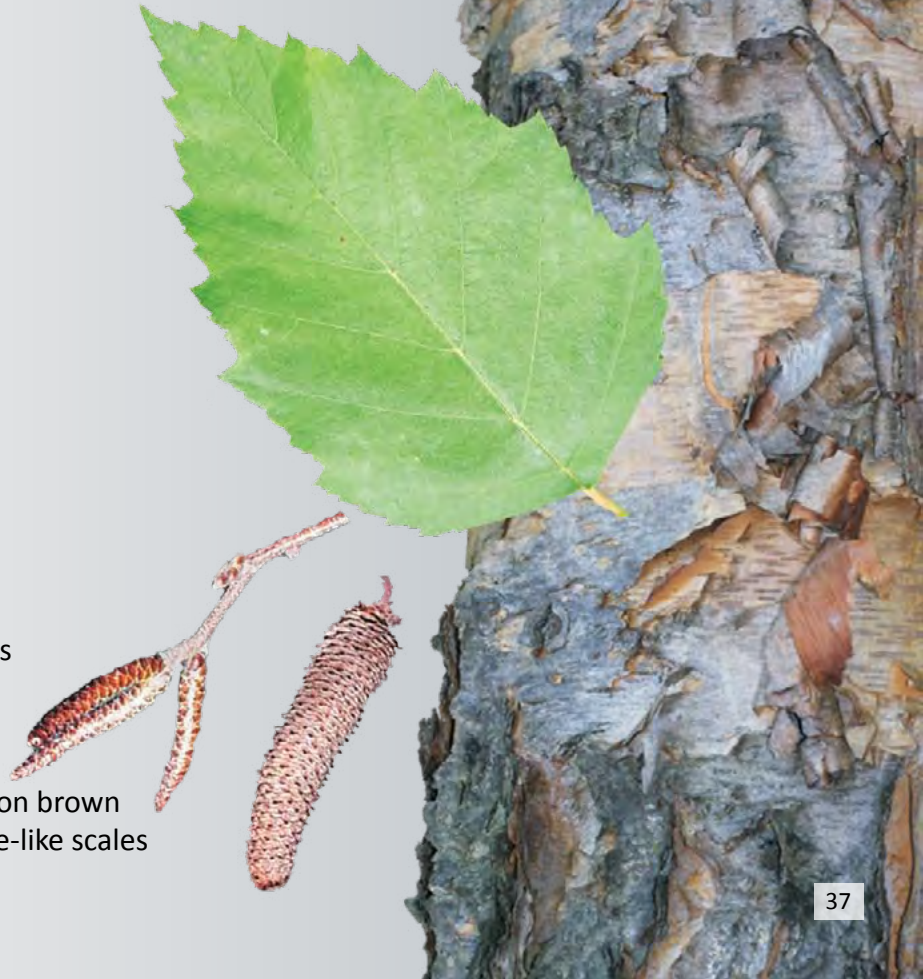
- Light reddish brown
- Slender, often with minute hairs
- Buds chestnut brown, slightly hairy

## Fruit

- Small winged nutlet, maturing in spring
- Arranged in tight, erect, cylindrical clusters
- The only spring-fruiting birch

## Bark

- Cream, salmon, orange brown, or cinnamon brown
- Peeling and deeply furrowed, broken plate-like scales



# PAPER BIRCH

*Betula papyrifera* Marsh.

## Leaves

- Alternate, simple, oval shaped
- Double toothed
- Dark green above, pale yellow green below
- 2-5.2" long

## Twigs

- Smooth to lightly grainy texture
- Reddish brown
- Many small, raised white spots on surface

## Fruit

- Small winged nutlet
- Arranged in tight, drooping, cylindrical clusters

## Bark

- Chalky white and peeling into thin paper-like layers
- Thin to wide horizontal black lines





# GRAY BIRCH

*Betula populifolia* Marsh.

## Leaves

- Alternate, triangular shape, almost straight base
- Margins with double row of two different sized teeth
- Dark green, papery texture, rough on upper surface, smooth on lower surface

## Twigs

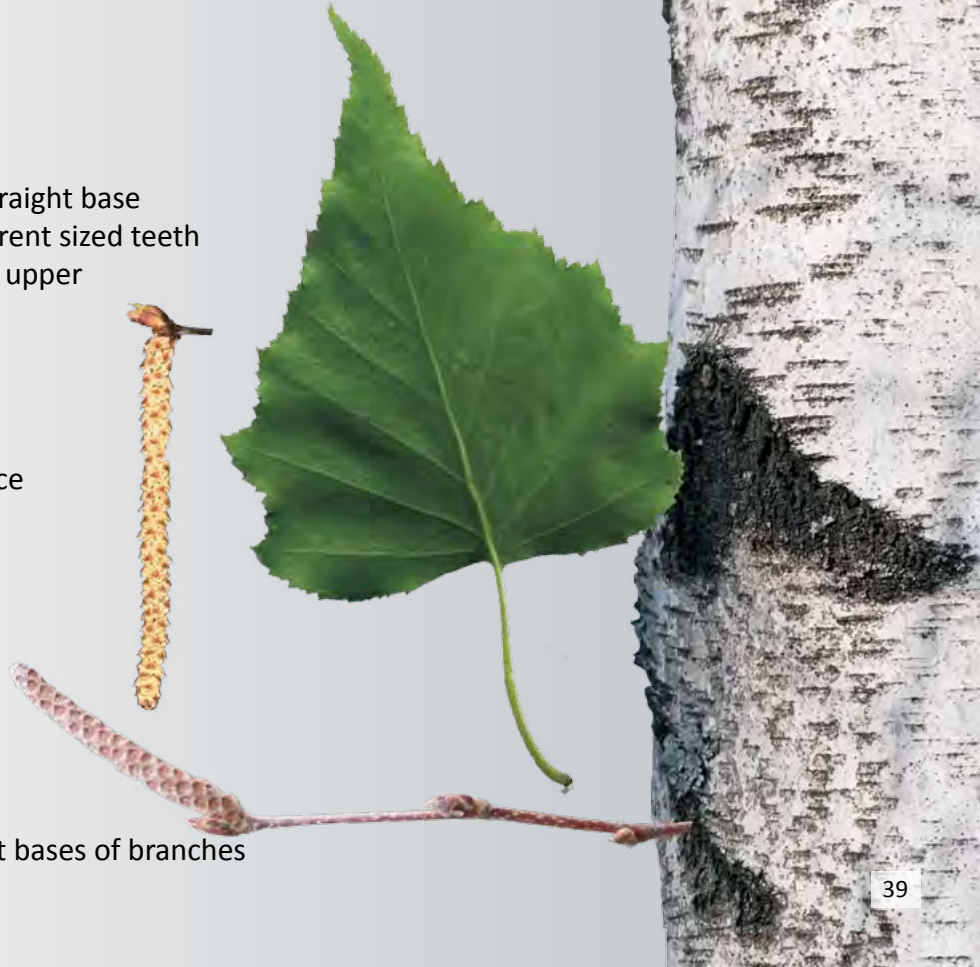
- Branchlets spreading and slender
- Orange brown to gray
- Scattered pale, warty glands on surface

## Fruit

- Cones are 0.75" long
- Contain many hairy 3-lobed seeds
- Cones are singular and drooping

## Bark

- Thin and smooth
- Dull grayish to chalky white
- Noticeable triangular black patches at bases of branches



# WHITE WILLOW

*Salix alba* L.

## Leaves

- Alternate, simple, lance shaped
- Bright green above, silvery green beneath
- Finely toothed

## Twigs

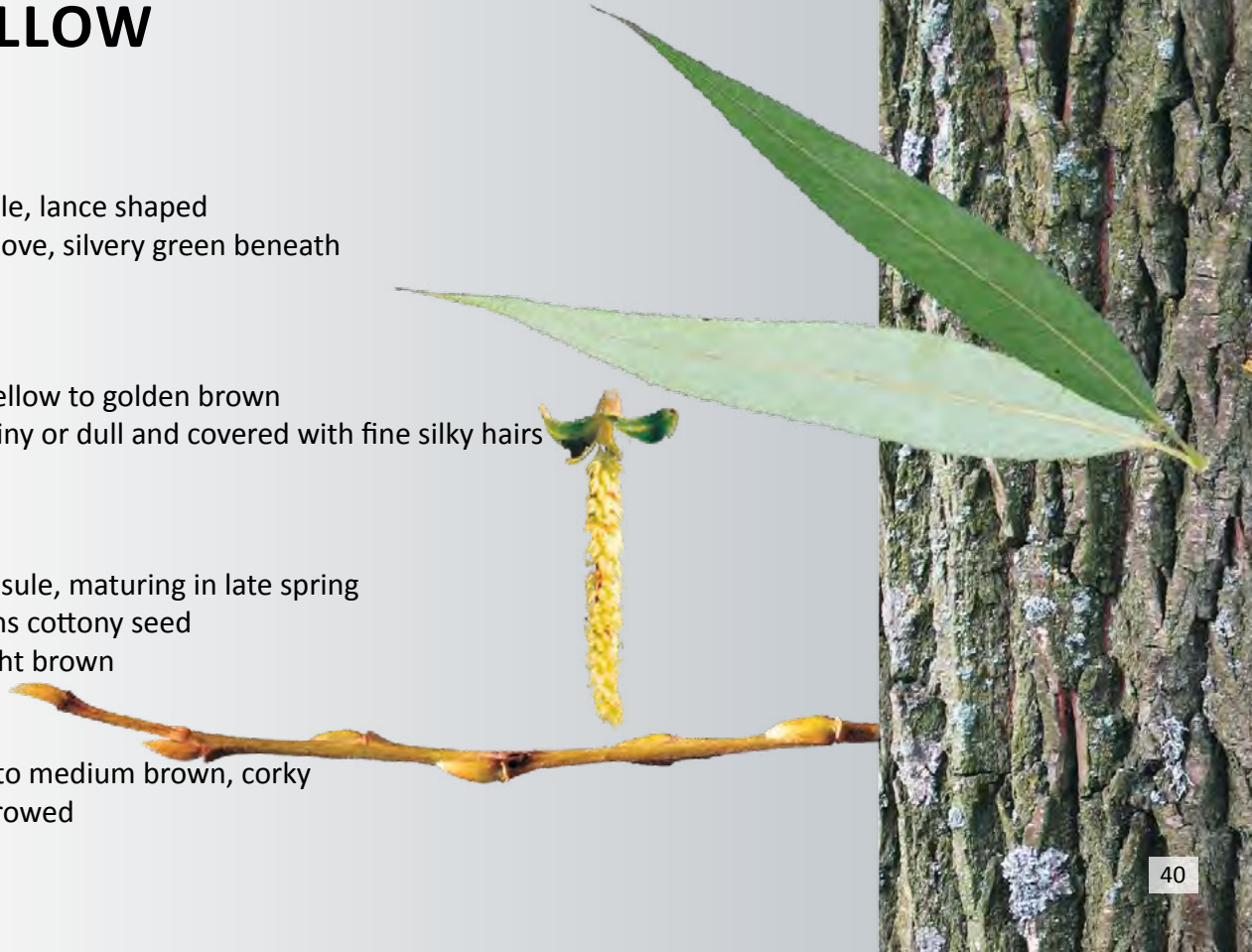
- Slender, light yellow to golden brown
- Smooth and shiny or dull and covered with fine silky hairs
- Bitter to taste

## Fruit

- Two-valved capsule, maturing in late spring
- Capsule contains cottony seed
- Hairless and light brown

## Bark

- Golden brown to medium brown, corky
- Ridged and furrowed



# WEeping WILLOW

*Salix babylonica* L.

## Leaves

- Alternate, simple, lance shaped, finely toothed
- Dark green above and grayish below
- Smooth, 2.4-7.1" long

## Twigs

- Reddish brown to brown, smooth
- Distinctive weeping habit

## Fruit

- Capsules, maturing in May-June
- Oval, green

## Bark

- Dark brown to black
- Heavily furrowed and ridged



# BLACK WILLOW

*Salix nigra* Marsh.

## Leaves

- Narrowly lance shaped, long pointed, finely toothed
- Shiny green above and whitish beneath
- 3-6" long

## Twigs

- Purplish green to pale orange brown
- Slender and smooth
- Buds reddish brown or yellowish

## Fruit

- Capsule, approximately 0.25" long, oval to cone shaped
- Capsules arranged in long clusters
- Matures in late spring

## Bark

- Dark brown to nearly black
- Deep furrows, jagged scaly ridges



# AMERICAN ELM

*Ulmus americana* L.

## Leaves

- Alternate, simple, double toothed
- Dark green, rough, with short hairs
- Unequally rounded at leaf base, 2.7-6.0" long

## Twigs

- Light red brown, slender
- Smooth or slightly hairy
- Buds light reddish brown

## Fruit

- Disc-shaped samara, maturing in late spring
- Approximately 0.5" long
- Notched at end, fringed with hairs

## Bark

- Brown to dark gray with alternating whitish buff color
- Often scaly, with deep intersecting ridges
- Young bark has a corky feeling



# CHINESE ELM

*Ulmus parvifolia* Jacq.

## Leaves

- Alternate, simple, oval shaped, double toothed
- Unequally rounded at leaf base
- Dark green; smooth above; soft, short hairs beneath
- 1-2.5" long

## Twigs

- Gray brown
- Slender and slightly hairy
- Buds reddish brown, oval, and pointed

## Fruit

- Disc-shaped samara, maturing in late summer
- Rounded and notched
- Lime green, maturing to gray brown

## Bark

- Mottled; peeling in irregular orange, green, and gray patches



# MIMOSA, SILKTREE

*Albizia julibrissin* Durazz.

## Leaves

- Alternate, divided twice
- Dark green; sometimes with soft, short hairs
- 18-30 pairs of leaflets

## Twigs

- Slender, greenish at first; gray brown at maturity
- Have many lenticels (pores), smooth, angled
- Buds are rounded and brownish

## Fruit

- Pods, light straw to gray brown in color and thin
- Maturing in September-October
- Usually persists through winter

## Bark

- Smooth, gray brown



# HACKBERRY

*Celtis occidentalis* L.

## Leaves

- Alternate, simple, single toothed
- Base unequally rounded
- Bright green above, paler beneath
- 2.4-3.5" long

## Twigs

- Slender, light olive brown to reddish brown
- Often zigzag between buds
- Buds are small, chestnut brown, downy

## Fruit

- Fleshy and berry like, ripening in autumn
- Dark red to blackish purple

## Bark

- Grayish brown with corky warts or ridges





# KATSURA TREE

*Cercidiphyllum japonicum*

## Leaves

- Two forms, 1-4" long
- Juvenile form (pictured above): opposite, egg shaped with a heart-shaped base, finely toothed
- Mature form (pictured below): single leaf on spurred shoot, heart shaped, finely toothed

## Twigs

- Thin, brown, opposite buds

## Fruit

- Inconspicuous small green flowers in early spring
- Clusters of small green pea-like pods

## Bark

- Brown, older bark shaggy
- Usually grows with multiple trunks



# WHITE ASH

*Fraxinus americana* L.

## Leaves

- Opposite, 5-9 leaflets arranged in two rows along an axis (leaf stalk)
- Shallow teeth near tips or on entire leaf
- Dark green above, paler green below
- 7.9-11.8" long

## Twigs

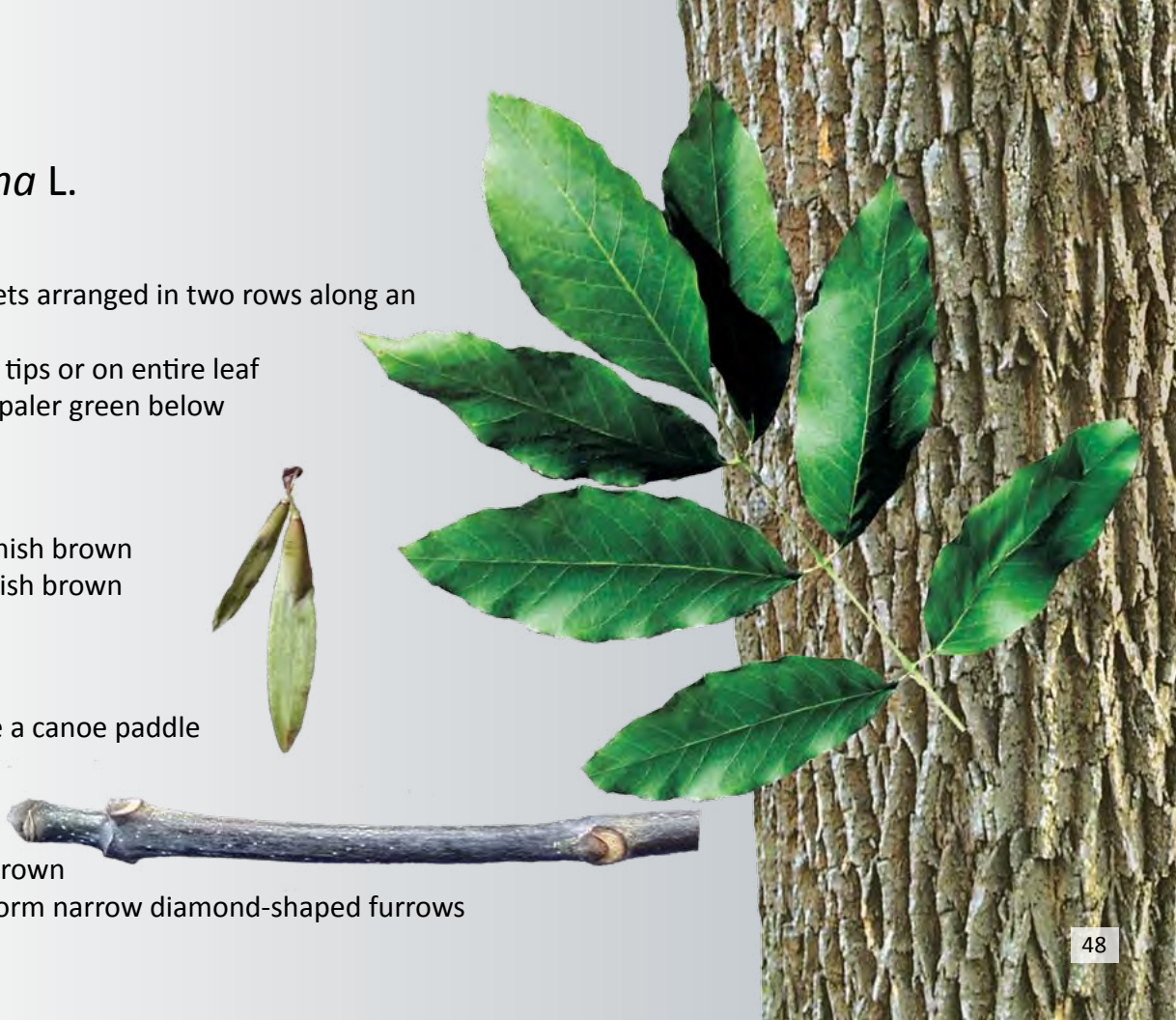
- Stout, gray to greenish brown
- Buds rusty to blackish brown
- Smiling leaf scars

## Fruit

- Samara shaped like a canoe paddle
- 1-2" long

## Bark

- Ashy gray to light brown
- Interlacing ridges form narrow diamond-shaped furrows



# EUROPEAN ASH

*Fraxinus excelsior* L.

## Leaves

- Opposite, 7-9 leaflets arranged in two rows along an axis (leaf stalk)
- Dark green above, lighter green beneath
- 2-4" long

## Twigs

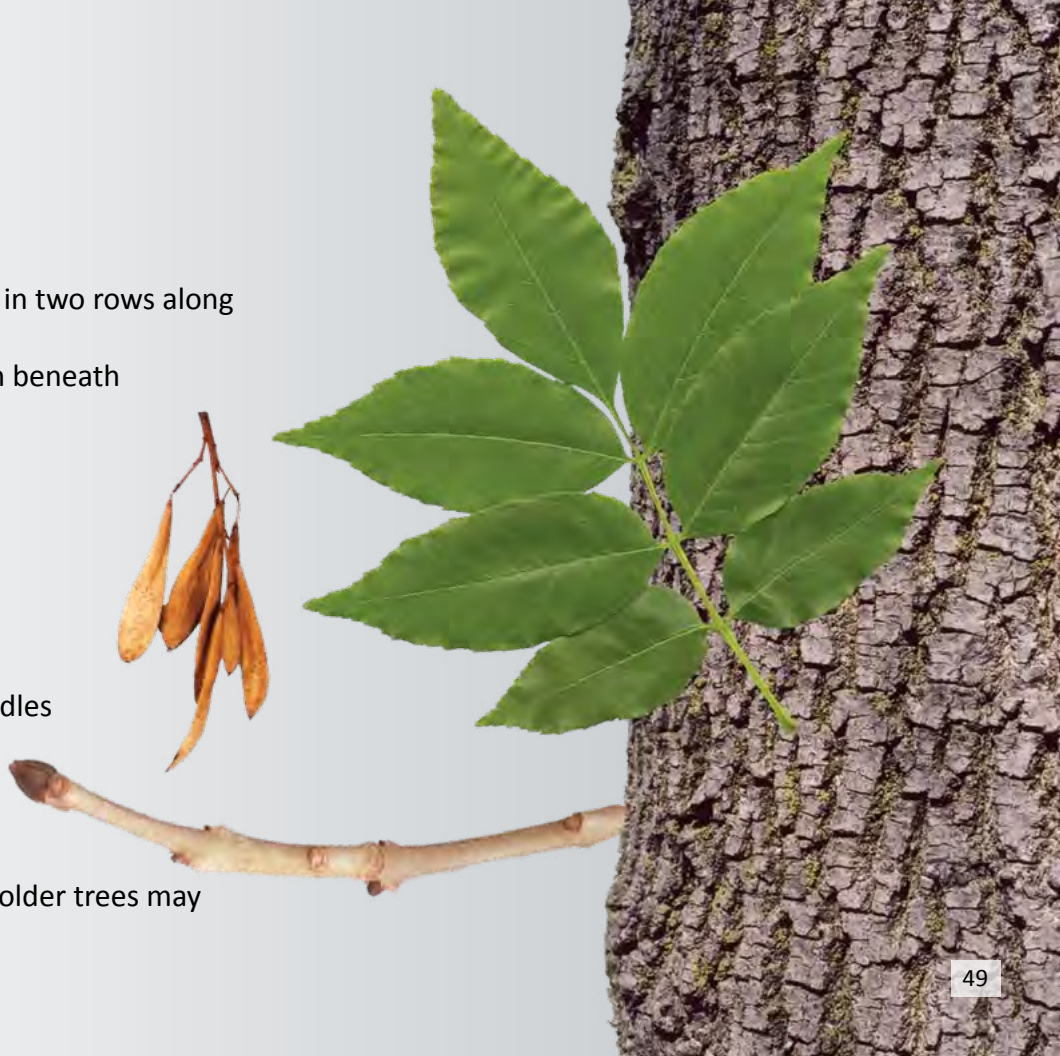
- Grayish or grayish brown, stout
- Scattered minute white spots
- Buds are nearly black

## Fruit

- Samaras shaped like canoe paddles
- Arranged in drooping clusters

## Bark

- Ashy gray to gray brown
- Interlacing ridges and furrows, older trees may appear scaly



# GREEN ASH

*Fraxinus pennsylvanica* Marsh.

## Leaves

- Opposite, 7-9 leaflets arranged in two rows along an axis (leaf stalk)
- Single toothed, most apparent near tip
- Medium to dark green
- 9.9-11.8" long

## Twigs

- Stout, gray to greenish brown
- May be smooth or very downy
- Buds are dark rusty brown

## Fruit

- Samara shaped like a canoe paddle
- 1-2.5" long

## Bark

- Ashy gray to gray brown
- Interlacing ridges form narrow diamond-shaped furrows



# GOLDENRAIN TREE

*Koelreuteria paniculata* Laxm.

## Leaves

- Alternate, 7-15 leaflets arranged in two rows along an axis (leaf stalk)
- Deeply serrated margin
- Dark green turning yellow in fall
- 5.8-20" long

## Twigs

- Stout, reddish brown, zig-zag bud arrangement
- Yellow flowers, grow in large terminal clusters
- Buds are round, dark rusty brown

## Fruit

- Clusters of papery, triangular capsules
- Contain three hard, black, globular seeds
- 1-2" long

## Bark

- Silvery gray, flat ridge tops
- Reddish furrows



# AMERICAN SYCAMORE

*Platanus occidentalis* L.

## Leaves

- Alternate, simple, 3-5 lobes
- Coarsely toothed along margins
- Medium to dark green, very large, 4-8" wide

## Twigs

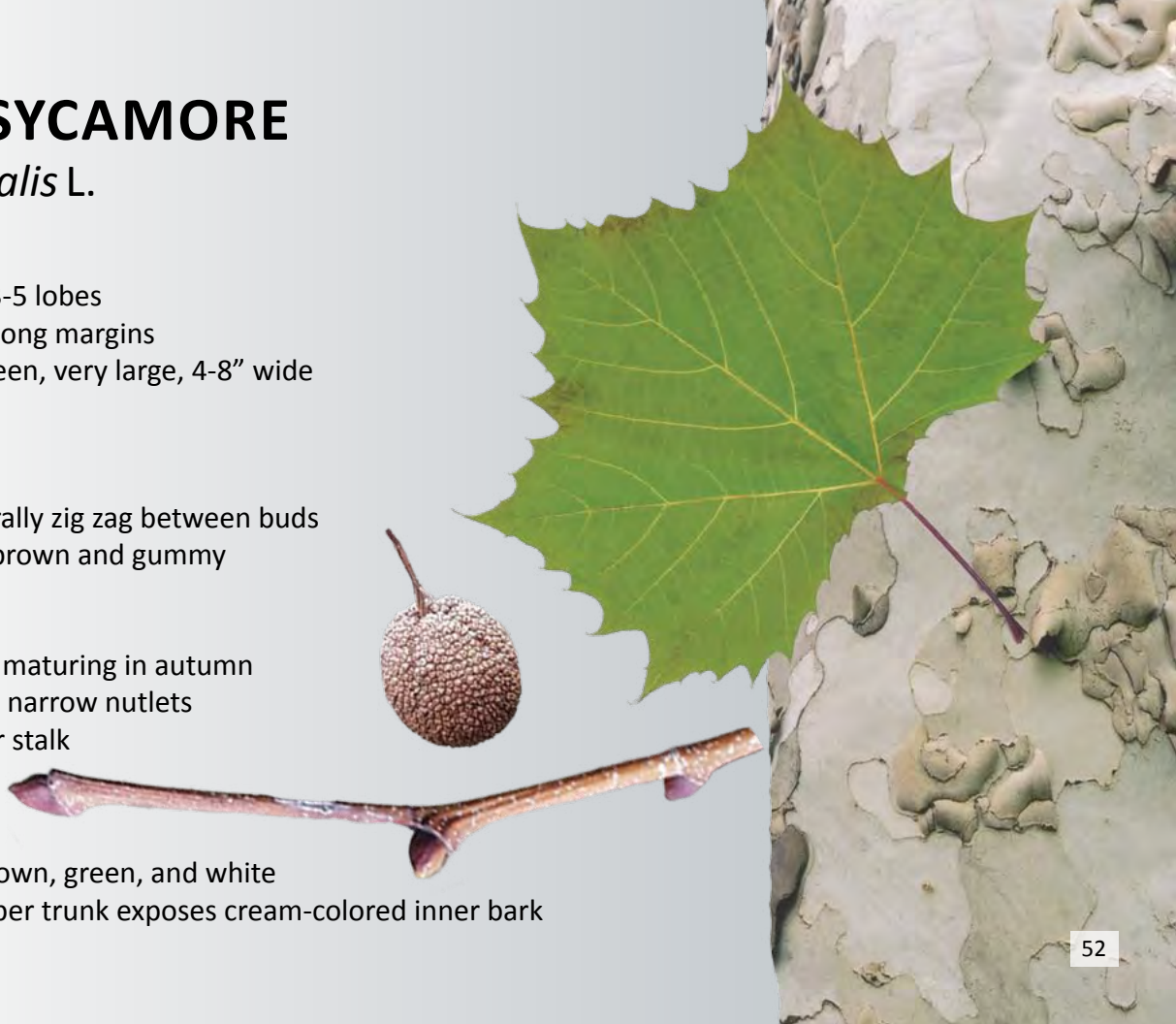
- Light orange brown
- Stout, round, generally zig zag between buds
- Buds dark reddish brown and gummy

## Fruit

- Bristly brown balls, maturing in autumn
- Composed of many narrow nutlets
- Usually one ball per stalk

## Bark

- Peeling layers of brown, green, and white
- Bark peeling on upper trunk exposes cream-colored inner bark



# LONDON PLANETREE

*Platanus x acerifolia* (Ait.) Willd.

## Leaves

- Alternate, simple, 5-9" long, very wide
- 3-5 lobes, coarsely toothed
- Petiole base covers bud

## Twigs

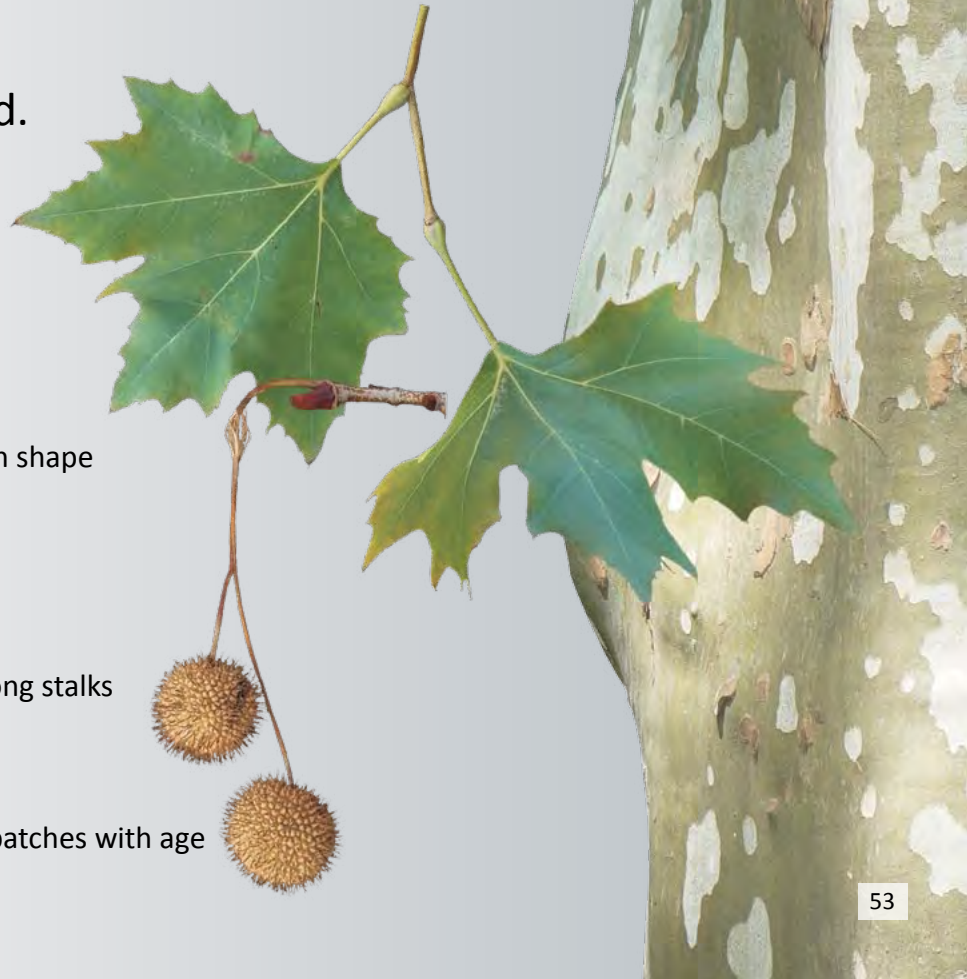
- Green to grayish brown
- Buds are reddish in color and conical in shape
- Twigs have zig-zag form

## Fruit

- Spherical in shape, 1-1.5" diameter
- Ripens to brown
- Usually appears in pairs, hangs from long stalks

## Bark

- Light brown
- Changes to creamy, olive, and yellow patches with age



# WHITE POPLAR

*Populus alba* L.

## Leaves

- Alternate, simple, 3-5 lobes
- Coarsely toothed lobes
- Dark green above, woolly white below
- 4.5-8.4" long

## Twigs

- Greenish gray to reddish brown
- Often covered with cottony wool
- Buds reddish brown, pointed

## Fruit

- Conical capsule containing cottony seeds
- Arranged in erect or drooping clusters

## Bark

- Smooth whitish gray, becoming rough, blackish, and furrowed at the base





# EASTERN COTTONWOOD

*Populus deltoides* Bartr. ex Marsh.

## Leaves

- Alternate, simple, triangular
- Coarse-toothed leaves, flattened stem
- Medium green above and pale green below
- 3-7" long

## Twigs

- Greenish yellow to brown
- Stout; often ringed by large, warty growths
- Buds greenish brown, shiny, and slightly gummy

## Fruit

- Conical capsule containing cottony seeds
- Arranged in loose drooping clusters

## Bark

- Ash gray, greenish yellow on younger trees
- Thick, flattened or rounded ridges, deep fissures



# BIGTOOTH ASPEN

*Populus grandidentata* Michx.

## Leaves

- Alternate, simple, coarse curved teeth
- Dull green above with minute white hairs below
- Leaf stalks long, slender, flattened, or compressed
- 2-3" long

## Twigs

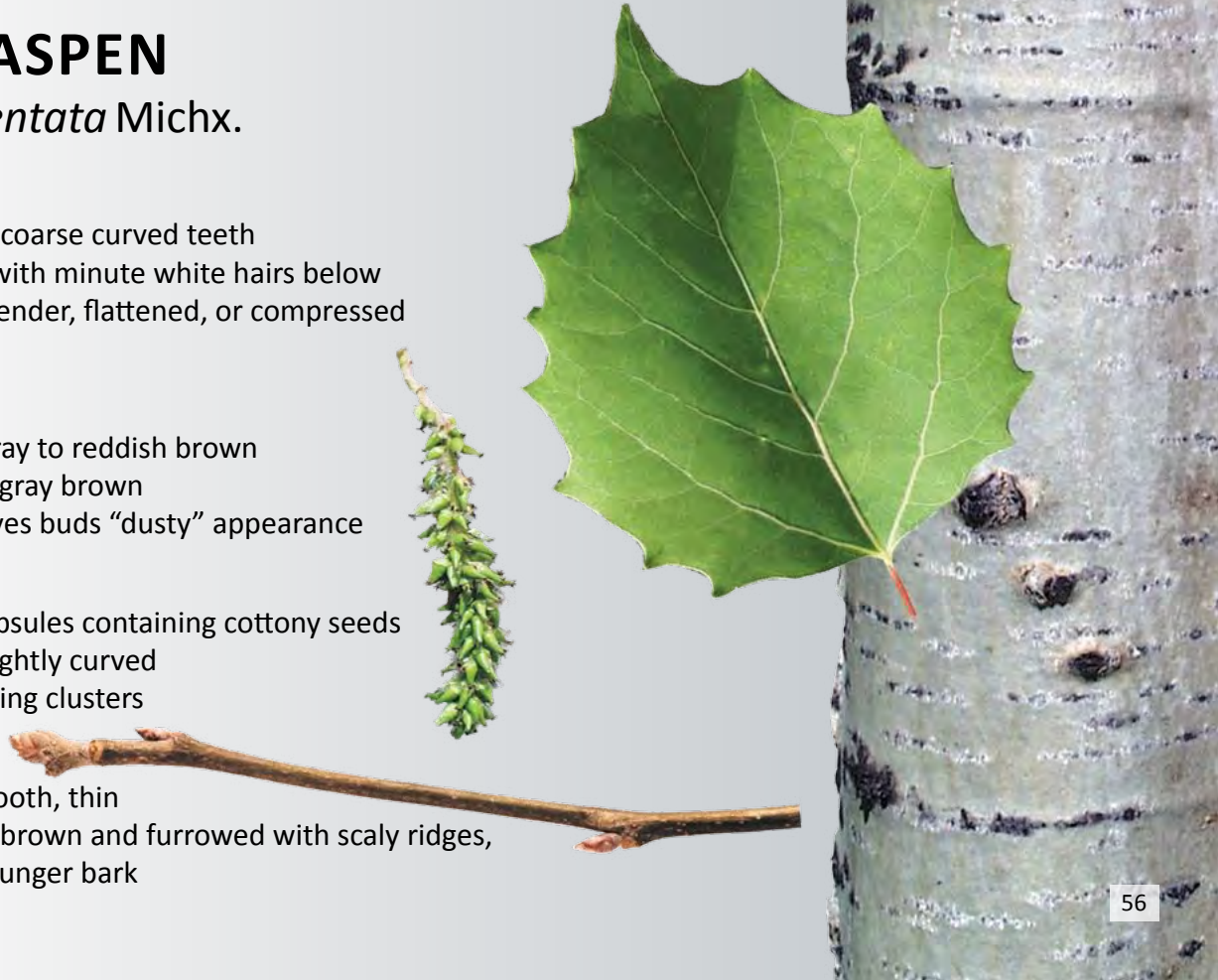
- Stout, brownish gray to reddish brown
- Buds are pointed, gray brown
- Velvety coating gives buds “dusty” appearance

## Fruit

- Narrow conical capsules containing cottony seeds
- Light green and slightly curved
- Arranged in drooping clusters

## Bark

- Greenish gray, smooth, thin
- Older bark is dark brown and furrowed with scaly ridges, orange tinge to younger bark



# LOMBARDY POPLAR

*Populus nigra* var. *italica* Muenchh.

## Leaves

- Alternate, simple, triangular
- Wavy, saw toothed
- Dark green above, light green below
- 2-4" long



## Twigs

- Slender, brownish orange
- Buds are shiny, reddish brown
- Buds long pointed and lay close to twig

## Fruit

- Trees are all male and bear no seeds
- Propagate by cutting and root sprouts

## Bark

- Initially smooth and gray green, becoming blackish brown and irregularly furrowed



# EUROPEAN MOUNTAIN ASH

*Sorbus aucuparia* L.

## Leaves

- Alternate, 9-15 leaflets arranged in two rows along an axis (leaf stalk)
- Each leaflet lance shaped to uniformly wide
- Leaflets sharply toothed at margins

## Twigs

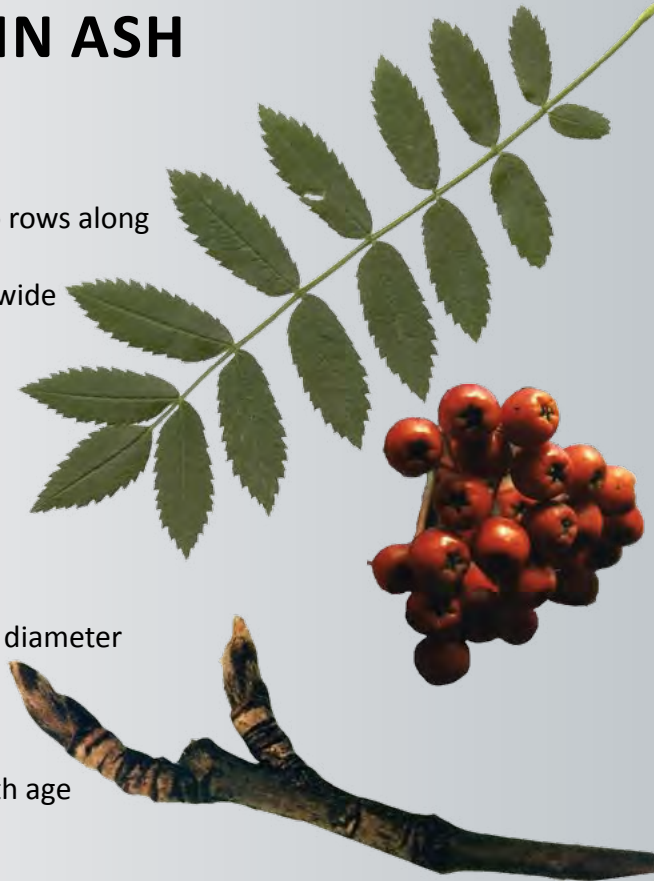
- Branches heavy bodied and spreading
- Gray, smooth, and shiny

## Fruit

- Fruits are in clusters
- Individual fruits rounded, about 0.3" in diameter

## Bark

- Very thin; usually less than 0.15" thick
- Initially smooth surface turns rough with age
- Gray



Infested



Eradicated



Replanted



Photos: Dennis Haugen

A tree-lined Chicago street once infested with Asian longhorned beetle is replanted after eradication.

# Reforestation After Asian Longhorned Beetle

U.S. Forest Service, Urban and Community Forestry

Tree planting is a critical component of helping a community recover from a pest infestation or natural disaster. Plant the right tree in the right place to ensure that trees grow well, provide desired benefits, and don't conflict with infrastructure. A brief checklist of basic steps for tree selection, planting, and maintenance is included below.

**Plan** – Work with knowledgeable professionals to develop a comprehensive reforestation plan. The plan can address prioritizing planting areas, planting/maintenance specifications, recommended species, working with partners and volunteers, inspecting work, and documenting progress. Develop detailed planting site plans for specific areas.

**Assess Planting Site** – Assess all aspects of the site that may affect the tree such as rooting space, distance to buildings, sidewalks, utilities, and competing trees. Check for underground utilities through the location service in your area. Consider the hardiness zone and soil type, drainage, and pH. Check local ordinances that regulate planting on public property.



Tree planting following Asian longhorned beetle eradication activities in Worcester, MA.

**Select Appropriate Species** – Many nonhost species make good choices for urban areas. Select a variety of species to diversify the future tree population and make it more resilient to stresses. Match the characteristics of the tree, including mature size, to the site. Consider what function you want the tree to serve—shade, aesthetics, and privacy, among others.

**Purchase Quality Tree Stock and Handle It Properly** – Determine the type of stock that is best for your project and budget—bare root, potted, or balled and burlapped. Work with a quality nursery and make sure the trees meet accepted standards. Protect tree stock during transportation and on the site prior to planting. Warranties for tree survival and health are recommended.

**Plant the Tree Correctly** – Prepare the appropriate size hole for the root ball—not too deep! Remove burlap and wire basket. Check for encircling roots. If trees must be staked, do it correctly and plan to remove the stakes. Mulch and water at time of planting.

### **Suggested References and Web Sites**

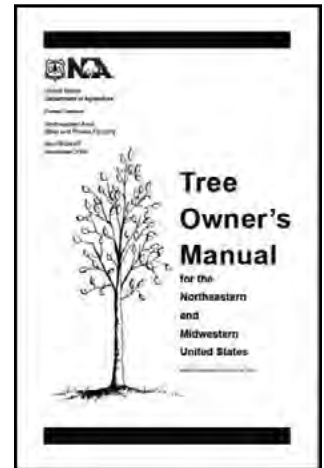
Tree Owner’s Manual, U.S. Forest Service: [www.treeownersmanual.info](http://www.treeownersmanual.info)

Best Management Practices for Tree Planting, ANSI Standards for Nursery Stock and Transplanting, Principles and Practice of Planting Trees and Shrubs: available from The International Society of Arboriculture: <http://www.isa-arbor.com/store/category.aspx>

Northern Tree Selection Web Site: <http://lyra.ifas.ufl.edu/NorthernTrees/>

Your State Forester: <http://www.stateforesters.org/about/who-we-are>

Arbor Day Foundation: [www.arborday.org](http://www.arborday.org)



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