DURHAM MASTER GARDENER NEWSLETTER
July 2009

Michelle Wallace, Durham County Extension Agent – Consumer Horticulturalist and MGV Coordinator
North Carolina State University Cooperative Extension Service

In This Issue:

This month we look at the copperhead. We delve into the mystery of roots. We include a recipe. Carol Holman discusses the Recognition Dinner.

Durham County Center
721 Foster Street
Durham, NC 27701
MGV Desk: (919) 560-0528
Hort. Agent: (929) 560-0526
Fax: (919) 560-0530

Picture courtesy of Rick Fisher

The Copperhead

Those of us who garden in North Carolina are aware of the copperhead, *Agkistrodon contortrix,* as this is our most common poisonous snake. Its geographical range is quite large, extending from Massachusetts to Nebraska to Florida. Like all members of the pit viper family—which includes rattlesnakes and cottonmouths—the copperhead has a pit organ located on each side of its face between the eye and the nostril. This organ detects a heat presence, thereby helping the snake to catch its prey. The male copperhead has a longer tail than the female but the female has a longer body length.[1] In North Carolina there are two subspecies: the northern copperhead and the southern copperhead, which is a bit lighter in color.

[1] http://animaldiversity.ummz.umich.edu/site/accounts/information/Agkistroden_contortix.html, p. 2.

Copperheads can reach an age of eighteen. Attaining sexual maturity at age four when they are four feet long, they will mate either in the spring or the fall. Spring mating occurs after the snakes have left their winter dens while autumn mating takes place in September or October. The actual mating is a marathon, lasting anywhere from 3 ½ to 8 ½ hours; during the mating process the male will secrete a pheromone, rendering the female unappealing to other males. Consequently, the female will breed with just one male while the male will go on to mate with other females. Males are quite contentious during the mating season. After a 105-day gestation period[2], the female either ejects the eggs, which immediately hatch or she bears live young.[3] Litters average between seven to ten babies who are ten inches in length and already possess fangs and the poisonous venom.

Winter dens are normally communal in nature with the snakes returning yearly to the same den. They will migrate to their summer feeding areas every spring, returning to the den by late autumn.

Primarily carnivores, copperheads feast on mice, birds, other snakes, frogs, and insects, including the cicada. Elastic jaws permit them to swallow prey wider in diameter than they are. Their venom attacks the red blood cells of their prey, resulting in prey restraint, thereby making it easier for the snake to swallow it. Sometimes they will bite larger prey and release it, only to hunt it down when it has become incapacitated. Copperheads will keep smaller prey in their mouths until it stops moving. Amazingly, some copperheads only have eight meals in one growing season.[4]

The bigger the snake, the larger are its fangs. Newborns have fully operational fangs but they are small compared to those of the adult. Copperheads generally will avoid confrontation, frequently remaining still until the threat has passed. Most bites occur when someone has inadvertently stepped on a copperhead, an event that is relatively common. If a copperhead is touched, it will release a musk resembling the odor of cucumbers. Many times the bite is an attempt to scare and little venom is released. While this is not an aggressive snake, they are responsible for 37% of all venomous snakebites in the United State. Also bear in mind that North Carolina heads the list for the most snakebites in the United States. Bites from copperhead resulting in death are rare—but they cause extreme discomfort. **If you are bitten, you must get to a medical facility as quickly as possible.**

Roots

A marvelous new gardening book is now in bookstores: *Understanding Perennials* by William Cullina. I hear you groaning, asking whether we really need another book on perennials. A rave review in *The New York Times* piqued my curiosity so I bought it—and what a special book it is. Never have I read a description of plant roots that was so enthralling—yes, I can hear your sighs, thinking this time hyperbole has finally overtaken the editor. Well think again.

---

[2] This refers to a spring gestation period. In a fall breeding the gestation period is considerably longer and there is an indication that the female simply stores the sperm until it gets warmer. www.copperheadsnake.net/lifecycle.htm, p. 2.
[3] There is conflict here with some experts coming down on one side of the discussion and others coming down on the other side. If she expels eggs, the young immediately hatch from the eggs.
[4] Animaldiversity, p. 4.

As we all know, roots are truly wondrous things. Not only do they anchor the plant, they also take in available water while absorbing nutrients from the surrounding soil. In addition they store food supplied by photosynthesis to tide the plant over during its period of dormancy. In the spring this stored food enables the plants to have a spring surge, appearing as though by magic. Roots, it turns out, are terribly busy creatures.

To enable the roots to push their way through the soil, the root cap on the tip of the root "functions as both soldier and diplomat."[5] This cap acts as a helmet, protecting the root while applying a huge amount of pressure in order to penetrate the soil and rocks.[6] The reason roots fail to penetrate compacted soil or subsoil is due to a lack of oxygen in these areas. Eventually with all this hard work, the root cap wears out, only to be replaced by a new one.

The tiny fuzzy root hairs are important as they absorb the water and nutrients necessary for a healthy plant. These root hairs constantly grow, dying off during dormancy or periods of drought. This is the reason why a transplanted plant or newly planted plant needs watering on a regular basis; it is impossible to dig up a plant without damaging some of these fine roots. By cutting back a transplanted plant, we lessen its thirst until the wounded root system begins to grow and functions again. This also explains why it is frequently easier to transplant a plant when it is dormant than when it is actively growing.

The main part of the root is the cortex: "It is a cylinder of cells that transports water into the central plumbing of the root, stores food reserves (starch), and provides mechanical (tensile) strength to cable the plant in place" [30]. Typically plants growing in dry conditions are more likely to have taproots, as the advantage to the taproot is that it can burrow deeply in its quest for water. Plants that have taproots are difficult to divide, as it is almost impossible to dig up a ten-foot deep taproot. In order to transplant a plant with a taproot, it is best to do this during dormancy. Eventually the mangled taproot will produce new roots, although it may take a year for the root system to recover [32]. Dandelions are one example of a plant that produces a taproot; they will spend years developing a root system before exhibiting much growth above ground, at which point it is difficult to rid the lawn of dandelions. "A large, deep taproot is truly a subterranean water tank that can store up to 10 percent of the rain that falls on the plant during the year, allowing it to continue to grow and photosynthesize during drought, when shallower-rooted neighbors become quickly stressed. Impressive food reserves also allow the plant to rebound quickly after browsing or fire" [32].

When there is plenty of water, the roots will absorb it through osmosis; however during drought conditions the same osmotic process wants to push the water out of the roots back into the soil. Drought resistant plants create greater osmotic pressure in an effort to bring in all available water and some plants will even close down their pumping action in an attempt to conserve water. It is very unwise to fertilize plants that are stressed due to the pressures brought on by drought, as the salts in the fertilizer will draw water from the root system, thereby stressing the plants even more. If a plant is wilting, do not fertilize but wait until water has returned and the leaves are turgid.

---

[5] Cullina, William. *Understanding Perennials: A New Look at an Old Favorite* (Houghton Mifflin Harcourt, New York, 2009), p. 28. Future references will be placed in brackets [ ].

[6] Cullina state that roots can apply pressure "as high as 100 to 200 pounds per square inch concentrate in a very small point." This is the reason roots penetrate sewer pipes with such persistence. p. 28.

During drought the fragile feeder hair roots will die, making it even harder for the plant to take in water. The first signs a plant is in trouble are wilting and dieback but the effects may be even longer lasting on the plant as it is forced to use some of its stored food that under ideal conditions would see it through its dormancy. It is not worrisome if the plant wilts in the heat of the day and recovers during the cooler evening but if the plant is still wilted the next morning there *is* a problem.

Like too little water, too much water is also a problem. Too much water forces the oxygen out of the ground; roots need oxygen if they are able to absorb water. Plants that grow in soggy conditions have adapted in a number of ways: (1) some develop air cells, called aerenchyma, in their roots; (2) some plants grow surface roots as a means of obtaining oxygen; and (3) other plants have develop drought tolerant measures such as the ability to close off the water supply as a means of coping with a water-logged environment. The important thing to remember is that a flooded field puts plants under as much stress as does an arid environment [39].

In areas that flood periodically, many plants are capable of "holding their breath," thereby minimizing their water use. They also slow down both their metabolism and their rate of transpiration [see November 2007 Newsletter] during these occasional floods. Because their habitat isn't habitually flooded, these plants have normal root systems. Due to these behavioral adaptations, these plants are able to survive both drought and flood conditions: it is these plants that are suitable for rain gardens.

Roots absorb nutrients from the soil, often from soil particles but more often from dead decaying plants and animals: "From a plant's perspective, the soil is really a big stomach where organic materials are digested to liberate the nitrogen, phosphorus, and all the other elements trapped in dead organic matter that a plant needs for proper growth" [40]. Photosynthesis traps energy from the sun; the plant then ejects 15-50% of this energy into the rhizosphere[7], the area right outside the roots. This is where fungi and bacteria play a role in the health of the plant. The perennial feeds the beneficial fungi and bacteria around its roots while these same fungi and bacteria deter the incursion of harmful microorganisms that cause phytophthora, pythium, and rhizoctonia, fungal root diseases often found in poor soil [41].

In compacted soil, not only are the roots oxygen-deprived, but the beneficial organisms plants need can not work their way through it—just as we cannot wriggle our way through stone boulders. This is where compost and soil amendments work their magic: "Spreading and incorporating two to six inches of aged compost…can jump-start a soil's metabolism, and a yearly topdressing of an inch or so will keep it chugging along."[8] Mulch also works well as it will "provide the raw materials for metabolism" [42].

The most abundant element in our world is nitrogen—but it is almost nonexistent in our soil. 99% of all nitrogen is locked up in the air. Historically, only lightening and bacteria were able to unlock it. By employing the enzyme nitrogenase, bacteria can convert nitrogen into ammonia. In order to do this bacteria needs to grab the energy derived from photosynthesis—and it needs an anaerobic environment as oxygen inhibits nitrogenase. Plants, in order to photosynthesize, need nitrogen. To accommodate the needed bacteria, the plants provide low oxygen structures in nodules around the roots; the bacteria in-

---

[7] The rhizosphere, unrecognized by spellcheck, is "the region of soil in the vicinity of plant roots in which the chemistry and microbiology is influenced by their growth, respiration, and nutrient exchange" according to the *New Oxford American Dictionary*.

[8] Michelle rightly points out that six inches of mulch is more than the recommended amount of between two to **four** inches.

vade the hair roots surrounding these nodules. "The nodules then encase the bacterial colony and begins pumping in sugars, nitrogen, and hydrogen while scrubbing out oxygen. Ammonia is whisked away as it is produced to be used by the plant" [44].

Like bacteria, fungi are also essential for good root development. "Mycorrhizal roots[9] are basically a fusion of fungal roots…and plant roots—a sort of hybrid structure that is neither plant nor fungus" [46]. 80% are either endomycorrhizae (EcM) or arbuscular mycorrhizae (AM) and exist on almost all perennials. Through photosynthesis, the plant feeds the fungus sugars; the fungus in turn prevents disease from entering the root system. AM is widespread in soil so contrary so some garden advisors—Cullina calls them "hucksters"—do not inoculate your plants with mycorrhizal fungi. Nourish your mycorrhizae instead with good compost. There are no commercial sources for EcM.

Next month: Leaves

Plant Combinations

The longer I garden the more I need to remind myself of the basics. It is a truism that mine is a small brain, incapable of remembering some of these gardening ABCs. I nod my head, telling myself that these principles make so much sense and then when planting time comes I madly throw plants at holes in the border, giving little thought as to where they should really go. I am good about putting shade plants in shade and sun plants in sun but I do not always consider the surrounding plants when I am in the midst of a planting frenzy. Recently I went back to watch a segment of "In the Garden," which aired in December 2008 for a refresher course. As Bryce Lane explains, when we are planting, we need to consider (1) the foliage, (2) the flowers, and (3) both the foliage and the flowers.

When planting perennials, consider the foliage because for most of the year that is what you will be seeing as perennial flowers usually last only six weeks or so. Consider the size, color, texture and the shape of the leaves. If you have a plant with variegated leaves, place it against a plant with solid colored leaves to enable the plants to play off one another. Create contrast. Chartreuse is a wonderful color in the garden; you might consider grouping a variegated-leafed salvia next to a lime green coleus with a plant with dark colored leaves in the background.

The garden writer Pamela Harper coined the term "color echo" to describe a different method of grouping plants. With "color echoing," the gardener places plants with similar colors in combination: a *Musa sumatrana*, which carries splotches of maroon on both the topside and underside of its leaves looks great with a Coleus carrying the same maroon color and *Pennisetum setaceum* 'Rubrum' with its maroon flowers. Another example of using the principle of color echoing might be to combine the caster bean plant, *Ricinus communis*, with its red veins, red seed pods, and red stems with *Canna* 'Phasion'.

When grouping flowering plants together, consider putting the warm colors, the reds, the oranges, and the yellows together. Cooler colors consist of the lavenders, roses, pinks, and blues, all of which work well together. This does not preclude the gardener from mixing hot and cool colors together—yellow

[9] See "Organic Gardening Part III," August 2008 Newsletter.

and blue flowers can work very well in the garden together—but mix on purpose to make a statement, not carelessly. White is neither cool nor hot; consequently white flowers can mix with hot colored and cool colored plants quite easily. *Euphorbia* 'Diamond Frost' is an excellent accent plant.[10]

Perennials are mostly foliage plants with a couple of weeks of bloom time. So consider this when planting them. Annuals peaking out of foliage plants can be quite effective. Repeating plants throughout the garden is effective in bringing the elements of the garden together.

In establishing new areas for mass plantings, Bryce recommends planting plants in groups of three as the young plants will appear to take up more space, making the area look more established. Group pots together for "potscaping," a term coined by the late English gardener, Christopher Lloyd. Always have a focal point in this grouping: use a pot at least 20 inches wide that can hold a large vertical plant such as a dwarf banana. By all means combine foliage plants with vegetables as habanero peppers with their orange fruit can add to the interest of the grouping of pots.

Tip: Dealing with Bee Stings

Bee stings are a fact of life in gardening. Today when I received yet another one, I rubbed sliced onion on the sting. Within minutes the redness subsided along with the discomfort. I would love to take credit for it but honesty compels me to admit that I had read about this treatment in the People's Pharmacy. http://www.peoplespharmacy.com/2009/06/15/onions-have-his/

[10] Michelle points out that it is also important to remember too much of one color palette can be unsettling or boring. Incorporating whites and blues in a largely warm color scheme provides the eye with some relief. Conversely, incorporating some hot colors like hot pink or red into a cool color planting scheme will invigorate it and stimulate the eye.