NORTH CAROLINA SCIENCE OLYMPIAD

Roots & Reptiles

2027 COMPETITION BINDER

Division A | For grades 4-5 | Fast station reference

Corrected edition | October 6, 2026



American Beech



Venus Flytrap



Copperhead



Pine Barrens Treefrog

Built for fast identification under station timing

46 official specimens • NC state symbols • plant structure and life cycles • photosynthesis • tropisms • gardening needs and problem diagnosis • reptile and amphibian habitats, diets, life cycles, ecosystem roles and human effects

Photos credited on each specimen page

START HERE

Competition rules & station strategy

OFFICIAL FORMAT

- Team of up to 2 students; maximum time is 50 minutes.
- Hands-on, station-based event. Stay at a station until time is called.
- Teams may not skip ahead or return to a previous station - even if a station is empty.
- No more than 50% of the test will be specimen identification.

BRING

- Writing instruments.
- Up to 2 hand lenses or magnifying glasses.
- One allowed reference combination: 2 commercial field guides; OR 2 one-inch 3-ring binders; OR 1 field guide + 1 binder.

BINDER LIMITS

- Every page must be secured in the rings.
- Plant and leaf samples are allowed only inside plastic sheet protectors.
- Animal parts are not allowed.
- Nothing may be removed from the binder during the event.

A FAST ROUTINE FOR EVERY STATION

- 1. Read every question before touching the binder.
- 2. Decide the section: tree, other plant, reptile, amphibian, plant science or gardening.
- 3. One partner observes while the other searches; say clues aloud.
- 4. Answer every part. If uncertain, write the strongest evidence-based answer.
- 5. With 10 seconds left, check spelling and state-symbol status.

PRACTICE THE BINDER, NOT JUST THE FACTS

Use the same tabs and hand lenses at practice. Run 60-90 second stations so both students learn where information lives. A short, familiar route to the answer beats frantic page-flipping.

FRONT MATTER

Fast specimen index

Trees A-Z, then evergreens; other plants A-Z; animals grouped by kind. Page numbers are in the lower-right corner.

TREES

American Beech 6
Black Gum 7
Bradford Pear / Callery Pear 8
Crepe Myrtle 9
Hickory 10
Oak 11
Red Maple 12
River Birch 13
Sweetgum 14

EVERGREENS

Magnolia 15
Eastern White Pine 16
Loblolly Pine 17
Longleaf Pine 18
Shortleaf Pine 19

OTHER PLANTS

Carolina Lily 21
Eastern Poison Ivy 22
English Ivy 23
Kudzu 24
Scuppernong Grape 25
Venus Flytrap 26

REPTILES

American Alligator 28
Eastern Fence Lizard 29
Eastern Glass Lizard 30
Green Anole 31
Southeastern Five-lined Skink 32
Banded Water Snake 33
Black Rat Snake 34
Copperhead 35
Cottonmouth 36

REPTILES CONTINUED

Dekay's Brownsnake 37
Eastern Diamondback Rattlesnake 38
Eastern Garter Snake 39
Eastern Hognose Snake 40
Eastern Kingsnake 41
Painted Turtle 42
Snapping Turtle 43
Spotted Turtle 44
Eastern Box Turtle 45
Yellow-bellied Slider 46

AMPHIBIANS

American Toad 48
Bullfrog 49
Pine Barrens Treefrog 50
Southern Leopard Frog 51
Marbled Salamander 52
Red-backed Salamander 53
White-spotted Slimy Salamander 54

CONCEPT SECTIONS

Plant & Animal Science divider 55
Plant parts & flowers 56
Life cycle & photosynthesis 57
Tropisms 58
Reptiles vs amphibians 59
Ecosystem roles 60
Gardening divider 61
What plants need 62
Problem diagnosis 63
Fertilizer & competition 64
Rapid comparisons 65
Glossary 66
Sources & photo notes 67

MEMORIZE THESE

North Carolina state symbols

These are easy points. Know the common name and the exact symbol title.

NC

Pine

STATE TREE

Loblolly, longleaf and shortleaf are marked because the official symbol is pine generically.

NC

Carolina Lily

STATE WILDFLOWER

Nodding orange-red, dark-spotted flower with strongly recurved tepals.

see p. 21

NC

Scuppernong Grape

STATE FRUIT

Bronze muscadine grape with thick skin and loose clusters.

see p. 25

NC

Venus Flytrap

STATE CARNIVOROUS PLANT

Hinged traps; insects provide nutrients, while sunlight supplies energy.

see p. 26

NC

Eastern Box Turtle

STATE REPTILE

High domed shell with a hinged lower shell that closes tightly.

see p. 45

NC

Pine Barrens Treefrog

STATE FROG

Green treefrog with a dark mask bordered by a pale line.

see p. 50

NC

Marbled Salamander

STATE SALAMANDER

Chunky black salamander with bold white or silver crossbands.

see p. 52

TEST YOUR PARTNER

Cover the middle column. Can your partner say the symbol title from the organism name - and the organism from the symbol title?

SECTION

Trees

14
SPECIMENS

Identify by leaves, bark and seeds/cones

WHAT TO LOOK FOR

- Start with leaf arrangement: alternate or opposite; simple or compound; lobed, toothed or smooth.
- Use at least two clues. Then check bark and fruit, nut, seed or cone.
- For pines, count needles in each bundle and compare needle and cone length.
- Habitat and season support an ID, but should not replace visible structural clues.
- Evergreens are grouped at the end of this tab: magnolia (p. 15) and the four pines (pp. 16-19).

TREES

American Beech

Fagus grandifolia



Sara Rall - CC BY-NC - iNaturalist photo 9216901



Douglas Goldman - CC BY-SA - iNaturalist photo 81850992



Katja Schulz - CC BY - iNaturalist photo 56682000

FAST IDENTIFICATION

- Smooth, pale gray bark - often compared with elephant skin.
- Alternate simple leaves with straight side veins ending at sharp teeth.
- Small triangular nuts sit inside a prickly four-part husk.

WHERE IT GROWS / WHAT IT NEEDS

Moist, rich, well-drained forests; tolerates shade and grows best in cool, fertile soil.

WHY IT MATTERS

Nuts feed birds and mammals; cavities and dense canopy provide shelter.

DO NOT CONFUSE IT WITH

Hornbeam can have smooth gray bark, but its trunk looks muscled and its leaves are double-toothed.

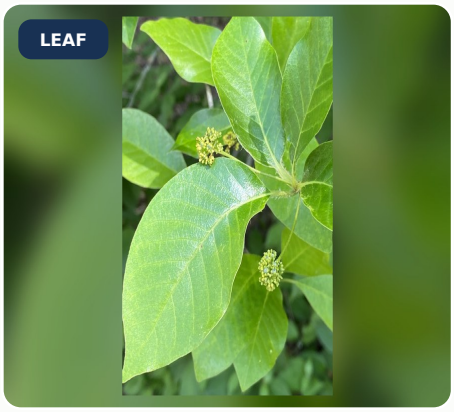
30-SECOND MEMORY CLUE

Smooth gray bark + straight veins + prickly beech-nut husk.

TREES

Black Gum

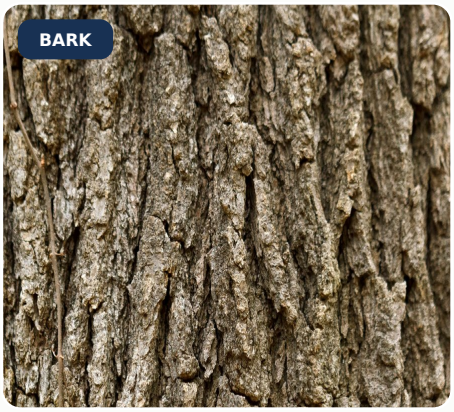
Nyssa sylvatica



mountainad82 - CC BY-NC - iNaturalist photo 197904434



Heather Dionne - CC BY-NC-SA - iNaturalist photo 331043051



Tom Potterfield - CC BY-NC-SA - iNaturalist photo 146754068

FAST IDENTIFICATION

- Alternate, simple, glossy oval leaves; margins are usually smooth.
- Leaves often turn brilliant red early in fall.
- Dark blue-black fruits; older bark becomes blocky like alligator hide.

WHERE IT GROWS / WHAT IT NEEDS

Moist woods and swamp edges, but also upland forests; sun to partial shade.

WHY IT MATTERS

Flowers support pollinators; fruits feed birds; hollow older trees provide dens.

DO NOT CONFUSE IT WITH

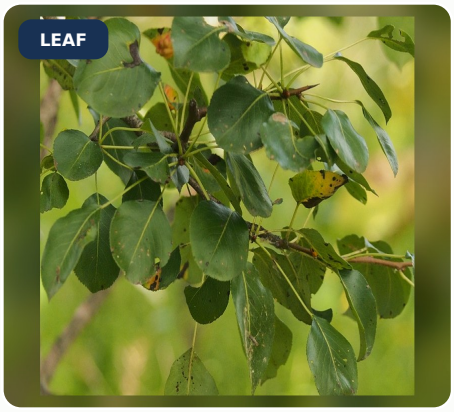
Sweetgum has star-shaped leaves and spiny balls; black gum has oval leaves and fleshy fruits.

30-SECOND MEMORY CLUE

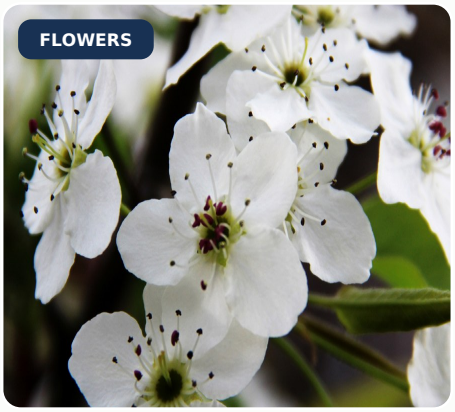
Glossy oval leaf + early red fall color + blue-black fruit.

Bradford Pear / Callery Pear

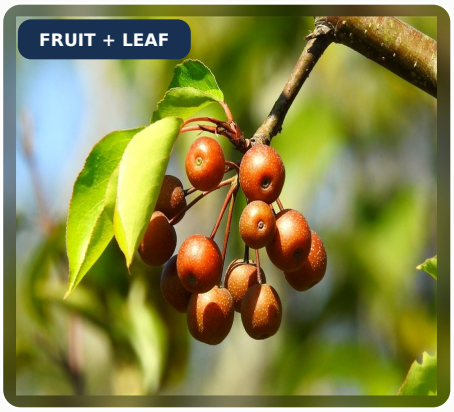
Pyrus calleryana



Ken Potter - CC BY-NC - iNaturalist photo 23987227



Benjamin Smith - CC BY - iNaturalist photo 269351075



Rich_Yang - CC BY-NC - iNaturalist photo 338482790

FAST IDENTIFICATION

- Glossy, round to broadly oval leaves with fine teeth and wavy edges.
- Dense clusters of five-petaled white flowers appear before or with leaves.
- Small hard brown fruits; gray-brown bark becomes furrowed.

WHERE IT GROWS / WHAT IT NEEDS

Roadsides, yards, fields and forest edges; full sun; very tolerant of poor urban soils.

WHY IT MATTERS

Early flowers offer some pollen, but this invasive tree spreads into natural areas and crowds out native plants.

DO NOT CONFUSE IT WITH

Serviceberry also blooms white, but has less glossy leaves and larger edible purple fruit.

30-SECOND MEMORY CLUE

Glossy rounded leaf + clouds of white spring flowers + small hard fruit.

TREES

Crepe Myrtle

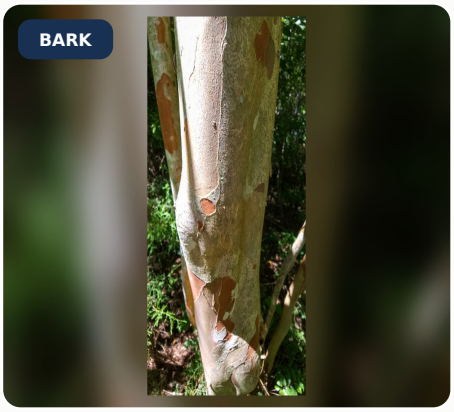
Lagerstroemia



Diego Monsores - CC BY-NC - iNaturalist photo 273276339



Jacinta Lluch Valero - CC BY-SA - Flickr photo 7825618540



grinnin - CC BY-NC - iNaturalist photo 308937137

FAST IDENTIFICATION

- Smooth oval leaves are opposite or nearly opposite, with entire margins.
- Large crinkled flower clusters bloom in summer.
- Smooth mottled bark peels to show tan, cream and cinnamon patches; dry round capsules persist.

WHERE IT GROWS / WHAT IT NEEDS

Sunny yards and streets; heat tolerant; best flowering in full sun and well-drained soil.

WHY IT MATTERS

Flowers support insects; commonly planted for summer color and patterned bark.

DO NOT CONFUSE IT WITH

River birch bark also peels, but its leaves are alternate and double-toothed.

30-SECOND MEMORY CLUE

Crinkled summer flowers + smooth patchy peeling bark.

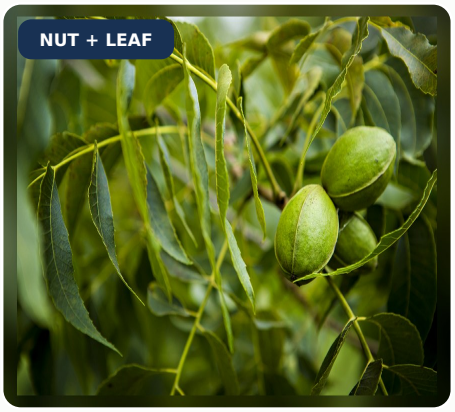
TREES

Hickory

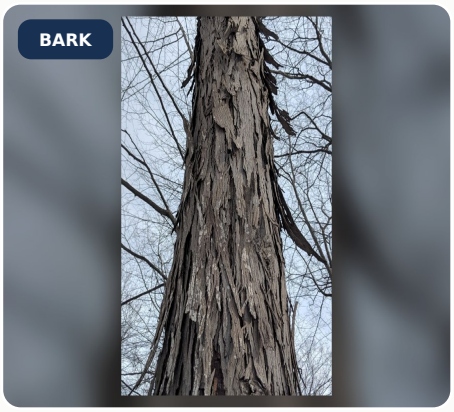
Carya



Ashwin Srinivasan - CC BY - iNaturalist photo 19495006



Mizzou CAFNR - CC BY-NC - iNaturalist photo 157183335



Nathaniel Sharp - CC BY-NC - iNaturalist photo 33407519

FAST IDENTIFICATION

- Alternate compound leaves, usually 5-9 leaflets; the end leaflet is often largest.
- Round or oval nut inside a husk that splits along seams.
- Bark varies by species; some is tight and ridged, shagbark peels in long strips.

WHERE IT GROWS / WHAT IT NEEDS

Hardwood forests in sun or partial shade; prefers deep, well-drained soil.

WHY IT MATTERS

Nuts are high-energy food for squirrels, turkeys and other wildlife; wood is strong and dense.

DO NOT CONFUSE IT WITH

Walnut also has compound leaves, but usually more leaflets and a husk that does not split cleanly into sections.

30-SECOND MEMORY CLUE

Compound leaf + husked nut that splits at seams.

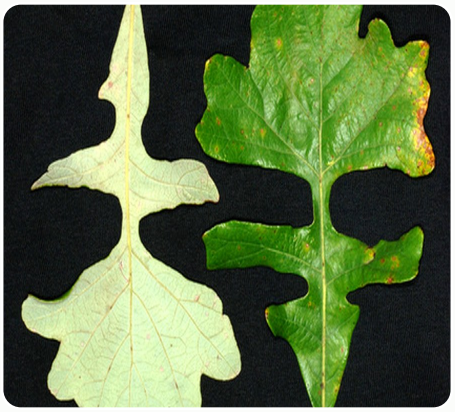
TREES

Oak

Quercus



Miguel Angel Masegosa Martínez - CC BY - iNaturalist photo 90880312



Douglas Goldman - CC BY-SA - iNaturalist photo 56307945



Susan Elliott - CC BY-NC - iNaturalist photo 2592222

FAST IDENTIFICATION

- Alternate simple leaves; may be lobed or unlobed depending on species.
- Fruit is always an acorn seated in a scaly cup.
- Red-oak group often has bristle-tipped lobes; white-oak group usually has rounded lobes.

WHERE IT GROWS / WHAT IT NEEDS

Many habitats from dry ridges to wetlands; most need sun as they mature and well-drained soil.

WHY IT MATTERS

Acorns feed many animals; oaks host hundreds of insect species and provide cavities and strong wood.

DO NOT CONFUSE IT WITH

No other listed tree makes acorns. Leaf shape alone is not enough because oak species vary.

30-SECOND MEMORY CLUE

If it has an acorn, it is an oak.

TREES

Red Maple

Acer rubrum



mefisher - CC0 - iNaturalist photo 371065093



Liv MW - CC BY-NC-SA - iNaturalist photo 508182



Dcrjsr - CC BY - iNaturalist photo 11741021

FAST IDENTIFICATION

- Opposite simple leaves with 3-5 lobes and toothed edges.
- Red twigs, buds, flowers or leaf stalks are common clues.
- Paired winged fruits (samaras); fall color may be red, orange or yellow.

WHERE IT GROWS / WHAT IT NEEDS

Wetlands, stream edges and upland woods; sun to shade; tolerates many soils.

WHY IT MATTERS

Early flowers feed pollinators; seeds feed birds and small mammals; important shade tree.

DO NOT CONFUSE IT WITH

Sweetgum has alternate star-shaped leaves; red maple leaves are opposite and have paired winged fruits.

30-SECOND MEMORY CLUE

Opposite 3-5-lobed leaf + paired helicopter fruits.

TREES

River Birch

Betula nigra



Richard Candler - CC BY-NC - iNaturalist photo 816571



Plant Image Library - CC BY-SA - iNaturalist photo 119528914



Katja Schulz - CC BY - iNaturalist photo 119528913

FAST IDENTIFICATION

- Young bark peels in papery curls colored salmon, cinnamon or cream.
- Alternate triangular to diamond-shaped leaves with double-toothed edges.
- Hanging flower catkins and small cone-like seed clusters.

WHERE IT GROWS / WHAT IT NEEDS

Riverbanks, floodplains and wet soils; sun to partial shade; handles periodic flooding.

WHY IT MATTERS

Roots stabilize streambanks; seeds and insects on the tree feed wildlife.

DO NOT CONFUSE IT WITH

Other birches may have white bark; river birch is famous for cinnamon-salmon peeling bark.

30-SECOND MEMORY CLUE

Peeling cinnamon bark + double-toothed triangular leaf.

TREES

Sweetgum

Liquidambar styraciflua



Randy Puckett - CC BY-NC - iNaturalist photo 239888168



Misty Keith - CC BY-NC - iNaturalist photo 604728403



Douglas Goldman - CC BY-SA - iNaturalist photo 650048998

FAST IDENTIFICATION

- Alternate, star-shaped leaves with 5-7 pointed lobes.
- Round woody gum balls (fruit clusters) covered with sharp points.
- Young twigs may have corky wings; bark becomes deeply ridged.

WHERE IT GROWS / WHAT IT NEEDS

Moist woods, bottomlands and old fields; sun to partial shade.

WHY IT MATTERS

Seeds feed finches and other birds; tree colonizes disturbed ground and provides shade.

DO NOT CONFUSE IT WITH

Maples can have lobed leaves, but maple leaves are opposite and make paired winged fruits - not spiky balls.

30-SECOND MEMORY CLUE

Star leaf + spiky gum ball + alternate leaves.

EVERGREEN TREES

Magnolia

Magnolia grandiflora



潘立傑 LiChieh Pan - CC BY-NC-SA - iNaturalist photo 82254330



ash_morgan - CC BY-NC - iNaturalist photo 169262925



Douglas Goldman - CC BY-SA - iNaturalist photo 557171383

FAST IDENTIFICATION

- Large evergreen leaves are thick, glossy dark green above and often rusty-fuzzy below.
- Huge fragrant white flowers.
- Cone-like red-seeded fruit; smooth gray bark when young.

WHERE IT GROWS / WHAT IT NEEDS

Warm, moist, well-drained sites; sun to partial shade; native to the southeastern Coastal Plain.

WHY IT MATTERS

Flowers feed beetle pollinators; red seeds feed birds; dense foliage provides cover.

DO NOT CONFUSE IT WITH

Sweetbay magnolia usually has smaller leaves with silvery rather than rusty undersides.

30-SECOND MEMORY CLUE

Big glossy evergreen leaf + rusty underside + huge white flower.

EVERGREEN TREES

Eastern White Pine

Pinus strobus



Forest and Kim Starr - CC BY - iNaturalist photo 638440764



Carter Dorscht - CC0 - iNaturalist photo 390760300



Conquest - CC BY - iNaturalist photo 413644120

FAST IDENTIFICATION

- Five soft, flexible needles per bundle - remember WHITE has five letters.
- Long, narrow, usually unarmed cones with thin scales.
- Branches form layered whorls; young bark is smooth, older bark deeply furrowed.

WHERE IT GROWS / WHAT IT NEEDS

Cool, moist, well-drained sites; common in mountains and planted statewide; full sun to partial shade.

WHY IT MATTERS

Seeds feed wildlife; tall trees provide nesting and cover; valuable timber.

DO NOT CONFUSE IT WITH

Other listed pines have two or three needles per bundle; white pine alone has five.



A (the_little_elephant) - CC BY-NC - iNaturalist photo 245921115

30-SECOND MEMORY CLUE

WHITE = 5 letters = 5 soft needles.

EVERGREEN TREES

Loblolly Pine

Pinus taeda

NC STATE SYMBOL

Pine trees (generic) are the NC State Tree



Susie Doe - CC BY-NC-SA - iNaturalist photo 102085356



radinis - CC BY-NC - iNaturalist photo 130584206



Diana Soteropoulos - CC BY-NC - iNaturalist photo 168824004

FAST IDENTIFICATION

- Usually three stiff needles per bundle, about 6-9 inches long.
- Egg-shaped cones have a sharp prickle on each scale.
- Mature bark forms reddish-brown plates.

WHERE IT GROWS / WHAT IT NEEDS

Common Coastal Plain and Piedmont tree; moist lowlands and old fields; full sun.

WHY IT MATTERS

Major timber tree; seeds and cover support wildlife.

DO NOT CONFUSE IT WITH

Longleaf has much longer needles and huge cones; shortleaf has shorter needles and smaller cones.



Jason Hernandez - CC BY - iNaturalist photo 279112216

30-SECOND MEMORY CLUE

Three medium-long needles + prickly egg-shaped cone.

EVERGREEN TREES

Longleaf Pine

Pinus palustris

NC STATE SYMBOL

Pine trees (generic) are the NC State Tree



Katja Schulz - CC BY - iNaturalist photo 14863929



Douglas Goldman, USDA - CC BY-NC - NCSU Plant Toolbox



Cathy Dewitt - CC BY - NCSU Plant Toolbox

FAST IDENTIFICATION

- Three very long needles per bundle, often 8-18 inches, forming large tufts.
- Very large cones, commonly 6-10 inches long, with prickled scales.
- Young trees have a distinctive grass stage before shooting upward.

WHERE IT GROWS / WHAT IT NEEDS

Sunny, sandy Coastal Plain; adapted to frequent low-intensity fire.

WHY IT MATTERS

Longleaf ecosystems support red-cockaded woodpeckers, gopher frogs and many grasses and wildflowers.

DO NOT CONFUSE IT WITH

Loblolly needles and cones are shorter; longleaf looks dramatically tufted.



Uploaded by daniel_e - CC0 - iNaturalist photo 66164433

30-SECOND MEMORY CLUE

Longest needles + biggest cones + grass-stage seedling.

EVERGREEN TREES

Shortleaf Pine

Pinus echinata

NC STATE SYMBOL

Pine trees (generic) are the NC State Tree



Joshua Hodge - CC BY-NC - NCSU Plant Toolbox



Douglas Goldman - CC BY-SA - iNaturalist photo 54642309



Sharon Forsyth - CC BY-NC - iNaturalist photo 27633172

FAST IDENTIFICATION

- Two or sometimes three needles per bundle, usually 3-5 inches long.
- Small cones, usually 1.5-2.5 inches, with short prickles.
- Small resin pockets may dot the bark; older bark forms flat plates.

WHERE IT GROWS / WHAT IT NEEDS

Dry uplands and Piedmont forests; full sun; more fire tolerant than loblolly.

WHY IT MATTERS

Timber and wildlife cover; can resprout from the base after young trees are damaged by fire.

DO NOT CONFUSE IT WITH

Virginia pine usually has twisted two-needle bundles; loblolly needles and cones are much larger.



dylanrice13 - CC BY-NC - iNaturalist photo 66411482

30-SECOND MEMORY CLUE

Bundles of 2 or 3 + smallest cones of the four listed pines.

SECTION

Other Plants

Bushes, vines, flowers and a carnivorous plant

6
SPECIMENS

WHAT TO LOOK FOR

- Notice whether the plant climbs, trails or forms a low rosette.
- Count leaflets carefully: one lobed leaf is not the same as three separate leaflets.
- Know this section's three state symbols: Carolina lily, scuppernong grape and Venus flytrap.
- Never collect poison ivy; use photographs only.

OTHER PLANTS

Carolina Lily

Lilium michauxii

NC STATE SYMBOL

NC State Wildflower



Michael J. Papay - CC BY - iNaturalist photo 221279883



Michael J. Papay - CC BY - iNaturalist photo 221280337

FAST IDENTIFICATION

- Nodding orange to red-orange flower with dark spots.
- Six tepals curve strongly backward; long stamens hang forward.
- Narrow leaves appear in whorls around the stem.

WHERE IT GROWS / WHAT IT NEEDS

Open woods, roadsides and dry slopes; filtered sun; well-drained acidic soil.

WHY IT MATTERS

Native wildflower pollinated by swallowtail butterflies; NC's official state wildflower.

DO NOT CONFUSE IT WITH

Turk's-cap lily has a green star at the flower's center; Carolina lily has no green star and fewer flowers.

30-SECOND MEMORY CLUE

Nodding spotted orange flower + swept-back petals + whorled leaves.

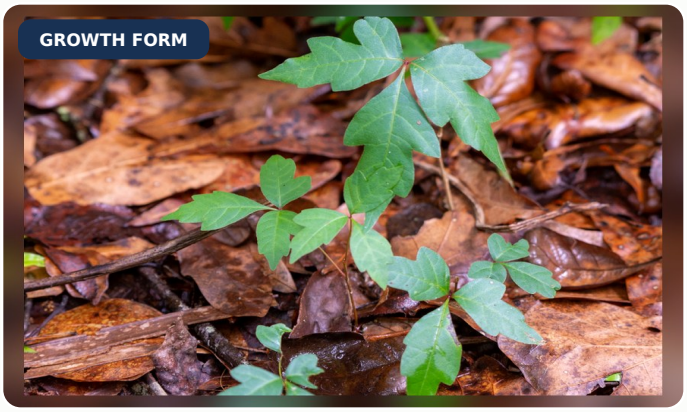
OTHER PLANTS

Eastern Poison Ivy

Toxicodendron radicans



Sam Fraser-Smith - CC BY - iNaturalist photo 2237896



Cathy Bester - CC BY-NC - iNaturalist photo 121663263

FAST IDENTIFICATION

- Three leaflets: 'leaves of three, let it be.' The middle leaflet has a longer stalk.
- Leaf shape varies; edges may be smooth, toothed or lobed.
- May trail, form a shrub, or climb as a hairy vine; clusters of pale berries.

WHERE IT GROWS / WHAT IT NEEDS

Forests, yards, roadsides and edges; sun or shade; spreads readily in disturbed places.

WHY IT MATTERS

Berries feed birds, but urushiol oil can cause a severe human skin rash. Never collect for the binder.

DO NOT CONFUSE IT WITH

Virginia creeper usually has five leaflets. Boxelder seedlings have opposite leaves; poison ivy leaves alternate.

30-SECOND MEMORY CLUE

Three leaflets + longer-stalked middle leaflet + hairy climbing vine.

OTHER PLANTS

English Ivy

Hedera helix



Marianna Boi - CC BY - iNaturalist photo 38428455



Douglas Goldman - CC BY-SA - iNaturalist photo 50733032

FAST IDENTIFICATION

- Evergreen vine with waxy leaves and pale veins.
- Juvenile climbing leaves usually have 3-5 lobes; mature flowering leaves may be unlobed.
- Clings with many small aerial rootlets; mature vines make round black berries.

WHERE IT GROWS / WHAT IT NEEDS

Shady forests, walls and yards; tolerates deep shade; can climb trees and blanket the ground.

WHY IT MATTERS

Provides cover but is invasive in North Carolina; dense growth smothers native plants and adds weight to trees.

DO NOT CONFUSE IT WITH

Poison ivy has three separate leaflets; English ivy has one lobed leaf.

30-SECOND MEMORY CLUE

One waxy lobed evergreen leaf + clinging rootlets.

OTHER PLANTS

Kudzu

Pueraria montana var. lobata



方伊琳(阿鈣) - CC BY-NC - iNaturalist photo 12273673



Alex Krohn - CC BY-NC-SA - iNaturalist photo 100986036

FAST IDENTIFICATION

- Each leaf has three large leaflets; leaflets may be entire or lobed.
- Fast, rope-like vines cover shrubs and trees.
- Purple pea-like fragrant flowers and flattened hairy seed pods.

WHERE IT GROWS / WHAT IT NEEDS

Sunny roadsides, fields and forest edges; vigorous in warm weather and disturbed soil.

WHY IT MATTERS

A nitrogen-fixing legume, but highly invasive; blocks light and can smother entire plant communities.

DO NOT CONFUSE IT WITH

Poison ivy also has three leaflets, but kudzu twines its stems around supports; poison ivy clings with rootlets.

30-SECOND MEMORY CLUE

Huge three-part leaves + blanket-forming vine + purple pea flowers.

OTHER PLANTS

Scuppernong Grape

Vitis rotundifolia

NC STATE SYMBOL

NC State Fruit



Mary Keim - CC BY-NC-SA - iNaturalist photo 76764131



Te Chang - CC BY-NC - iNaturalist photo 45633371

FAST IDENTIFICATION

- A muscadine grape with round bronze to green-gold fruits in small clusters.
- Thick, glossy, roundish leaves with toothed edges.
- Woody climbing vine with unbranched tendrils; bark stays tight, not peeling in strips.

WHERE IT GROWS / WHAT IT NEEDS

Warm, sunny woodland edges and well-drained soils of the Southeast.

WHY IT MATTERS

Fruit feeds wildlife and people; culturally and agriculturally important in North Carolina.

DO NOT CONFUSE IT WITH

Bunch grapes usually bear many fruits in long clusters; muscadines form smaller loose clusters with thick-skinned berries.

30-SECOND MEMORY CLUE

Bronze muscadine fruit + round toothed leaf + climbing tendrils.

OTHER PLANTS

Venus Flytrap

Dionaea muscipula

NC STATE SYMBOL

NC State Carnivorous Plant



Galen Green - CC BY-NC - iNaturalist photo 293878659



David Hill - CC BY - iNaturalist photo 108567955

FAST IDENTIFICATION

- Low rosette of hinged traps edged with tooth-like cilia.
- Inside each trap are sensitive trigger hairs; repeated touches cause rapid closing.
- Small white flowers rise above the traps on a tall stalk.

WHERE IT GROWS / WHAT IT NEEDS

Sunny, wet, acidic, nutrient-poor bogs and pocosins in a small Coastal Plain range of NC and SC; depends on fire-open habitat.

WHY IT MATTERS

Still makes food by photosynthesis. Insects supply scarce nutrients like nitrogen, not its main energy.

DO NOT CONFUSE IT WITH

Pitcher plants trap prey in tubes; sundews use sticky leaves; flytraps have hinged jaw-like leaves.

30-SECOND MEMORY CLUE

Hinged tooth-edged traps; insects provide nutrients, sunlight provides energy.

SECTION

Reptiles

Alligator, lizards, snakes and turtles

19
SPECIMENS

WHAT TO LOOK FOR

- Reptiles have scales or scutes, breathe with lungs and do not metamorphose.
- Use pattern, body shape, head markings, scales and special structures - not color alone.
- Know habitat, food, egg vs live birth, ecosystem role and effects of people.
- Copperhead, cottonmouth and eastern diamondback are venomous. Never handle any unknown snake.

REPTILES

American Alligator

Alligator mississippiensis



sandiwheeler - CC BY-NC - iNaturalist photo 446571555



Josiah Smith - CC BY-NC - iNaturalist photo 482931168

FAST IDENTIFICATION

- Broad U-shaped snout; dark armored body; eyes and nostrils high on head.
- When the mouth is closed, most lower teeth are hidden.
- Young have bright yellow crossbands on the body and tail.

HABITAT

Freshwater swamps, marshes, ponds and slow rivers, mainly in the Coastal Plain.

FOOD

Fish, turtles, birds and mammals; young eat insects and small aquatic animals.

LIFE CYCLE

Female builds a vegetation nest and guards eggs and hatchlings; young resemble small adults.

WHY IT MATTERS

Top wetland predator and ecosystem engineer; creates 'gator holes' used by other animals during drought.

DO NOT CONFUSE IT WITH

Crocodiles have a narrower V-shaped snout and exposed lower fourth tooth; wild crocodiles are not native to NC.

30-SECOND MEMORY CLUE

U-shaped snout + armored body + hidden lower teeth.

REPTILES

Eastern Fence Lizard

Sceloporus undulatus



Uploaded by w_mark_c - CC0 - iNaturalist photo 123858448



rabbiter - CC BY-NC - iNaturalist photo 123707472

FAST IDENTIFICATION

- Rough, spiny-looking scales; gray-brown body with dark wavy crossbars.
- Males show bright blue patches on the throat and belly.
- Often seen flat against tree trunks, fences or logs.

HABITAT

Dry open woods, forest edges, logs, rocks and fences; needs sunny basking places.

FOOD

Mostly insects and spiders.

LIFE CYCLE

Lays eggs in soil; hatchlings look like tiny adults and grow without metamorphosis.

WHY IT MATTERS

Controls insects and is food for snakes, birds and mammals.

DO NOT CONFUSE IT WITH

Five-lined skinks are smoother and shinier; fence lizards have rough keeled scales.

30-SECOND MEMORY CLUE

Rough scales + wavy bars + blue male belly.

REPTILES

Eastern Glass Lizard

Ophisaurus ventralis



grinnin - CC BY-NC - iNaturalist photo 322159117



Josiah Londerée - CC BY - iNaturalist photo 181342075

FAST IDENTIFICATION

- Long, snake-like lizard with no legs and a very long tail.
- Has movable eyelids and external ear openings - snakes do not.
- Body often greenish to brown with lengthwise markings; tail can break off.

HABITAT

Sandy grasslands, marsh edges and open Coastal Plain habitats.

FOOD

Insects, spiders, snails, small reptiles and rodents; jaws do not stretch like a snake's.

LIFE CYCLE

Lays eggs; female may remain with the nest. Young look like smaller adults.

WHY IT MATTERS

Predator of invertebrates and prey for larger animals.

DO NOT CONFUSE IT WITH

A snake lacks eyelids and external ear openings; a glass lizard has both.

30-SECOND MEMORY CLUE

Legless lizard with eyelids and ear openings.

REPTILES

Green Anole

Anolis carolinensis



Roberto R. Calderón - CC BY-NC - iNaturalist photo 2626904



Tommy Farquhar - CC BY-NC - iNaturalist photo 44877514

FAST IDENTIFICATION

- Slender lizard with long toes and tail; can change from green to brown.
- Male has a pink-red throat fan called a dewlap.
- Toe pads help it climb leaves, fences and branches.

HABITAT

Shrubs, vines, yards and woodland edges; warm sunny perches with nearby cover.

FOOD

Small insects and spiders.

LIFE CYCLE

Female lays one egg at a time during warm months; hatchlings are miniature adults.

WHY IT MATTERS

Controls insects and is prey for birds, snakes and larger lizards.

DO NOT CONFUSE IT WITH

Not a chameleon. Carolina anoles change color but are a different lizard family.

30-SECOND MEMORY CLUE

Green-or-brown climber + long toes + red male dewlap.

Southeastern Five-lined Skink

Plestiodon inexpectatus



evangrimes - CC BY - iNaturalist photo 123619813



Todd Pierson - CC BY-NC-SA - iNaturalist photo 55923416

FAST IDENTIFICATION

- Smooth, shiny scales and five light stripes on a dark body in young animals.
- Juveniles have a brilliant blue tail; adult males may develop reddish heads.
- Body is more streamlined and glossy than a fence lizard.

HABITAT

Dry woods, stumps, logs and buildings, especially in the Coastal Plain and Piedmont.

FOOD

Insects, spiders and other small invertebrates.

LIFE CYCLE

Lays eggs under cover; female guards them. Young resemble adults but are more striped and blue-tailed.

WHY IT MATTERS

Controls insects and is important prey; can drop its tail to escape.

DO NOT CONFUSE IT WITH

Common five-lined and broad-headed skinks are similar; location and scale details may be needed, so focus on the official common name and classic five-line pattern.

30-SECOND MEMORY CLUE

Shiny body + five stripes + electric-blue juvenile tail.

REPTILES

Banded Water Snake

Nerodia fasciata



Miles Buddy - CC BY-NC - iNaturalist photo 330521230



kaynine35 - CC BY-NC - iNaturalist photo 267617835

FAST IDENTIFICATION

- Heavy-bodied nonvenomous snake with dark crossbands, usually widest across the back.
- Round pupils; head is only slightly wider than neck when relaxed.
- Keeled scales; pale belly with dark squarish markings.

HABITAT

Ponds, swamps, marshes and slow streams, mainly Coastal Plain.

FOOD

Fish and amphibians.

LIFE CYCLE

Gives birth to live young; babies are more brightly patterned than adults.

WHY IT MATTERS

Important aquatic predator; often killed because it is mistaken for a cottonmouth.

DO NOT CONFUSE IT WITH

Cottonmouth has a heat-sensing pit and vertical pupils; both can have a dark eye stripe. Behavior alone is not a safe ID.

30-SECOND MEMORY CLUE

Nonvenomous water snake; bands tend to be broad across the back.

REPTILES

Black Rat Snake

Pantherophis alleghaniensis



Zane Fish - CC BY-NC - iNaturalist photo 631968885



Catherine Bollinger - CC BY-NC - iNaturalist photo 238128650

FAST IDENTIFICATION

- Large, mostly black snake; white chin and throat; faint blotches may show.
- Slender compared with venomous pit vipers; excellent climber.
- Keeled scales; belly usually checkered black and white near the front.

HABITAT

Forests, farms, barns and suburbs; climbs trees and buildings.

FOOD

Rodents, birds and eggs; kills prey by constriction.

LIFE CYCLE

Lays eggs; hatchlings are gray with dark blotches and look very different from adults.

WHY IT MATTERS

Controls rodents and is harmless to people when left alone.

DO NOT CONFUSE IT WITH

Young are blotched and may resemble other snakes; adults differ from black racers by keeled scales, not chin color.

30-SECOND MEMORY CLUE

Big black climber + white chin; babies are gray and blotched.

REPTILES

Copperhead

Agkistrodon contortrix

VENOMOUS
Observe - never handle



Shreybae - CC BY-NC - iNaturalist photo 395750671



Yinan Li - CC BY-NC - iNaturalist photo 649442308

FAST IDENTIFICATION

- Tan to copper body with dark hourglass bands: narrow across the spine, wide on the sides.
- Broad triangular head, vertical pupils and heat-sensing pit.
- Young have a bright yellow-green tail tip.

HABITAT

Wooded hillsides, rocky areas, stream edges and suburban leaf litter.

FOOD

Rodents, frogs, lizards and insects; young may lure prey with the colored tail.

LIFE CYCLE

Gives birth to live young; young resemble adults except for the tail tip.

WHY IT MATTERS

Predator that controls small animals. Venomous: observe only from a safe distance.

DO NOT CONFUSE IT WITH

Water-snake bands are often widest on top; copperhead hourglasses pinch narrow across the back.

30-SECOND MEMORY CLUE

Hourglass bands narrow on the spine. Never handle.

REPTILES

Cottonmouth

Agkistrodon piscivorus

VENOMOUS
Observe - never handle



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Jance S Carter - CC BY-NC - iNaturalist photo 75842969

FAST IDENTIFICATION

- Heavy-bodied pit viper with a blocky head and dark stripe through the eye.
- Young are strongly banded and have a yellow-green tail tip; adults may become very dark.
- May display a white mouth, but a closed mouth does not rule it out.

HABITAT

Swamps, marshes, lakeshores and slow waterways in the Coastal Plain.

FOOD

Fish, frogs, snakes, turtles, birds and small mammals.

LIFE CYCLE

Gives birth to live young; juveniles have brighter patterns.

WHY IT MATTERS

Aquatic predator and scavenger. Venomous: keep a safe distance.

DO NOT CONFUSE IT WITH

Nonvenomous water snakes often have narrower heads and no facial pit; do not approach either one to inspect.

30-SECOND MEMORY CLUE

Heat pit + vertical pupils + coastal wetlands. Never handle.

REPTILES

Dekay's Brownsnake

Storeria dekayi



Michael J. Papay - CC BY - iNaturalist photo 422007190



Patrick Coin - CC BY-NC - iNaturalist photo 637209311

FAST IDENTIFICATION

- Small, slender brown or gray snake, usually under 15 inches.
- Two rows of small dark spots border a lighter stripe down the back.
- Head is small; scales are keeled.

HABITAT

Leaf litter, gardens, parks and city lots; hides under logs, rocks and debris.

FOOD

Earthworms, slugs and snails.

LIFE CYCLE

Gives birth to live young; babies are tiny and may have a pale neck collar.

WHY IT MATTERS

Helpful garden predator that eats slugs; harmless to people.

DO NOT CONFUSE IT WITH

A juvenile rat snake has bold blotches; a brownsnake is tiny with paired spots and a faint stripe.

30-SECOND MEMORY CLUE

Tiny brown garden snake + paired dark spots + pale back stripe.

Eastern Diamondback Rattlesnake

Crotalus adamanteus

VENOMOUS
Observe - never handle



Yinan Li - CC BY-NC - iNaturalist photo 346751387



natalie_likes_snakes - CC BY-NC - iNaturalist photo 125431484

FAST IDENTIFICATION

- Very large, heavy snake with dark diamond shapes outlined in cream.
- Diamonds fade into dark bands on a brown or gray tail; rattle at the tip.
- Broad head, vertical pupils and heat-sensing pit.

HABITAT

Longleaf pine flatwoods, sandy scrub and coastal habitats; now rare in North Carolina.

FOOD

Rabbits, rats and other mammals.

LIFE CYCLE

Gives birth to live young; rattles gain a segment when the snake sheds, but segments do not equal age.

WHY IT MATTERS

Controls rodents; venomous and protected from careless disturbance.

DO NOT CONFUSE IT WITH

Timber rattlesnake has dark chevrons and usually a solid black tail, not cream-edged diamonds.

30-SECOND MEMORY CLUE

Cream-edged diamonds + brown or gray banded tail + rattle. Never handle.

REPTILES

Eastern Garter Snake

Thamnophis sirtalis sirtalis



Jonathan Gagnon - CC BY-NC - iNaturalist photo 28532243



Mike Leveille - CC BY-NC - iNaturalist photo 16577842

FAST IDENTIFICATION

- One light stripe down the back and one along each side.
- Dark checkered spots may appear between stripes.
- Slender body; color ranges from greenish to brown or black.

HABITAT

Gardens, meadows, woods and wetland edges; often near water but also common in yards.

FOOD

Earthworms, amphibians, fish and other small prey.

LIFE CYCLE

Gives birth to live young; young look like miniature adults.

WHY IT MATTERS

Controls pests and links aquatic and land food webs; generally harmless.

DO NOT CONFUSE IT WITH

Ribbon snakes are slimmer with cleaner stripes and a longer tail; garter snakes often look checkered.

30-SECOND MEMORY CLUE

Three pale stripes with checkering between them.

REPTILES

Eastern Hognose Snake

Heterodon platirhinos



evangrimes - CC BY - iNaturalist photo 198456500



Shreybae - CC BY-NC - iNaturalist photo 393302291

FAST IDENTIFICATION

- Distinct upturned snout used for digging.
- Color is extremely variable: blotched, orange, brown, gray or nearly black.
- May flatten its neck, hiss, bluff-strike and then play dead.

HABITAT

Sandy woods, fields and coastal dunes where it can dig.

FOOD

Especially toads; also frogs and small animals.

LIFE CYCLE

Lays eggs in sandy soil; hatchlings have the same upturned snout.

WHY IT MATTERS

Specialist predator of toads; harmless to people despite dramatic bluffing.

DO NOT CONFUSE IT WITH

Do not rely on color. The unmistakable clue is the shovel-like upturned nose.

30-SECOND MEMORY CLUE

Upturned hog nose + dramatic bluff + may play dead.

REPTILES

Eastern Kingsnake

Lampropeltis getula



Shreybae - CC BY-NC - iNaturalist photo 637917906



Shreybae - CC BY-NC - iNaturalist photo 661778801

FAST IDENTIFICATION

- Glossy black body with thin white or yellow chain-like bands.
- Smooth scales and a small head not much wider than the neck.
- Pattern can vary, but linked pale bands are the classic clue.

HABITAT

Forests, fields, wetlands and farms; often uses logs, burrows and debris for cover.

FOOD

Rodents, lizards, turtle eggs and other snakes, including venomous snakes; constrictor.

LIFE CYCLE

Lays eggs; hatchlings resemble small adults.

WHY IT MATTERS

Controls rodents and other snakes; nonvenomous and beneficial.

DO NOT CONFUSE IT WITH

A black rat snake is mostly solid black with a white chin; kingsnake is glossy with chain-like bands.

30-SECOND MEMORY CLUE

Black snake wrapped in pale chain links.

REPTILES

Painted Turtle

Chrysemys picta



Susan Elliott - CC BY-NC - iNaturalist photo 9927445



smmcdonald - CC BY-NC - iNaturalist photo 49642243

FAST IDENTIFICATION

- Smooth, low dark shell with yellow lines and red markings along the edge.
- Head and legs have bright yellow stripes; red may show on limbs and shell margin.
- Scutes across the center of the top shell line up in straight rows.

HABITAT

Quiet ponds, marshes and slow streams with basking logs and aquatic plants.

FOOD

Aquatic insects, snails, tadpoles, carrion and plants.

LIFE CYCLE

Female lays eggs on land; temperature influences hatchling sex; young enter water after hatching.

WHY IT MATTERS

Consumes plants and small animals and provides prey; basking helps regulate body temperature.

DO NOT CONFUSE IT WITH

Sliders have a taller shell and a large colored patch behind the eye; painted turtles show red along shell edges.

30-SECOND MEMORY CLUE

Dark smooth shell painted with yellow lines and red edges.

REPTILES

Snapping Turtle

Chelydra serpentina



Alyssa Harvey - CC BY-NC - iNaturalist photo 165512432



lwolfartist - CC BY - iNaturalist photo 352641070

FAST IDENTIFICATION

- Large head, powerful hooked jaws and very long saw-toothed tail.
- Top shell is rough with three low ridges in younger turtles.
- Bottom shell is small, so the turtle cannot close itself inside.

HABITAT

Ponds, marshes, lakes and slow rivers with muddy bottoms.

FOOD

Fish, frogs, invertebrates, carrion and aquatic plants; opportunistic omnivore.

LIFE CYCLE

Female leaves water to lay eggs on land; hatchlings head toward water.

WHY IT MATTERS

Scavenger and predator that helps recycle nutrients; defensive on land but usually avoids people in water.

DO NOT CONFUSE IT WITH

Alligator snapping turtles have a more heavily ridged shell and are not native to North Carolina.

30-SECOND MEMORY CLUE

Huge head + tiny lower shell + long dinosaur-like tail.

REPTILES

Spotted Turtle

Clemmys guttata



smmcdonald - CC BY-NC - iNaturalist photo 55141680



Shreybae - CC BY-NC - iNaturalist photo 482847922

FAST IDENTIFICATION

- Small smooth black shell sprinkled with round yellow spots.
- Yellow or orange spots also mark the head and limbs.
- Adults are usually only about 3.5-5 inches long.

HABITAT

Shallow wetlands, bogs, marshes and wet meadows; may move over land between wetlands.

FOOD

Snails, worms, insects, tadpoles and some plants.

LIFE CYCLE

Lays a small clutch of eggs on land; grows slowly and matures late.

WHY IT MATTERS

Wetland predator and sensitive indicator; vulnerable to habitat loss and illegal collection.

DO NOT CONFUSE IT WITH

No other listed turtle has a black shell covered with separate round yellow dots.

30-SECOND MEMORY CLUE

Small black turtle with polka-dot yellow spots.

REPTILES

Eastern Box Turtle

Terrapene carolina carolina

NC STATE SYMBOL

NC State Reptile



Ryan Jones - CC BY-NC - iNaturalist photo 18191877



Richard Coldiron - CC BY-NC - iNaturalist photo 48987498

FAST IDENTIFICATION

- High domed shell with yellow or orange markings on brown.
- Hinged bottom shell can close tightly like a box.
- Stout feet for walking on land; each turtle's markings vary.

HABITAT

Moist forests, woodland edges and meadows; mostly terrestrial but needs humid cover and shallow water.

FOOD

Berries, mushrooms, worms, insects, slugs and carrion; omnivore.

LIFE CYCLE

Female lays eggs in soil; young are small and duller. Individuals may live for many decades.

WHY IT MATTERS

Disperses seeds and eats invertebrates. Roads, habitat loss and collection are major threats.

DO NOT CONFUSE IT WITH

Aquatic turtles are flatter with webbed feet; box turtles are high-domed and can close the shell.

30-SECOND MEMORY CLUE

Domed land turtle that closes like a box.

REPTILES

Yellow-bellied Slider

Trachemys scripta scripta



Yinan Li - CC BY-NC - iNaturalist photo 439950568



BJ Stacey - CC BY-NC - iNaturalist photo 19492950

FAST IDENTIFICATION

- Dark green to brown shell with yellow bars and markings.
- Large yellow patch behind each eye; yellow-striped head and legs.
- Bottom shell is yellow, often with dark spots.

HABITAT

Ponds, lakes, swamps and slow rivers with basking sites and vegetation.

FOOD

Young eat more animals; adults eat more aquatic plants, plus insects, snails and fish.

LIFE CYCLE

Female lays eggs on land; young hatch as small aquatic turtles.

WHY IT MATTERS

Common wetland omnivore and prey; often basks in groups.

DO NOT CONFUSE IT WITH

Red-eared sliders have a red patch behind the eye; yellow-bellied sliders have a broad yellow patch.

30-SECOND MEMORY CLUE

Big yellow cheek patch + yellow belly.

SECTION

Amphibians

Frogs, toads and salamanders

7
SPECIMENS

WHAT TO LOOK FOR

- Amphibians have permeable skin and unshelled eggs; moisture is especially important.
- Use skin texture, spots or stripes, body shape, toe pads and habitat clues.
- Most have aquatic larvae and metamorphosis, but some woodland salamanders develop directly on land.
- Know why amphibians can act as environmental indicators.

AMPHIBIANS

American Toad

Anaxyrus americanus



Alex Shure - CC BY-NC - iNaturalist photo 130773208



jlemmonds - CC BY-NC - iNaturalist photo 461936458

FAST IDENTIFICATION

- Dry, warty skin; one or two warts inside each dark back spot.
- Large oval poison glands behind the eyes.
- Chest and belly usually spotted; short hops rather than long leaps.

HABITAT

Woodlands, gardens and fields; breeds in shallow ponds and pools.

FOOD

Adults eat insects, worms and slugs; tadpoles graze algae and organic matter.

LIFE CYCLE

Eggs are laid in long jelly strings; aquatic tadpoles metamorphose into tiny land-dwelling toadlets.

WHY IT MATTERS

Controls garden pests and is prey for many animals; permeable skin makes amphibians sensitive to pollution.

DO NOT CONFUSE IT WITH

Fowler's toad often has three or more warts per dark spot and a cleaner belly.

30-SECOND MEMORY CLUE

Warty toad + 1-2 warts per dark spot + spotted belly.

AMPHIBIANS

Bullfrog

Lithobates catesbeianus



Jag Athwal - CC BY-NC - iNaturalist photo 519633752



Kelsey Low - CC BY - iNaturalist photo 2900500

FAST IDENTIFICATION

- Very large frog with a huge round eardrum behind the eye.
- No raised dorsolateral folds running down the back; fold curves around the eardrum.
- Green to brown with a pale belly; deep 'jug-o-rum' call.

HABITAT

Permanent ponds, lakes and slow rivers with vegetation.

FOOD

Almost any animal it can swallow: insects, crayfish, frogs, fish, small snakes and mice.

LIFE CYCLE

Egg masses float at the surface; tadpoles may take one to three years to metamorphose.

WHY IT MATTERS

Major aquatic predator and prey; can disrupt ecosystems where introduced outside its native range.

DO NOT CONFUSE IT WITH

Green frog has dorsolateral folds that run partway down the back; bullfrog lacks them.

30-SECOND MEMORY CLUE

Largest frog + giant eardrum + no long back folds.

AMPHIBIANS

Pine Barrens Treefrog

Dryophytes andersonii

NC STATE SYMBOL

NC State Frog



Saunders Drukker - CC BY-NC - iNaturalist photo 9343322



Shreybae - CC BY-NC - iNaturalist photo 597828841

FAST IDENTIFICATION

- Bright green frog with a bold dark stripe from snout through eye to the side.
- White or pale border outlines the dark stripe; hidden inner legs may be orange.
- Round toe pads for climbing.

HABITAT

Acidic shrub bogs, pocosins and seepage areas, especially in the Sandhills and Coastal Plain.

FOOD

Insects and other small invertebrates.

LIFE CYCLE

Eggs are laid in shallow acidic water; tadpoles develop in water and metamorphose into climbing adults.

WHY IT MATTERS

Rare habitat specialist and indicator of healthy bog wetlands; habitat drainage and fire suppression are threats.

DO NOT CONFUSE IT WITH

Green treefrog usually has a light side stripe but not the Pine Barrens frog's strong dark mask bordered in white.

30-SECOND MEMORY CLUE

Green treefrog with a dark mask outlined in white.

AMPHIBIANS

Southern Leopard Frog

Lithobates sphenocephalus



Jack and Shirley Foreman - CC BY-NC - iNaturalist photo 34427994



Ty Smith - CC BY-NC - iNaturalist photo 242917691

FAST IDENTIFICATION

- Green or brown frog with distinct dark round spots edged in light color.
- Raised pale dorsolateral folds run from behind the eyes down the back.
- Usually has a pale spot in the center of the eardrum.

HABITAT

Marshes, ponds, wet fields and ditches; often forages on land near water.

FOOD

Insects, spiders, worms and other small animals.

LIFE CYCLE

Rounded egg masses attach to vegetation; tadpoles metamorphose into spotted froglets.

WHY IT MATTERS

Controls insects and feeds fish, snakes, birds and mammals.

DO NOT CONFUSE IT WITH

Pickerel frog has squarer spots in two neat rows and yellow-orange color inside the hind legs.

30-SECOND MEMORY CLUE

Leopard-like round spots + pale back folds.

AMPHIBIANS

Marbled Salamander

Ambystoma opacum

NC STATE SYMBOL

NC State Salamander



edporopat - CC BY-NC - iNaturalist photo 26591238



Beren Erkan (herper/photographer) - CC BY-NC - iNaturalist photo 336428012

FAST IDENTIFICATION

- Chunky black salamander with bold white or silvery crossbands.
- Bands are usually bright white in males and grayer in females.
- Short rounded snout; adults have lungs and no gills.

HABITAT

Forests near seasonal fish-free pools; adults spend much of the year underground or under logs.

FOOD

Worms, insects and other small invertebrates; larvae eat tiny aquatic animals.

LIFE CYCLE

Unlike its pond-breeding relatives, nests on land in fall. Female guards eggs in a dry pool basin until rain floods it; larvae then become aquatic.

WHY IT MATTERS

Predator and prey in forest-pool food webs; depends on both intact woods and temporary wetlands.

DO NOT CONFUSE IT WITH

Slimy salamanders have scattered spots, not broad zebra-like crossbands.

30-SECOND MEMORY CLUE

Black-and-white marbled bands + fall nest in a dry pool basin.

AMPHIBIANS

Red-backed Salamander

Plethodon cinereus



Ty Smith - CC BY-NC - iNaturalist photo 248530577



Ty Smith - CC BY-NC - iNaturalist photo 183836724

FAST IDENTIFICATION

- Small slender salamander; common form has a red or orange stripe down a dark back.
- Lead-backed form lacks the stripe and is dark gray-black.
- Speckled black-and-white belly; no lungs.

HABITAT

Cool moist forests under logs, rocks and leaf litter; does not need a pond.

FOOD

Mites, springtails, insects, worms and other tiny invertebrates.

LIFE CYCLE

Female guards eggs on land; young hatch as miniature adults with no free-swimming larval stage.

WHY IT MATTERS

Extremely important forest predator and prey; helps move energy through leaf-litter food webs.

DO NOT CONFUSE IT WITH

A striped two-lined salamander is yellower and associated with streams; red-backed is a woodland Plethodon.

30-SECOND MEMORY CLUE

Tiny woodland salamander; red stripe or lead-gray form; direct development.

White-spotted Slimy Salamander

Plethodon cylindraceus



Henry Seilheimer - CC BY-NC - iNaturalist photo 337501905



Ty Smith - CC BY-NC - iNaturalist photo 133474652

FAST IDENTIFICATION

- Large black woodland salamander sprinkled with many white or silvery spots.
- Long tail and 16-17 grooves along the sides.
- Produces sticky slime when threatened; no lungs.

HABITAT

Moist mature forests, ravines and rocky slopes under logs and stones.

FOOD

Insects, spiders, worms and other invertebrates.

LIFE CYCLE

Female guards eggs on land; young hatch as miniature adults without an aquatic larval stage.

WHY IT MATTERS

Forest-floor predator and prey; sensitive to drying and forest disturbance.

DO NOT CONFUSE IT WITH

Marbled salamander has broad bands; slimy salamander has many separate white spots.

30-SECOND MEMORY CLUE

Black body dusted with white spots + sticky defensive slime.

SECTION

Plant & Animal Science

Structures, life cycles, energy and environmental responses

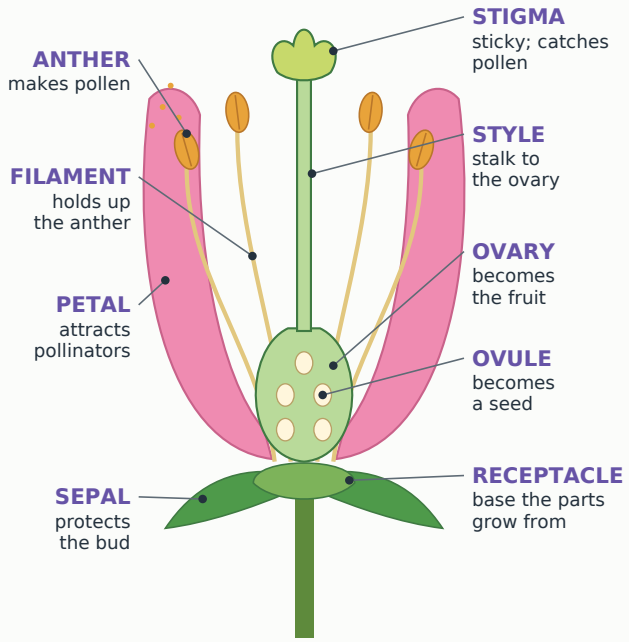
WHAT TO LOOK FOR

- Know each plant part and its job.
- Explain the plant life cycle and basic photosynthesis without a chemical formula.
- Recognize gravitropism, phototropism, thigmotropism and hydrotropism from examples.
- Compare reptile and amphibian characteristics and life cycles.

Plant parts, root types & flower jobs

FLOWER PARTS

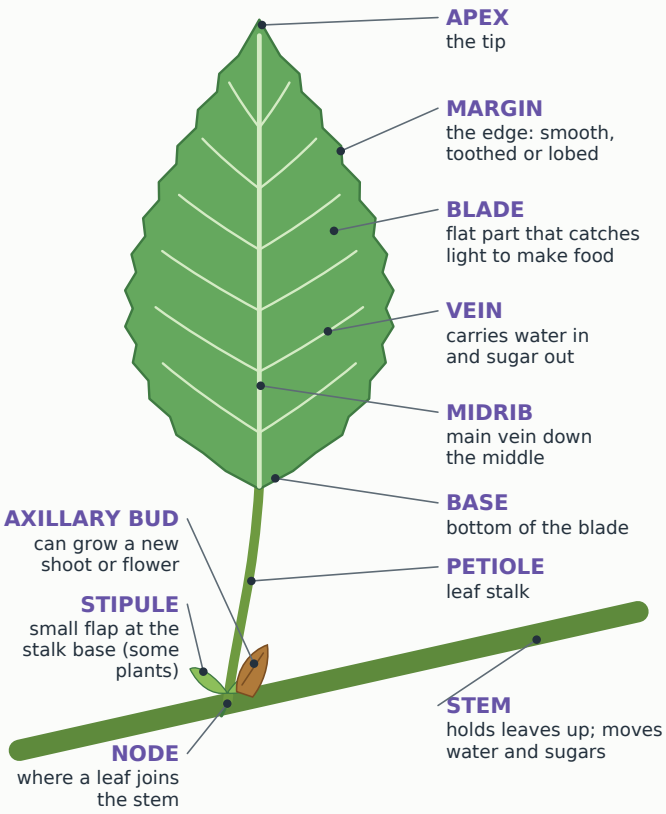
Job: reproduction; makes seeds



STAMEN (male) = anther + filament
PISTIL (female) = stigma + style + ovary

LEAF PARTS

Job: photosynthesis (makes food); gas exchange



ROOT TYPES & SPECIAL JOBS

Roots anchor the plant and absorb water and minerals; some store food.

Taproot	One thick main root with smaller side roots	*carrot, dandelion*
Fibrous roots	Many thin roots of similar size	*grasses*
Storage root	Stores sugar/starch	*sweet potato*
Aerial roots	Attach or absorb above ground	*English ivy*

FLOWER PART	JOB
Petal	Attracts pollinators; may protect inner parts
Sepal	Protects the flower bud
Stamen	Male part: filament holds the anther
Anther	Produces pollen

FLOWER PART	JOB
Pistil / carpel	Female structure: stigma + style + ovary
Stigma	Sticky surface that receives pollen
Style	Connects stigma to ovary
Ovary / ovule	Ovary holds ovules; after fertilization ovules become seeds and ovary may become fruit

PLANT SCIENCE

Plant life cycle & photosynthesis

1 SEED
Embryo + stored food + seed coat

2 GERMINATION
Water activates growth; root emerges first

3 SEEDLING
First leaves begin photosynthesis

4 MATURE PLANT
Roots, stems and leaves grow

5 FLOWER
Pollination moves pollen to stigma

6 FRUIT & SEEDS
Fertilization forms seeds; dispersal restarts cycle

Photosynthesis: how plants make sugar

carbon dioxide + water + light energy -> sugar + oxygen

Carbon dioxide	enters through stomata, tiny openings mostly in leaves
Water	is absorbed by roots and moves upward through xylem
Light	is captured by chlorophyll in chloroplasts
Sugar	stores chemical energy and is moved by phloem or used to build plant parts
Oxygen	is released as a product; plants also use oxygen during cellular respiration

HIGH-VALUE DISTINCTIONS

- Pollination is pollen transfer. Fertilization is the joining of reproductive cells after pollen reaches the flower.
- A seed contains a young plant. A fruit develops from the flower's ovary and helps protect or disperse seeds.
- Plants do not 'eat' soil. They make sugar using light, carbon dioxide and water; roots absorb water and minerals.
- Carnivorous plants still photosynthesize. Captured insects supply minerals, not the plant's main energy.

Tropisms: growth responses to the environment

A tropism is directional growth in response to a stimulus. Positive = growth toward the stimulus; negative = growth away.

1 GRAVITROPISM

STIMULUS: GRAVITY

Response Roots usually grow with gravity (positive). Shoots usually grow against gravity (negative).

Practice Turn a germinating bean sideways; the root curves down and shoot curves up.

2 PHOTOTROPISM

STIMULUS: LIGHT

Response Shoots bend toward a one-sided light source so leaves receive more light.

Practice Place a plant near one window or shine a lamp from one side.

3 THIGMOTROPISM

STIMULUS: TOUCH

Response Tendrils coil around a support after contact, helping a vine climb.

Practice Let a pea or grape tendril touch a stick or string.

4 HYDROTROPISM

STIMULUS: WATER / MOISTURE

Response Roots grow toward areas with more available moisture.

Practice Keep one side of the growing medium moist and compare root direction.

COMMON TRAP

A plant's immediate movement is not always growth. A Venus flytrap closing is a rapid nastic movement; a vine tendril permanently growing around a support is thigmotropism.

Reptiles vs amphibians

FEATURE	REPTILES	AMPHIBIANS
Skin	Dry scales or scutes	Moist, glandular, permeable skin; no scales
Eggs	Usually leathery or hard-shelled; laid on land	Usually jelly-like, unshelled; often laid in water or damp places
Young	Look like small adults; no metamorphosis	Often aquatic larvae that metamorphose; some salamanders develop directly on land
Breathing	Lungs	Larvae often use gills; adults use lungs and/or skin; lungless salamanders use skin
Body temperature	Ectothermic - body temperature depends mainly on outside heat	Ectothermic - body temperature depends mainly on outside heat
Water connection	Need water but skin prevents rapid water loss better	Skin and eggs lose water easily, so moisture is especially important
Examples here	Alligator, lizards, snakes, turtles	Frogs, toads, salamanders

LIFE-CYCLE SHORTCUTS

Frog / toad egg mass or strings -> tadpole with gills -> legs develop -> tail shrinks -> adult

Salamander egg -> larva -> adult, OR direct development on land in red-backed and slimy salamanders

Snake / lizard egg OR live birth -> miniature adult -> growth through repeated shedding

Turtle / alligator shelled egg laid on land -> hatchling -> juvenile -> adult

Why reptiles & amphibians matter

PREDATORS

They control insects, slugs, rodents, fish and other prey. Examples: garter snakes eat worms and amphibians; rat snakes eat rodents; frogs eat insects.

PREY

Eggs, tadpoles, frogs, lizards and snakes feed fish, birds and mammals. Removing them can disrupt many food-web connections.

NUTRIENT MOVERS

Amphibians move energy between water and land. Scavengers and omnivores help recycle nutrients. Turtles may disperse seeds.

ECOSYSTEM ENGINEERS

Alligators create wet depressions that hold water. Turtle nests disturb soil. Burrows and hiding places connect many species.

ENVIRONMENTAL INDICATORS

Amphibians have permeable skin and unshelled eggs, so pollution, disease and drying can affect them early.

HOW PEOPLE AFFECT THEM

- Habitat loss, wetland drainage, roads and fragmented forests can remove breeding and feeding areas.
- Pollution, pesticides, disease, climate shifts and invasive species can change survival.
- Collection for pets and killing snakes from fear can reduce wild populations.
- Helpful actions: protect connected habitat, keep water clean, drive carefully, keep wildlife wild and never handle an unknown snake.

SECTION

Gardening

Plant needs, problem solving and competition

WHAT TO LOOK FOR

- Know why plants need light, water, soil/medium, air, nutrients, suitable temperature and space.
- Use multiple observations to distinguish too much water from too little water.
- Explain how too little light, excess fertilizer and crowding affect plants.
- When asked to investigate, change one variable and keep the rest controlled.

What plants need to grow and make food

L — LIGHT

Energy for photosynthesis. Too little often causes pale, weak, stretched growth; too much can scorch shade-adapted leaves.

W — WATER

Keeps cells firm, carries minerals and is a photosynthesis ingredient. Too little wilts; too much can suffocate roots.

A — AIR

Leaves need carbon dioxide; roots need oxygen for cellular respiration. Compacted or waterlogged soil has too little air.

N — NUTRIENTS

Minerals such as nitrogen, phosphorus and potassium are building materials and helpers - not plant food or energy.

S — SOIL / MEDIUM

Anchors roots and supplies water, air and minerals. Texture, drainage, organic matter and pH affect availability.

T — TEMPERATURE

Controls growth and germination speed. Frost, heat or rapid change can damage tissues.

S — SPACE

Crowded plants compete for light, root room, water and minerals; crowding can also reduce airflow.

KEY IDEA

Plants make their own sugar. Water, minerals, air, light, suitable temperature and space let the plant carry out the processes needed for growth.

HORTICULTURE

Diagnosing common plant problems

One symptom can have several causes. Use the whole pattern: soil wetness, light, which leaves are affected, root condition and recent care.

OBSERVATION	POSSIBLE CAUSE	NEXT CHECK / RESPONSE
Wilted; dry soil; crisp edges	Too little water	Water deeply; check whether roots can access moisture
Wilted; wet soil; yellowing	Too much water / low root oxygen	Improve drainage; let suitable soil dry; inspect roots
Pale, stretched, leaning growth	Too little light	Move gradually to brighter suitable light; rotate plant
Bleached or brown scorched patches	Too much intense light / heat	Provide appropriate shade; avoid sudden exposure
Older leaves evenly yellow	Possible nitrogen shortage OR root problem	Check roots, pH and watering before adding fertilizer
Purple older leaves; slow growth	Possible phosphorus shortage or cold roots	Check temperature and soil conditions; test before fertilizing
Brown leaf margins; weak growth	Possible potassium issue, salts or drought	Check watering and fertilizer buildup; soil test
Stunted plants crowded together	Competition for light, water, minerals or space	Thin, transplant or increase resources appropriately
Sudden browning after fertilizer	Too much fertilizer / salt injury	Stop fertilizing; flush only if drainage allows; follow label

BEST SCIENCE-OLYMPIAD ANSWER

Name the likely cause and the evidence: 'The plant may be overwatered because it is wilted even though the soil is wet; waterlogged roots cannot get enough oxygen.'

Fertilizer, competition & fair tests

FERTILIZER IS NOT FOOD

- Plants make sugar during photosynthesis. Fertilizer supplies mineral nutrients.
- The three numbers on many labels are N-P-K: nitrogen, phosphorus and potassium.
- More is not always better. Excess fertilizer can burn roots, cause weak growth and pollute waterways.
- A soil test helps decide whether nutrients or pH actually need correction.

NUTRIENT	MAIN ROLE	POSSIBLE SHORTAGE CLUE
Nitrogen (N)	Leafy green growth; proteins and chlorophyll	Older leaves may yellow; growth may slow
Phosphorus (P)	Energy transfer; roots, flowers and seeds	Stunting; older leaves may look dark or purplish
Potassium (K)	Water balance, enzymes, overall stress resistance	Weak growth; scorching or browning near leaf edges

COMPETITION

- Above ground: leaves compete for light and space.
- Below ground: roots compete for water, minerals and physical room.
- The stronger competitor may grow faster, shade neighbors or build a larger root system.
- Invasive English ivy and kudzu can cover native plants and block their light.

HOW TO DESIGN A FAIR PLANT TEST

- Change one independent variable, such as light direction, water amount or fertilizer level.
- Measure a dependent variable, such as height, leaf number, root direction or mass.
- Keep plant type, age, pot, soil, temperature and test time the same. Include repeated plants when possible.
- Use a control group that does not receive the treatment; record observations and units consistently.

RAPID REVIEW

High-value look-alike comparisons

THE FOUR LISTED PINES

PINE	NEEDLES / BUNDLE	NEEDLE CLUE	CONE CLUE	FASTEST CLUE
Eastern white	5	soft, 2.5-5 in	long, slender, no sharp prickle	WHITE = five letters
Shortleaf	2-3	short, 3-5 in	small, 1.5-2.5 in	smallest listed cones
Loblolly	usually 3	stiff, 6-9 in	egg-shaped, 3-6 in, prickly	middle-sized needles/cones
Longleaf	3	very long, 8-18 in	huge, 6-10 in	giant tufts + grass stage

SNAKES STUDENTS OFTEN CONFUSE

SNAKE	PATTERN	SAFETY	BEST CLUE
Copperhead	hourglasses narrow on spine	venomous	yellow tail in young
Cottonmouth	heavy; banded young, dark adult	venomous	facial pit; vertical pupils
Banded water snake	bands broad over back	nonvenomous	round pupil; no facial pit
Eastern hognose	variable	harmless to people	upturned snout; bluff/play dead
Black rat snake	black adult; blotched young	nonvenomous	white chin; climber
Eastern kingsnake	black with pale chains	nonvenomous	smooth glossy scales

SNAKE SAFETY

Never approach or handle a snake to check pupils, facial pits or scales. Use the whole visible pattern from a safe distance; at competition, rely on the specimen or photo provided.

RAPID REVIEW

Essential vocabulary

ALTERNATE
one leaf attaches at each node, switching sides

OPPOSITE
two leaves attach across from each other at one node

SIMPLE LEAF
one blade per leaf stalk; lobes do not reach the stalk

COMPOUND LEAF
one leaf divided into separate leaflets

ENTIRE MARGIN
smooth leaf edge without teeth or lobes

SERRATED
toothed like a saw

WHORL
three or more leaves or branches at one node

CATKIN
slender flower cluster, often hanging

SAMARA
dry winged fruit, such as maple helicopters

DRUPE
fleshy fruit with one hard inner stone

SCUTE
large plate-like scale, as on a turtle shell or alligator

KEELED SCALE
scale with a raised ridge down the center

ECTOTHERMIC
body temperature depends mainly on outside heat

METAMORPHOSIS
major body change from larva to adult

CLUTCH
group of eggs produced at one time

HABITAT
place supplying an organism's food, water, shelter, space and conditions

ECOSYSTEM
living organisms and nonliving surroundings interacting

INVASIVE
non-native organism that spreads and causes ecological, economic or human harm

POLLINATION
movement of pollen to a flower's stigma or to a seed cone

FERTILIZATION
joining of reproductive cells that begins seed formation

GERMINATION
start of seed growth

CHLOROPHYLL
green pigment that captures light energy

STOMATA
tiny openings that regulate gas exchange and water loss

XYLEM
plant tissue carrying water and minerals mainly upward

PHLOEM
plant tissue carrying sugars to where they are needed

TROPISM
directional growth response to a stimulus

BIOTIC
living factor, such as competition or insects

ABIOTIC
nonliving factor, such as water, light or temperature

REFERENCE NOTES

Sources, photo licenses & coach notes

COMPETITION SCOPE

2027 Division A Official Rules Manual, Roots & Reptiles, pages 38-40, supplied by the coach. The rules sheet is the authority if any event detail changes.

PLANTS AND HORTICULTURE

N.C. Cooperative Extension Gardener Plant Toolbox - https://plants.ces.ncsu.edu/ - plus standard elementary botany and horticulture concepts aligned to the rule sheet.

REPTILES AND AMPHIBIANS

Herps of North Carolina - https://herpsofnc.org/ - and North Carolina Wildlife Resources Commission species information - https://www.ncwildlife.gov/species

STATE SYMBOLS

Official symbol status follows the 2027 specimen list supplied with the rules. North Carolina Secretary of State state-symbol references may be used for confirmation.

IDENTIFICATION PHOTOS

Most photos are from iNaturalist; three are from the NC State Plant Toolbox and one is from Flickr. Beneath each image are its photographer or uploader, Creative Commons license and source; credits are clickable in the digital PDF. Photos have been cropped and resized to fit their frames; the pine needle photos are also rotated.

HOW THIS BINDER TREATS SCIENTIFIC NAMES

The event requires common-name identification; scientific names are reference only. Some names in the 2027 list use older combinations. This binder keeps the organism intended by the rule sheet while using a commonly accepted current name for photo matching when needed (for example, Plestiodon for the southeastern five-lined skink).

COACH NOTE

Print in color on one side of each sheet (67 sheets fit a 1-inch binder) and add physical tabs. Before competition, confirm the final tournament rules and permitted binder dimensions.