Toomer's Corner Oaks April 2012 Update

Rhizomic shoots at the base (left) and the canopy (right) of the Magnolia Avenue oak; note the glossy green healthy foliage. Image taken April 3, 2012

Appearance of the Toomer's Corner Oaks

- Throughout Fall and into Winter the trees continued to lose their foliage until only about 5% of the normal winter foliage remained indicating that stored food reserves were close to being exhausted. We expected one of two responses coming out of winter: the trees simply fail to produce any new foliage because of depleted food reserves, in which case the trees would be dead or close to dying, or the trees respond to a mild winter and very early spring by developing new leaves. Fortunately, the latter has happened.

January 13, 2012

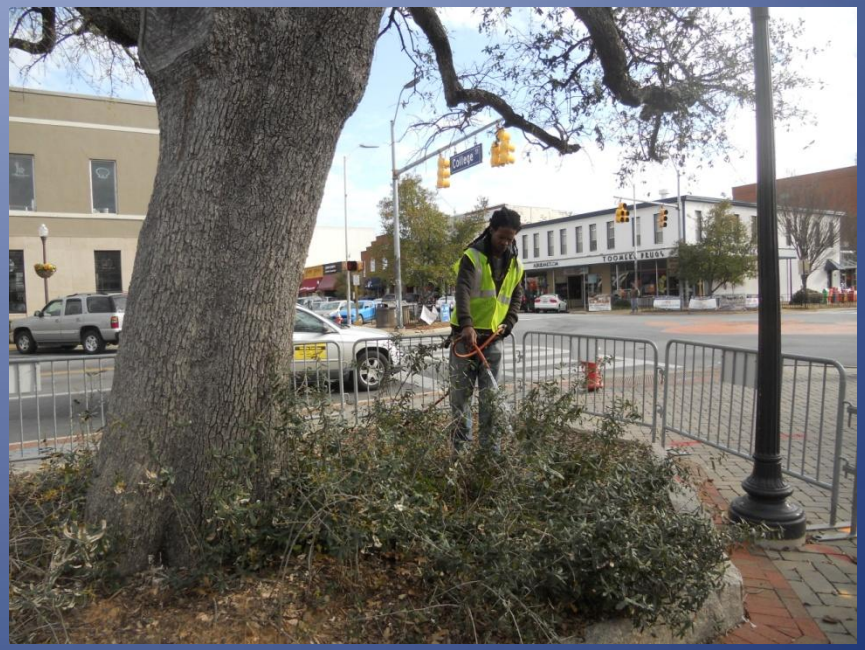
Spring 2012 Efforts

- The Task Force and AU Landscape Services initiated several actions designed to assess the trees' condition and promote their health.

Note the greenish cast to the canopy that reflects the development of new foliage, March 9, 2012

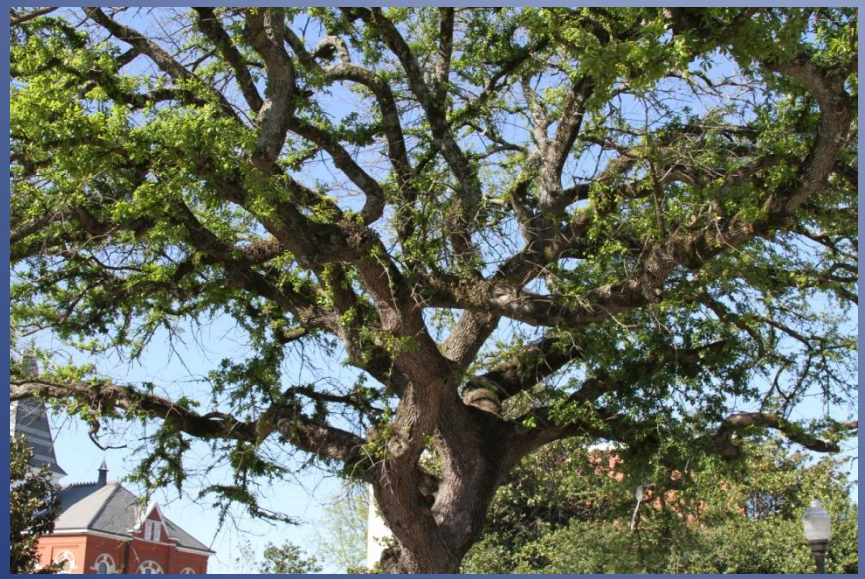
Tree Fertilization

- AU Landscape Services began drenching the two oaks' beds with about 300 gallons each of a soluble fertilizer on March 8, 2012. The intent is to supply the trees with any needed nutrients during the spring when the trees are trying to rapidly replace foliage lost last year. This practice will continue every two weeks through the spring. Trees will also be irrigated every 5 to 7 days when rainfall is lacking.



Bilal Ali with Landscape Services applying liquid fertilizer to the Toomer's Corner Oaks

Tree Fertilization



Within 10 days of applying liquid fertilizer the developing foliage was noticeably darker green.

Foliage on the rhizomic shoots at the base of the trees is glossy dark green and is not showing any signs of herbicide poisoning.

Images taken 3/26/12

Canopy Inspection

- AU Facilities provided a lift on March 9, 2012 to examine the tree canopy for any developing signs of herbicide poisoning and to assess the extent of dead branches that will be removed this spring.

Live vs. Dead Tissue

Live branches are distinguished by yellow to green tissue beneath the bark as opposed to tan to brown tissue in non-living branches.

New foliage is not developing throughout the trees' canopies because of the presence of dead twigs and larger branches. Note the abundant lichens growing on branches. Lichens do not cause the oaks to grow poorly, but may indicate the trees are in a declining condition.

The uppermost 3 feet of the College Street tree is dead.

Areas of the canopy of the College Street oak have little or no new foliage.

A mix of new foliage and bare twigs

Dr. Art Chappelka, School of Forestry and Wildlife Sciences, examining branches in the upper canopy. The branch he is holding is dead. The Magnolia Avenue oak has several large dead branches that will be removed soon.

A mixture of older foliage from last year (larger and dark green) and immature foliage (light, yellow-green) from the Spring 2012 flush of growth

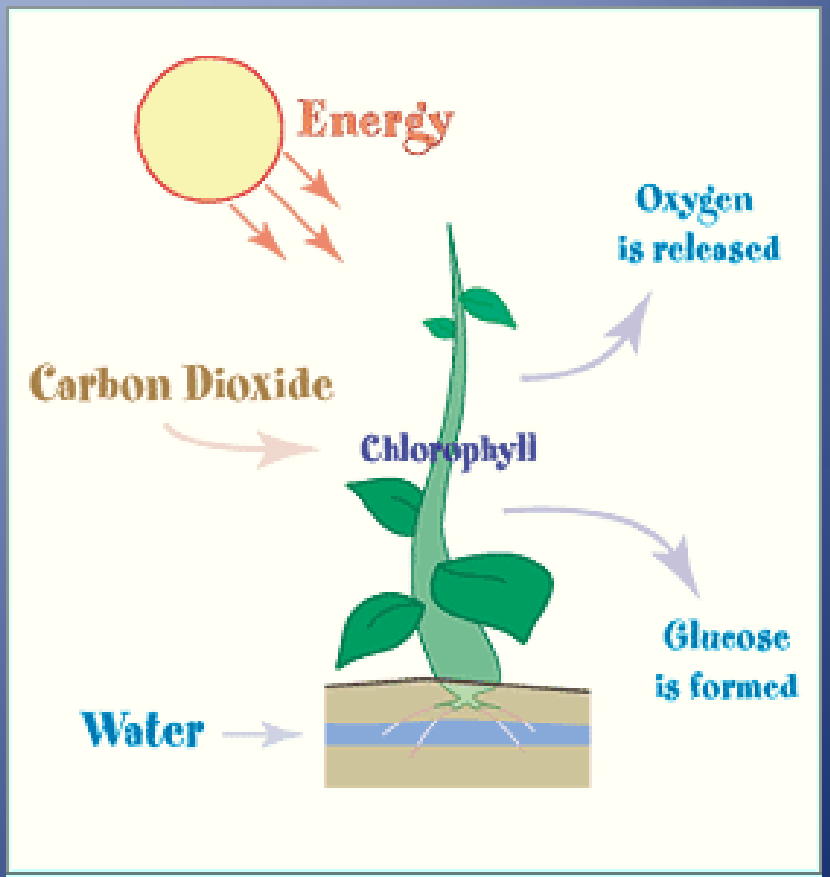
A dead branch on the Magnolia Avenue oak

Last year we reported herbicide injury to a crapemyrtle, water oak and hollies close to the Toomer's Corner Oaks. Signs of the injury are present on the hollies south and west of the oaks. The crapemyrtle and water oak have not leafed out completely yet.

Possible herbicide injury to vetch, a common late winter weed in the landscape, growing near the injured hollies

2012 Remediation (Background): How Spike 80 DF Kills and Why Inject Sugars

- Spike 80 DF, the herbicide used to poison the Toomer's Corner Oaks, inhibits photosynthesis, the process by which all green plants convert carbon dioxide into sugars, but death usually occurs due to cell membrane damage from free radicals formed in the leaves.

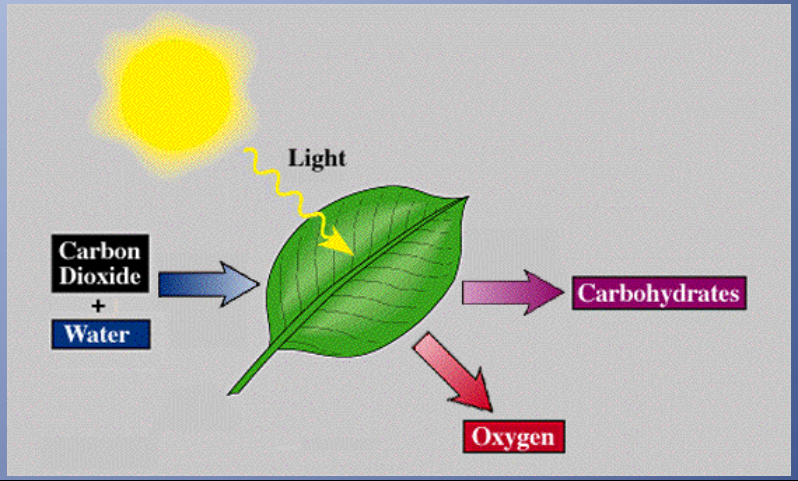


Plant Response to Spike 80 DF

- Damaged cell membranes resulted in the yellowing, browning of leaves and defoliation that both trees experienced last year. The inability to form carbohydrates through photosynthesis forced the trees to use stored carbohydrates to replace the damaged leaves that abscised.

Sugars (Carbohydrates) in Trees

- Sugars produced by photosynthesis are converted into energy and carbon skeletons needed for growth and maintenance of live tissues, or transported to other organs where they are needed or stored for future use. Tree growth and vitality depend on these sugars.



Macroinjection of Sugars

- On March 26, 2012, AU brought in two arborists with Cortese Tree Specialists in Knoxville, Tenn., to inject the Toomer's Corner Oaks with sugar solutions. This was an experimental procedure as only one scientific study on macroinjection of carbohydrates into urban trees has been published and non-stressed live oaks were used, as opposed to our stressed oaks.

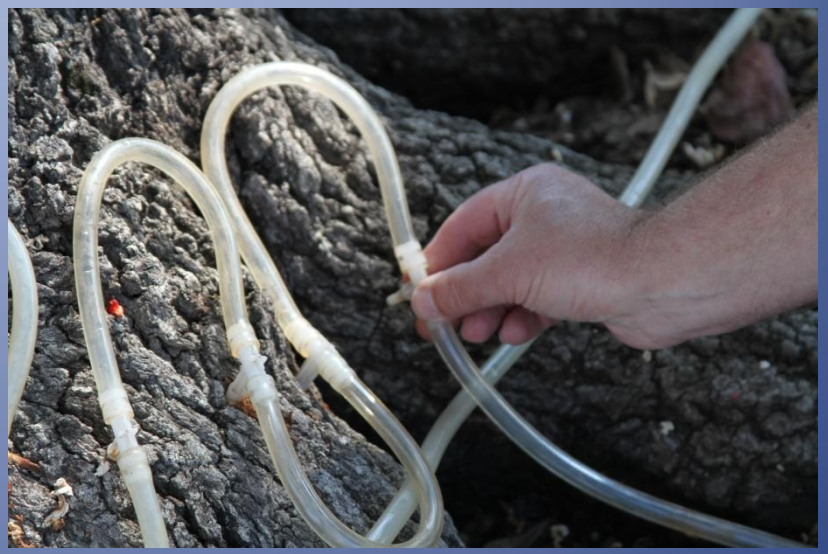
Tom Perry (left) and Jim Cortese (right) with Cortese Tree Specialists

Sugar Injection Procedures

- Forty-nine 11/64” diameter holes were drilled around the circumference of each tree into the flare roots of the College St. tree and into the base of the trunk of the Magnolia Ave. tree.

Sugar Injection Procedures

- Nylon ports interconnected with tubing were inserted into the drilled holes and secured with a rubber mallet.
- The tubing was looped around the trunk and routed to a reservoir.

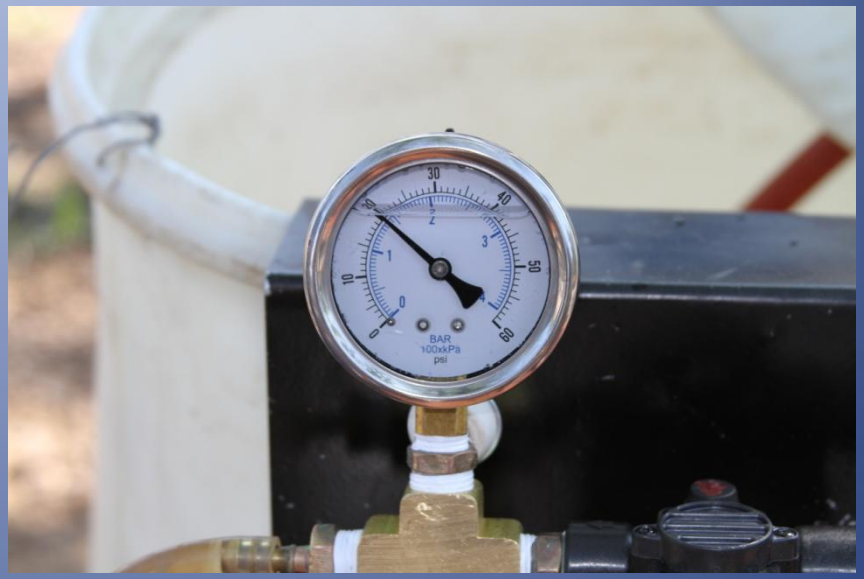


Sugar Injection Procedures

- The system was primed and pressurized with water to test for leaks around the injection ports.
- After sealing the system a 1.5% sugar solution of 1 part sucrose, 2 parts fructose and 2 parts glucose, using water as the solvent, was added to the reservoir and pumped into the trees at 20 psi.

Sugar Injections

- The College St. oak absorbed 26.4 gallons (100 liters) of sugar solution over 3 ½ hours, while the Magnolia Ave. oak absorbed 21 gallons (almost 80 liters) over 2 ½ hours.



Like many members of the Auburn Family, Jim Cortese and Tom Perry with Cortese Tree Specialists, Knoxville, Tenn., are true tree huggers. Their services are most appreciated.

Other Activities : Soil Samples

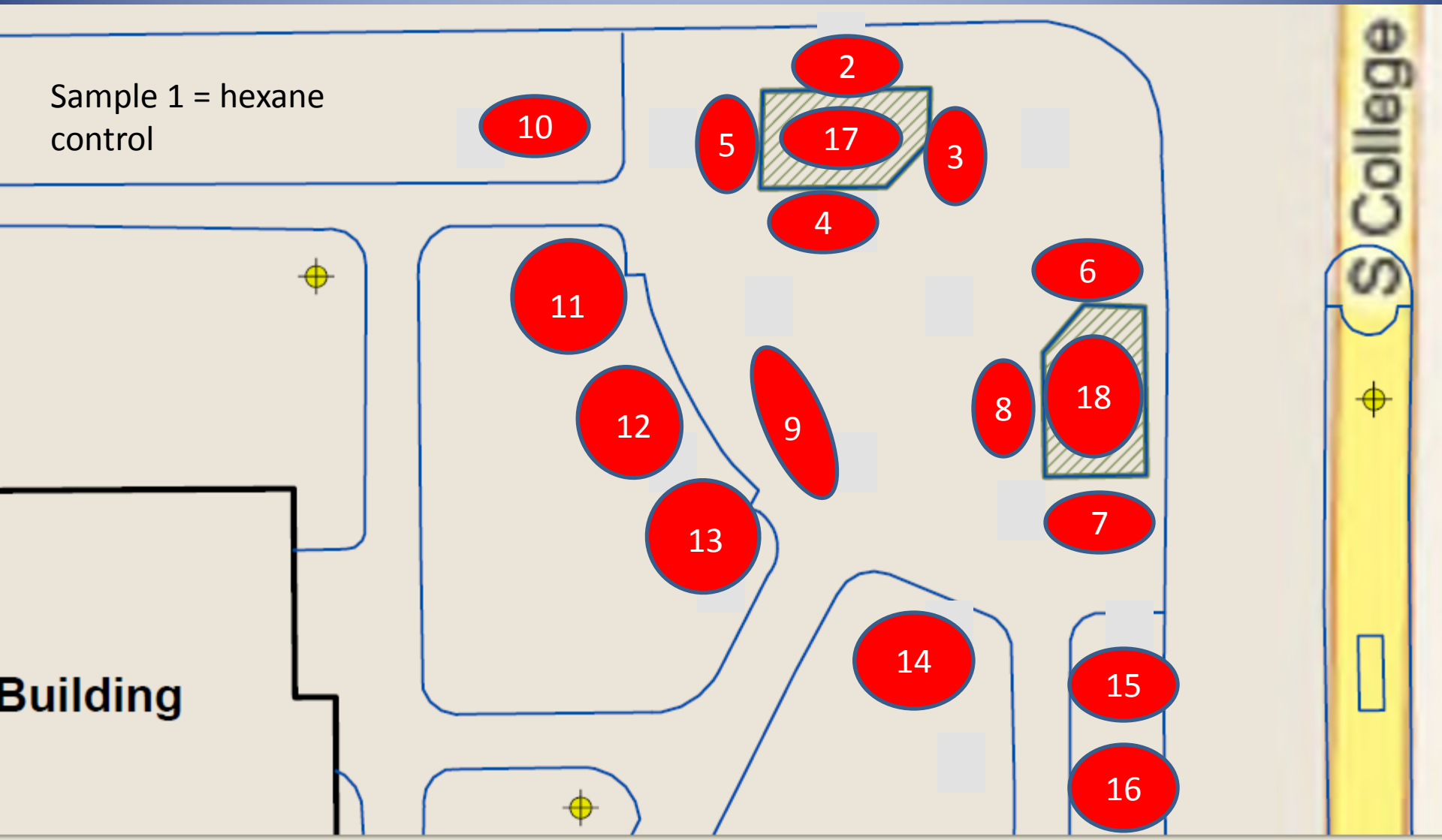
- Soil samples were collected from the beds in which the oaks are growing, from beneath the plaza, and from landscaped areas bordering the plaza by AU personnel and the Alabama Department of Agriculture on March 29, 2012.

John Voller with AU Landscape Services assisting with the collection of soil samples

Rationale for Collecting Soil Samples March 2012

- Retest beds to assure no new poisoning and check for new contamination from leaf drop
  - 2 samples total
- Test under bricks in area that surround the two beds to be certain hot spots outside the beds weren't missed
  - 8 samples total
- Test directly under affected and unaffected hollies, crepe myrtle, water oak, and willow oak
  - 7 samples total

Soil sampling on 3/29/2011



Methods

1. Composites of 5 subsamples from within each red circle were collected
2. Pavers were lifted and gravel removed from beneath before coring samples collected on the plaza
3. Cores ranged in depth from about 4” (on plaza) to 16” (from beds)
4. Probes were disinfected between samples, but not between subsamples, by brushing off any soil, spraying with hexane, and wiping the probe thoroughly with Kimwipes
5. Samples will be analyzed by the Alabama Department of Agriculture.

Soil Sampling

Marking the pavers for removal

Removing pavers for sampling beneath

Soil Sampling

Removing a soil core from beneath the plaza

Removing a soil core from around a water oak south of the plaza

Future sampling if Foliage Shows Signs of Herbicide Poisoning

Sample immature and mature foliage in the canopy and from the basal rhizomic shoots: new/mature (2) x 2 locations x 2 trees = 8 samples

Note the presence of herbicide damage on the older dark green leaves from 2010 and the absence of any injury on the immature leaves formed in 2011

Other Activities : EarthMAX

- On March 29, 2012,
- the two Toomer's Corner Oaks' beds were drenched with EarthMAX, a product that contains macro- and micronutrients, a carbon source, and organic acids that promote root growth. The product will be reapplied two weeks later.

EarthMAX was donated by Harrell's, LLC, Sylacauga, AL

EarthMAX

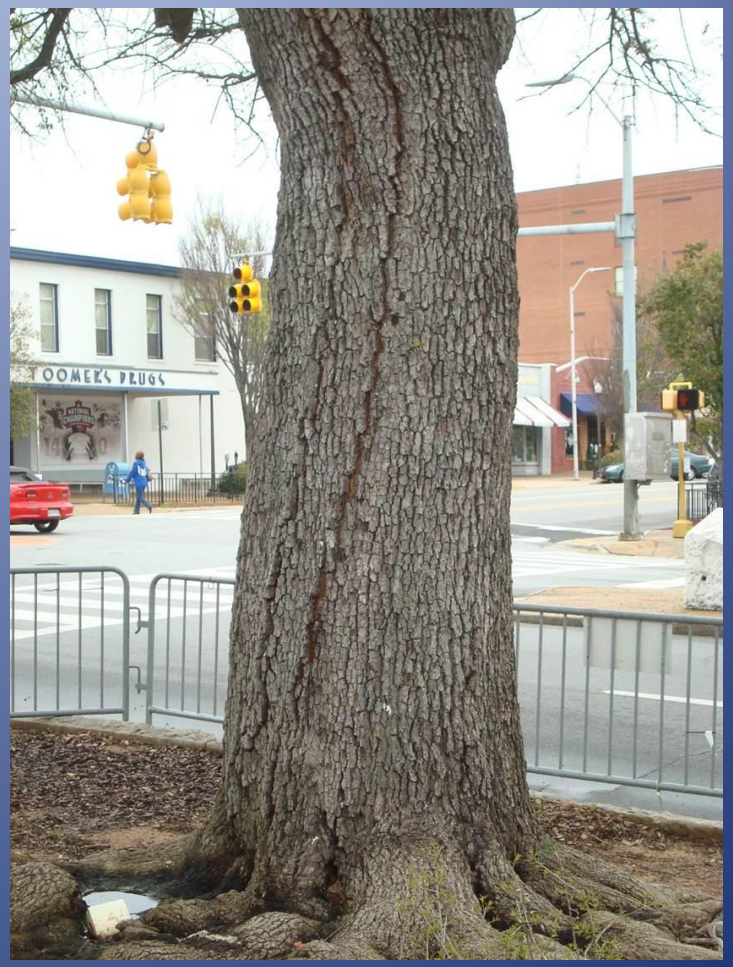
- Four gallons of EarthMAX was applied in 200 gallons of water to each bed. Note the dark brown color of the solution.

Tracy Lockhart of Landscape Services applying EarthMAX to the two beds

Next Steps

- The dead branches in the canopies of both trees will be removed by pruning this spring.
- Drenching the two beds with liquid fertilizer and a fortified compost extract every two weeks will continue through spring (fertilizer) and at least twice for the extract.
- The beds and plaza will be irrigated every 7 to 10 days during periods of drought.

Unknown Streaks



The College St. oak has developed two vertical fissures along the southwest side of the trunk that extend into the lower canopy. These streaks appeared during the 2011-12 winter and are similar in appearance to those caused by lightning, except they don't extend into the upper crown. Some have speculated the cause may be linked to the herbicide.

Current Prognosis: The Bad

- The trees were severely weakened by the repeated loss of foliage in 2011 as evidenced by the inability to replace lost foliage.
- Herbicide effects are further exhibited by the extensive loss of twigs and branches in the canopies of both trees present today.

Current Prognosis: The Good

- The presence of developing new foliage without any signs of herbicide damage, the darkening of this foliage following fertilization, and the uptake of sugar solutions by both trees are all reasons to be encouraged. But recognize that signs of the herbicide's presence can reappear any time. We are not out of the woods yet.

Images taken 4/3/12