

For most creatures, the world is a difficult place.
Plants and animals must adapt or perish

When the Going Gets Tough

written by Jeff Beane / illustrations and nature activity by Anne M. Runyon

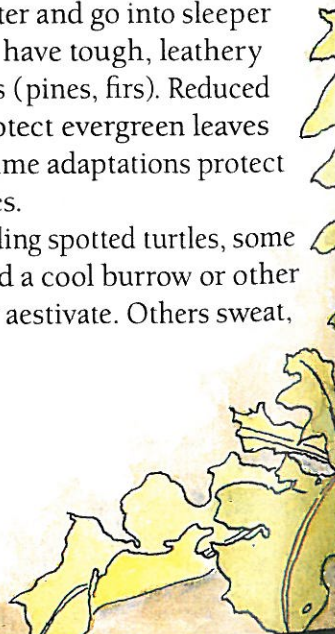
What would your life be like without a roof, electricity, clothing, plumbing, gadgets or grocery stores? Just ask most living things. In the real world, survival's the game. And there are almost as many different survival strategies as there are species.

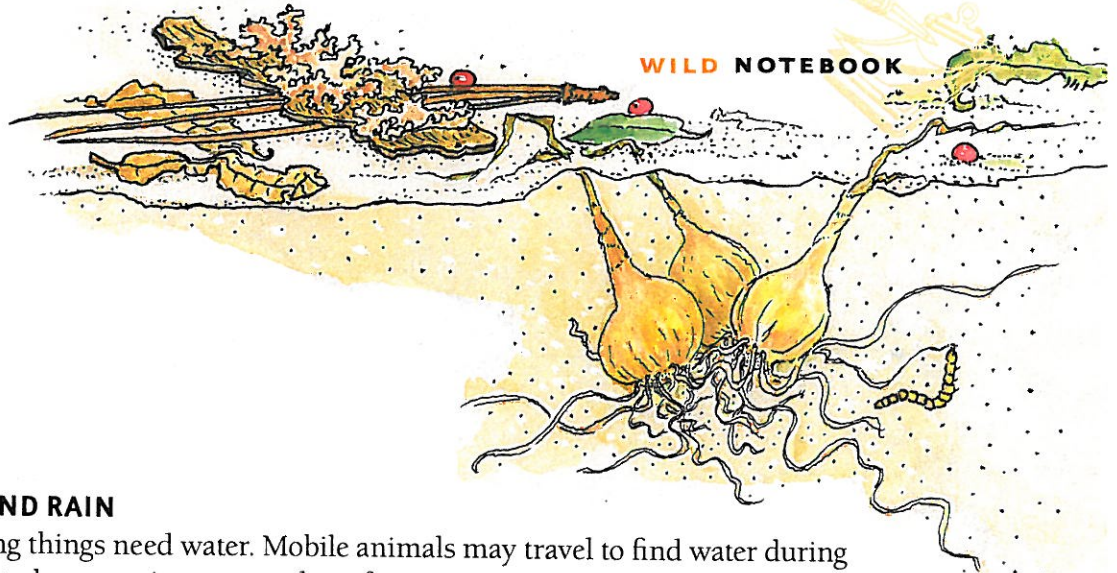
HOT AND COLD RUNNING STRATEGIES

When seasons change, animals and plants must change with them. Mobile creatures, like some birds, bats and insects, can migrate to warmer or cooler places. Those that can't must adapt. Many animals (most reptiles, many insects, some mammals) hibernate in winter. They find a protected spot — often underground below the frost line, lower their metabolism and sleep until spring. Animals remaining active in winter have special adaptations. Many mammals grow warmer, thicker fur. Grouse and owls have feathers covering their feet. Chickadees and kinglets must eat constantly to fuel their tiny furnaces. Wood frogs and spring peepers have antifreeze in their blood.

Some trees drop their leaves in winter and go into sleeper mode. Those that don't (evergreens) have tough, leathery leaves (hollies, bays) or slender needles (pines, firs). Reduced surface area and a waxy covering protect evergreen leaves from freezing and water loss. These same adaptations protect some desert plants from heat extremes.

In hot weather, some animals, including spotted turtles, some butterflies and many amphibians, find a cool burrow or other refuge where they become inactive, or aestivate. Others sweat, pant or cool off in water or shade.





FIRE AND RAIN

All living things need water. Mobile animals may travel to find water during droughts, but aquatic creatures have fewer options. Faced with a drying pond, sirens (eel-like aquatic salamanders) burrow into the mud and envelop themselves in slime to prevent desiccation. Some amphibian larvae can accelerate their metamorphosis, transforming early at smaller-than-normal size. Mud and chicken turtles leave the pond and bury themselves in sandy uplands for months or even years. Even some fish can survive for days in wet leaves or mud.

Too much water is equally problematical. Floods are hard on many animals, but some can swim to high ground. Fire ants survive floods by forming a tight ball that floats until the colony reaches land.

Fire is deadlier than water to some creatures, but vital to others. Longleaf pine forests and some other forest and grassland ecosystems are not only fire-tolerant, but fire-dependent. Animals can flee from fire, or retreat underground. Many plants have fire-resistant bark or foliage, or quick regeneration capacity.

PLANNING AHEAD

Nature's bounty is inconsistent. There are times of plenty and times of want. Faced with famine, some animals can migrate to greener pastures or change their diet. Some can endure months or even years without eating. Animals can accumulate body fat to help them through lean times, while plants store nutrients in roots or tubers.

Some animals plan for lean times. Mice, jays, titmice and some woodpeckers cache seeds for future consumption. Carnivores often bury a kill for later. Spiders hang fresh insects in their webs for leisurely dining. Honey bees devote much of their lives to food storage; their marvelous pantries are surpassed only by our own.

Strategies may vary even among closely related animals. Gray squirrels, chipmunks and woodchucks are all squirrels with different winter strategies. Chipmunks stockpile seeds in their burrows, alternately sleeping and feasting. Gray squirrels are "scatter hoarders," foraging all winter for nuts they buried at strategic locations in fall. A woodchuck stuffs his face all summer and sleeps winter away, sustained by his body fat.



HARD TO KILL

For many creatures, predators offer the toughest challenge — how to survive each day without being eaten. Some (rabbits, deer) outrun their predators. Others (moles, earthworms) hide from them. Still others, (whales, bison) grow intimidatingly large or strong. Animals may fight for their lives with teeth, claws, horns, antlers, hooves, beaks, jaws, pincers, venomous fangs, stingers or defensive chemicals. Others make themselves hard to eat with spines, thorns, thick bark or skin, shells or armored plates. Some are bad-tasting, poisonous or otherwise revolting. Hognose snakes and opossums use deceptive behavior to look dangerous or dead. Scarlet king-snakes and spicebush swallowtail caterpillars mimic more dangerous creatures. Katydid, fence lizards and whip-poor-wills use their superb camouflage.



Get Outside

Take a walk on a very hot or cold day (be sure to dress and provision yourself appropriately). What creatures can you see active? What adaptations do they have for withstanding sun, wind, snow, ice and temperature extremes? What creatures do you never encounter during summer? During winter? What do you think they're doing when you don't see them?

As you visit different habitats and environments — deserts, oceans, rivers, mountains — notice the plants and animals. Which ones are different from those in your yard? How do they differ? How are they able to make their homes in sand, rock, saltwater, strong currents, pounding surf or other harsh conditions? What survival adaptations can you see just by looking at them or watching their behavior? Always be careful in harsh environments and extreme weather — many creatures can survive conditions that you can't!



THE HARDEST TIMES

Even very adaptable creatures have limits. Sometimes the survivors aren't who you'd expect. A hot fire may consume a mighty oak, but tiny *Hypoxis* (yellow star-grass) pokes its fragile yellow bloom up through the ashes by the still-smoking stump. A drought may kill a big, tough snapping turtle while a petite mud turtle survives. Coping with tough times is all about adaptations, and different adaptations are what allow so many creatures to share one world.

But the hardest times ever may be on the way. Generalists, like coyotes and crabgrass, can survive a wide range of habitats and hardships. Specialists, like polar bears and cacti, can only live in specific situations, often where most other species can't. Specialists have an advantage over generalists under certain harsh-but-stable conditions. But when conditions change rapidly, generalists have the upper hand. As humans continually alter Earth's habitats and climate, more and more species find survival impossible. If our world becomes so impoverished that only a few species can survive, will we be among them?

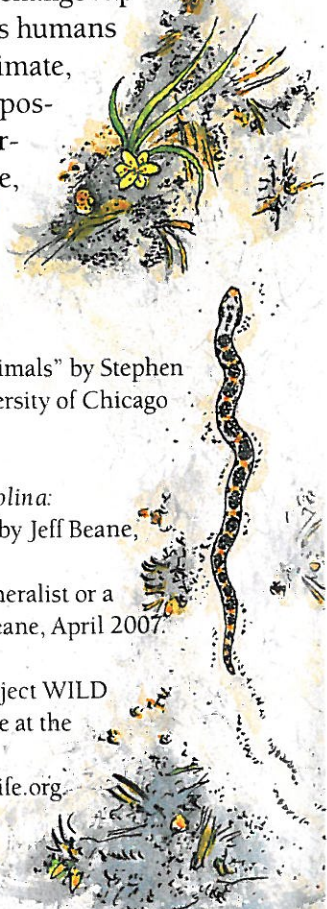
Read and Find Out

- "Food Hoarding in Animals" by Stephen B. Vander Wall, University of Chicago Press, 1990.

In *Wildlife in North Carolina*:

- "Stocking the Pantry" by Jeff Beane, March 1998.
- "Is it Better to Be a Generalist or a Specialist?" by Jeff Beane, April 2007.

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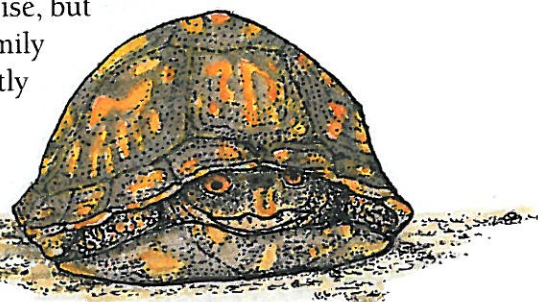


Few reptiles are as popular or well known as our state reptile. Meet the

Turtle in a Box

written by Jeff Beane / illustrations and nature activity by Anne M. Runyon

The Eastern box turtle is North Carolina's only fully terrestrial turtle. It resembles a tortoise, but actually belongs to the large family Emydidae, which includes mostly aquatic and semiaquatic species. North Carolina has no true tortoises, but the box turtle occupies a tortoise's niche. Its thick, domed shell and heavy limbs are adaptations to life on land.



HOME IN A BOX

The box turtle's common name refers to its ability to close its shell. All turtles can withdraw at least partially into their shells, but in most species the bottom part of the shell, called the plastron, is immovable. A box turtle's plastron is hinged, and can completely enclose its head and limbs. Mud and musk turtles also have hinged plastra, but theirs are smaller, offering less protection. Aquatic turtles trade some protection for mobility in water.

The box turtle's scientific name, *Terrapene carolina*, means "Carolina terrapin." Terrapin is derived from a Native American word for turtle. Although box turtles are sometimes called "dry land terrapins," biologists normally use that name only in reference to the diamondback terrapin, which lives in our coastal salt marshes.



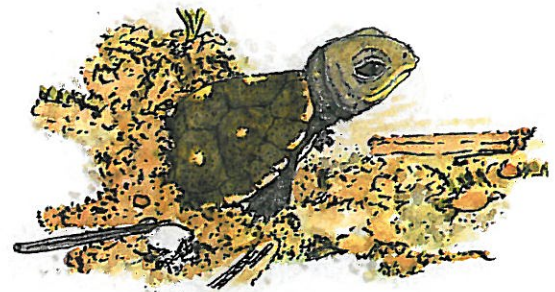
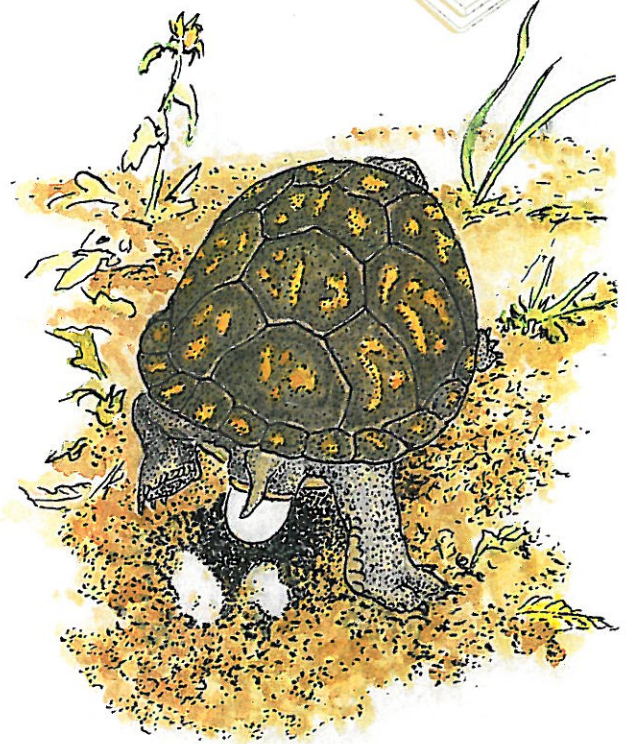
INSIDE THE BOX

Box turtles occur in all North Carolina counties, in a wide variety of habitats, but they prefer moist woodlands. Their varied diet includes insects, worms, slugs and snails, small vertebrates, carrion, fungi (including some mushrooms very toxic to humans) and a wide variety of plant material — especially berries and other fruits.

Male box turtles grow slightly larger than females. Males tend to be more colorful, and usually have longer, thicker tails, a concave area on the lower plastron, thicker, more curved claws on their hind feet, and bright red eyes. A female usually has a flat, proportionally longer plastron, deeper shell, and brown, yellowish or dark red eyes.

Box turtles may mate opportunistically throughout the warmer months. In spring or early summer, a female uses her hind feet to dig a vase-shaped nest, into which she deposits from two to seven (usually three or four) oval, leathery-shelled eggs. A female may nest more than once during a season. Eggs hatch in two to three months. Some hatchlings emerge in late summer or fall; others remain in the nest until the following spring. The tiny juveniles are secretive and seldom encountered. Their plastral hinges do not develop until they are 2 or 3 years old; hence hatchling box turtles are often mistaken for other species. Box turtles mature in about seven to 10 years, and can live for 50 years, or occasionally much longer.

Box turtles overwinter in soft soil beneath surface litter, but they may occasionally be active on warm winter days. Radiotelemetry studies have taught us much about their home ranges and movement patterns. Most individuals have well established territories, ranging from less than an acre to well over a hundred acres, depending on habitat and available resources.



For more information on how you can help box turtles, visit the Box Turtle Collaborative website: sites.google.com/a/uncg.edu/ncboxturtles.

OUTSIDE THE BOX

Turtles have long symbolized perseverance, longevity, continuity and strength. Box turtles are no exception. Four of the 26 states to have thus far adopted state reptiles have selected box turtles. North Carolina adopted the Eastern box turtle as its official state reptile in 1979.

Ancient and highly adaptable, box turtles were once extremely abundant. Human activities have greatly reduced their populations through habitat loss and fragmentation. Turtles walked with dinosaurs, but roads, automobiles, bulldozers, lawnmowers, subdivisions, shopping centers and introduced predators present much greater challenges. The N.C. Wildlife Resources Commission includes the box turtle as a priority species in its Wildlife Action Plan. One goal of the plan is keeping common species common. The box turtle is considered an “umbrella species”—protecting its habitat will result in the protection of many other species.



Tennessee picked the Eastern box turtle as its state reptile, while Missouri claimed the three-toed box turtle (a separate subspecies, *T. c. triunguis*). Kansas chose our other North American species, the ornate box turtle (*T. ornata*). Box turtles are also popular in various logos, including that of the North Carolina Herpetological Society.

North Carolina
Herpetological Society



Get Outside

Regardless of where you live in North Carolina, you should be able to find box turtles nearby. Unless you are in a highly urbanized area, or on certain portions of the Outer Banks, you may have them in your neighborhood. They aren't always easy to find, but woodland paths, gardens, berry patches and along brush piles are good places to look. Sometimes placing fruit scraps along the edge of a woodlot may attract them. One of the best ways to encounter box turtles is to slowly ride country backroads on warm days, especially after summer rains.

If you find turtles while you are out exploring your surroundings, it may be tempting to keep box turtles as pets, but besides the fact that they have special space and lighting requirements, a pet turtle is a lifetime commitment. They are best enjoyed in the wild, where they belong. Short-term captives should be released back exactly where they were found. Long-term captives should not be released anywhere. Never move box turtles far from where they were found; they have familiar home territories just as you do.

Turtle watching takes time and patience. Should you encounter a box turtle, rather than rushing to pick it up, try watching it from a distance. You may get to see feeding, mating, fighting, nesting or other activities. Never paint box turtles, or carve into their shells to identify them. Take photos instead; individuals can be identified by their unique markings. Make an album of the turtles in your neighborhood. Record where and when you find them, and their behavior. Consult an expert for other noninvasive methods of marking box turtles for study. If you find an injured box turtle, contact a wildlife rehabilitator or the North Carolina State University College of Veterinary Medicine's Turtle Rescue Team (919-982-5923; clubs.ncsu.edu/waazm/turtle_rescue_team.htm). Provide information on exactly where the turtle was found, so it can be returned when recovered.

Read and Find Out

- “Box Turtle at Long Pond” by William T. George, Greenwillow Books, 1989.
- “North American Box Turtles: A Natural History” by C. Kenneth Dodd, University of Oklahoma Press, 2002.
- “Reptiles of North Carolina” by William M. Palmer and Alvin L. Braswell, University of North Carolina Press, 1995.
- “The Box Turtle Connection” by Ann Berry Somers and Catherine E. Matthews, 2006, available as a downloadable pdf: www.uncg.edu/~absomers/BoxTurtleBook.pdf.

In *Wildlife in North Carolina*:

- “Home is Where the Shell Is” by Jane Rohling, Aug. 1988.
- “The Perilous Good Life of the Box Turtle” by Jim Dean, Feb. 1999.
- “A Turtle Bears the Weight of the World” by Elizabeth Hunter, July 2001.
- “Is a Turtle Safe in its Shell?” by Jeff Beane, June 2005.

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Mistletoe: Winter's Kiss

written by Terry Krautwurst / illustrated by Amelia Hansen
nature activity by Anne M. Runyon

It's almost December, and most of summer's leafy trees are becoming bare and lifeless-looking. But wait, look up in the tops of some of the trees along rivers, roadsides, and fields. What are those round, ruffled green clusters swaying in the breeze among the branches like pom-poms cheering the sun? It's mistletoe, a plant that for centuries has mystified humans and served as a symbol of holiday celebration. It's the plant people smooch under for good luck.

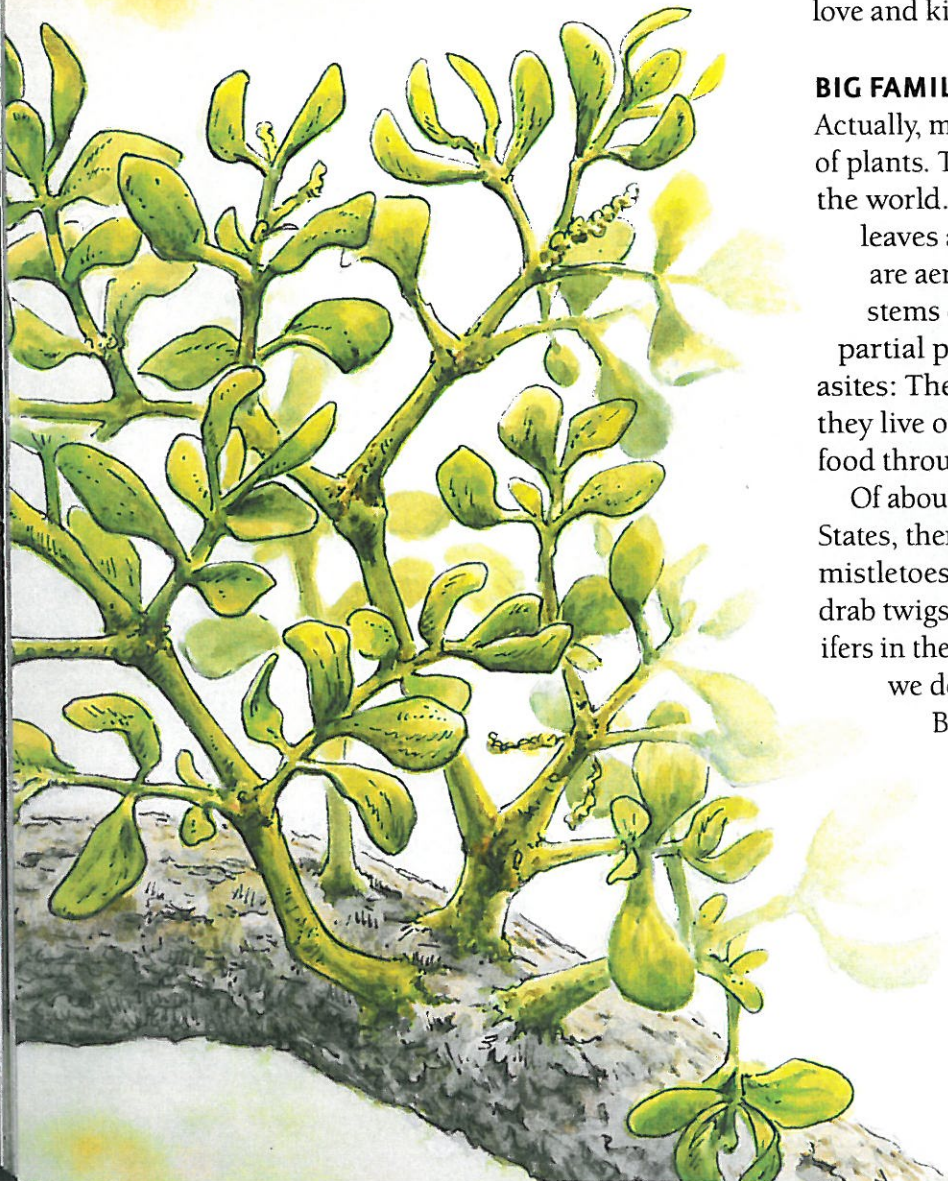
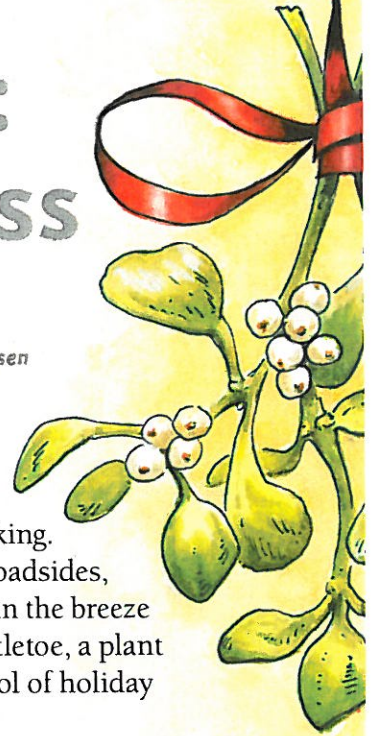
But there's much more to mistletoe than love and kisses.

BIG FAMILY

Actually, mistletoe isn't just one plant, but a large group of plants. There are over 1,000 different species around the world. Some have large leaves, some have small leaves and some have no leaves. But almost all are aerial plants: they grow above ground, on the stems or limbs of shrubs or trees. Mistletoes are partial parasites, or what botanists call hemiparasites: They get water and nutrients from the plants they live on, but also make at least some of their own food through photosynthesis.

Of about 30 kinds of mistletoe that grow in the United States, there are two types: leafy mistletoes and dwarf mistletoes. Dwarf mistletoes are leafless and look like drab twigs. Most grow on pines, spruces and other conifers in the West and North. Leafy mistletoes are the ones we decorate our homes with during the holidays.

By far the most common — and the only mistletoe that grows in North Carolina and most of the rest of the Southeast and East — is American mistletoe. The plant grows on more than 100 kinds of trees — mostly hardwoods, such as birch, maple, hickory, oak, beech, cherry, chestnut and dogwood. Clusters of its lustrous leathery leaves can become as big as beach balls.

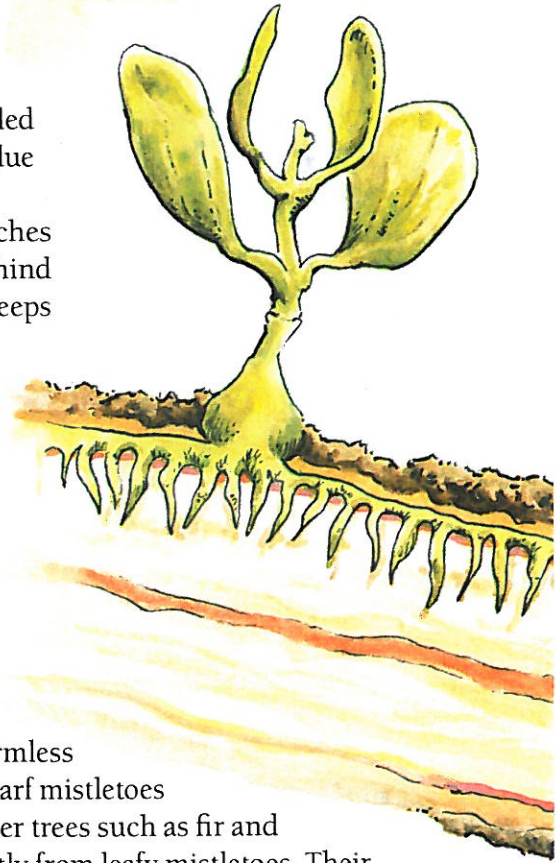




STICKY SITUATION

Mistletoe berries are poisonous to humans, but birds love them and gobble them up. Inside each berry is a seed surrounded by a gummy coating, a substance called viscin that hardens like glue when exposed to air.

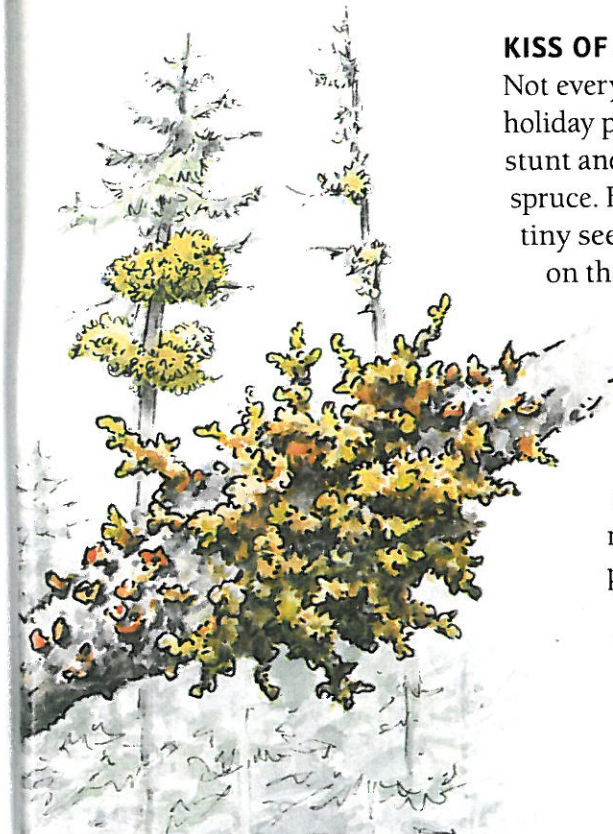
Birds that eat the berries “plant” the sticky mistletoe seeds on branches by rubbing off seeds stuck to their beaks or feet, or by leaving them behind in their droppings. When the gluey seed germinates, its primitive root creeps along the branch until it meets a bud, leaf base, or other rough spot. Then it flattens and attaches itself to the wood, forming a disc called a holdfast. The baby root drills into the branch and sends more rootlike structures, called sinkers, that spread under the bark and into the living tissue or cambium. Using water and nutrients from the tree’s tissue, the plant grows and eventually develops its own leaves. In autumn, when the tree it’s living on loses its foliage, the mistletoe’s green food-producing leaves are exposed to more sun than ever, helping it thrive through winter.



KISS OF DEATH?

Not everyone thinks of mistletoe as a harmless holiday plant. In the West and North, dwarf mistletoes stunt and kill valuable commercial timber trees such as fir and spruce. But dwarf mistletoes act differently from leafy mistletoes. Their tiny seeds shoot out from their berries like missiles and rain down on their host tree, infecting it with more and more new plants. And because they’re leafless and can’t produce as much food by photosynthesis, dwarf mistletoes steal more from their hosts. American mistletoe and its leafy cousins don’t spread as quickly, and seldom actually kill. Usually only a few plants infest a tree. Because they rob their hosts of water and nutrients they can weaken trees during dry times. And fruit and nut growers don’t like mistletoe because infested orchard trees produce lower harvests.

Pruning limbs or snipping the mistletoe off and covering the branch with heavy plastic for several months can help control unwanted mistletoe. Remember, though, that mistletoe is a valuable winter food source for birds.



MYTH-LE-TOE?

Mistletoe's ability to grow far above the ground, its roots never touching soil and its leaves green even in winter, seemed magical or miraculous to people of early civilizations. They believed the plant possessed special powers.

In Africa, Walos tribesmen wore mistletoe to protect them in battle. In Scandinavia, enemy soldiers who met among trees bearing mistletoe would declare peace for the day. The Ainu people of Japan's Hokkaido Island still clip mistletoe from sacred willow trees and plant the leaves among garden seeds to encourage good crops.

Northern Europeans believed that mistletoe prevented and cured all illnesses. A few sprigs tied in a bunch and hung over your doorway kept witches and trolls away. You could use it as a divining rod to find buried gold. In ancient Italy, mistletoe was thought to be capable of extinguishing fire.

In what's now the British Isles and western Europe, Druid priests revered oak trees and especially the mistletoe that grew from them. They believed that mistletoe contained the oaks' life energy. Every year in mid-December they would ceremoniously cut mistletoe from oaks using a golden sickle, and distribute it to the people to hang in their homes for luck

Get Outside

Gather holiday mistletoe. Look for clusters of mistletoe in trees along roadsides, forest fields, and rivers and streams. If you're lucky, you'll find clumps growing on branches within easy reach. Usually mistletoe grows higher. Use a ladder and a long-handled pruner, or a pole with a nail partially driven into the end and bent over, to snag the mistletoe. Of course, get permission before gathering mistletoe from private property, and be sure to check with officials before harvesting it from public parks or forest lands.

Watch winter's trees. Trees reveal all kinds of interesting things when they lose their leaves in autumn. Look closely at the buds along those "leafless" branches. Within them are miniature versions of next season's leaves, fully formed and waiting to unfurl in spring. Look at all the different kinds of bark: rough, smooth, furrowed, peeling, wavy, straight-lined, cracked, bumpy, and more. Do you see any nuts or seed pods in the branches? Are there holes, or cavities, where birds or other animals live? Watch how the tree's limbs move in the winter wind. Listen to the rustling of dry leaves still clinging to twigs. Even in winter, trees are beautiful.



and protection. In the 1500s in England, kissing under a sprig of mistletoe during the Christmas season became popular — no one is sure why.

Over the centuries, superstitions and religious beliefs about mistletoe faded, but many of the traditions remained. When settlers arrived in the New World, they found American mistletoe, which is similar to European mistletoe, and adopted it for their customs. Today, most Americans still see mistletoe as a simple symbol of good luck and holiday cheer.

Read and Find Out

- "Decking the Halls: The Folklore and Traditions of Christmas Plants" by Linda Allen, Willow Creek Press, 2000.
- "Stories Behind the Great Traditions of Christmas" by Ace Collins, Zondervan, 2008.
- "Forest Plants of the Southeast and their Wildlife Uses" by James H. Miller, University of Georgia Press, 2005.

In *Wildlife in North Carolina*:

- "The Parasitic Majority" by Jeff Beane, May 1998.

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