The 2011 Drought in Texas

Tree Health Issues

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Forest Health
Let’s begin by looking at the severity of the 2011 drought
“Texas could be in the midst of a drought the history books have never seen,” state climatologist John Nielsen-Gammon said. The current drought could last until 2020, because the region's climate is in the middle of a 20- to 40-year dry phase, he said. The drought of record, occurred from about 1950 - 1957. "Sooner or later there will be a drought that's worse," Nielsen-Gammon said. The 2011 drought was estimated to have caused $5.2 billion in agricultural losses in Texas through August.
Some bullet points about the 2011 drought in Texas

✓ Texas has experienced its most severe one-year drought on record. (John Nielsen-Gammon, Texas State Climatologist).

✓ The 12 months from October 2010 – September 2011 were the driest on record with 7.18” (statewide average) of rainfall (normal is 14.94”; record low was 7.35” Oct 1901 – Sep 1902).

✓ Oppressive summer heat with temperatures over 100° broke records across the state, especially for consecutive days and total number of days with temperatures equal to or greater than 100°.

✓ Tree-ring data has been used to calculate the standard Palmer Drought Severity Index (PDSI) dating back over 450 years (to 1550) in Texas. From this study, it was concluded that 1789 was the only year in the last 461 years when Texas had a drought as severe as 2011.

✓ In some areas of central and west Texas, the drought may be causing “landscape level” changes in the vegetation with millions of acres being impacted.

✓ 100 million to 500 million trees with a diameter of five inches or larger were estimated to have succumbed to the 2011 drought. That is equivalent to 2% to 10% of the state’s 4.9 billion trees. Urban/yard/street trees are not included in the estimate.
U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid for February 2 - April 30, 2012
Released February 2, 2012

KEY:
- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.
The impact of the 2011 drought on some East Texas lake levels
(as of November 16, 2011)

✓ Sam Rayburn Reservoir – 13.7 feet below normal pool elevation
✓ Lake Nacogdoches – 12.34 feet below normal pool elevation
✓ Toledo Bend Reservoir – 12.31 feet below normal pool elevation
✓ Lake Livingston – 4.04 feet below normal pool elevation
✓ Lake Palestine – 6.9 feet below normal pool elevation
✓ Lake Conroe – 7.92 feet below normal pool elevation
✓ B. A. Steinhagen (Dam B) – 3.78 feet below normal pool elevation
✓ Lake Fork – 7.62 feet below normal pool elevation
While talking about the 2011 drought, we must not forget the impact wildfires had on the Texas landscape. Following are a few statistics and photos about the fires.
Wildland Fire Statistics for Texas for 2011 (as of October 5, 2011)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Fires</th>
<th>Acres</th>
<th>Structures Lost</th>
<th>Structures Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>State (TFS)</td>
<td>3,163</td>
<td>2,874,780</td>
<td>5,774</td>
<td>28,078</td>
</tr>
<tr>
<td>Fire Departments</td>
<td>18,487</td>
<td>893,860</td>
<td>1,224</td>
<td>21,573</td>
</tr>
<tr>
<td>Totals</td>
<td>21,650</td>
<td>3,768,640</td>
<td>6,998</td>
<td>49,651</td>
</tr>
</tbody>
</table>

Ten largest Fires 2011

<table>
<thead>
<tr>
<th>Start Date</th>
<th>Fire Name</th>
<th>Acres</th>
<th>County</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-Apr-11</td>
<td>Rockhouse</td>
<td>314,444</td>
<td>Jeff Davis</td>
<td>2011</td>
</tr>
<tr>
<td>25-Apr-11</td>
<td>Deaton Cole</td>
<td>175,000</td>
<td>Val Verde</td>
<td>2011</td>
</tr>
<tr>
<td>11-Apr-11</td>
<td>Cooper Mountain Ranch Fire</td>
<td>162,625</td>
<td>Kent</td>
<td>2011</td>
</tr>
<tr>
<td>10-Apr-11</td>
<td>Wildcat Fire</td>
<td>158,308</td>
<td>Coke</td>
<td>2011</td>
</tr>
<tr>
<td>09-Apr-11</td>
<td>PK Complex</td>
<td>126,734</td>
<td>Palo Pinto</td>
<td>2011</td>
</tr>
<tr>
<td>06-Apr-11</td>
<td>Swenson Fire</td>
<td>122,500</td>
<td>Stonewall</td>
<td>2011</td>
</tr>
<tr>
<td>06-May-11</td>
<td>Dickens Complex</td>
<td>89,200</td>
<td>Dickens</td>
<td>2011</td>
</tr>
<tr>
<td>09-May-11</td>
<td>Iron Mountain Fire</td>
<td>87,401</td>
<td>Brewster</td>
<td>2011</td>
</tr>
<tr>
<td>07-May-11</td>
<td>Schwartz Fire</td>
<td>83,995</td>
<td>Brewster</td>
<td>2011</td>
</tr>
<tr>
<td>14-Apr-11</td>
<td>Frying Pan Fire</td>
<td>80,907</td>
<td>Andrews</td>
<td>2011</td>
</tr>
</tbody>
</table>
## Top 10 Fires – Homes Lost

<table>
<thead>
<tr>
<th>Start Date</th>
<th>Fire Name</th>
<th>Homes Lost</th>
<th>County</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>04-Sep-11</td>
<td>Bastrop County Complex</td>
<td>1,649</td>
<td>Bastrop</td>
<td>2011</td>
</tr>
<tr>
<td>09-Apr-11</td>
<td>Possum Kingdom Complex</td>
<td>168</td>
<td>Palo Pinto</td>
<td>2011</td>
</tr>
<tr>
<td>05-Sep-11</td>
<td>Riley Rd</td>
<td>73</td>
<td>Montgomery</td>
<td>2011</td>
</tr>
<tr>
<td>04-Sep-11</td>
<td>Pedernales Bend</td>
<td>67</td>
<td>Travis</td>
<td>2011</td>
</tr>
<tr>
<td>04-Sep-11</td>
<td>Bear Creek</td>
<td>66</td>
<td>Cass</td>
<td>2011</td>
</tr>
<tr>
<td>09-Apr-11</td>
<td>Rockhouse</td>
<td>41</td>
<td>Jeff Davis</td>
<td>2011</td>
</tr>
<tr>
<td>30-Aug-11</td>
<td>101 Ranch</td>
<td>39</td>
<td>Palo Pinto</td>
<td>2011</td>
</tr>
<tr>
<td>04-Sep-11</td>
<td>Steiner Ranch</td>
<td>35</td>
<td>Travis</td>
<td>2011</td>
</tr>
<tr>
<td>09-Apr-11</td>
<td>Hickman</td>
<td>34</td>
<td>Midland</td>
<td>2011</td>
</tr>
<tr>
<td>27-Feb-11</td>
<td>Tanglewood Fire</td>
<td>33</td>
<td>Randall</td>
<td>2011</td>
</tr>
</tbody>
</table>

2,555 houses lost in 2011 as of October 5, 2011
Aviation resources have played a critical role this fire season and have been instrumental in saving hundreds of homes. Since January 1, dozens of air tankers (including a DC-10 and several “scooper “ aircraft from Canada), SEATs (single engine air tankers), helicopters, and fixed-wing air attack aircraft have flown more than 16,000 accident-free hours and have dropped more than 33 million gallons of water and retardant.

(October 5, 2011)
More than one-third of the nearly 36 million cubic feet (216 million board feet) of timber killed earlier this year by wildfires in Grimes, Jasper, Trinity and Polk counties has been salvaged.

The Dyer Mill Fire ignited June 21 charring 5,280 acres and destroyed 30 homes in Grimes County.

The Powerline Fire ignited on June 21 charring 4,197 acres in Jasper County. No homes lost.

The Bearing Fire ignited on June 30 charring 22,222 acres in Polk and Trinity counties and destroyed one home.
Bastrop Fire: 34,068 acres, 1,649 homes destroyed, two civilians were found dead as search crews went through the charred subdivisions.

Corpus Christi (175 miles from Bastrop)

Houston

Other fires
Bastrop Fire
Bastrop Fire as seen from Austin
Following is a photographic tour of some of the 2011 drought impact around Texas
Lake Travis (near Austin) at 46.52 feet below normal, "Sometime Island"
Lake Travis “Sometime Island” February 27, 2009
Hurst Creek on Lake Travis
Cell phones found on the bottom of Lake Travis
Pedernales River at State Highway 71 crossing, NW of Austin
Brazos River runs dry in Knox County, Texas during the summer drought of 2011.
Swimming hole between College Station and Austin
Ron Billings, TFS
Drought impact near Junction, TX
(about 125 miles west of Austin)

Ron Billings, TFS
Drought impact near Junction, TX
(about 125 miles west of Austin)
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Central Texas drought – dead(?) live oaks
Mark Duff, TFS
My GPS as I drove in the dry lake bed to find water at Marion Ferry
Pine and hardwood trees impacted by drought on the Jones State Forest near Conroe (Montgomery County)
Pine and hardwood trees impacted by drought in The Woodlands
Pine and hardwood trees impacted by drought in The Woodlands (Research Forest area)
Memorial Park – Houston
Located a few miles west of downtown and inside Loop 610
An estimated 80% of the trees have died.
Memorial Park, Houston

2010

2011
Trinity River at Riverside, TX
Lake Nacogdoches
Pine and hardwood trees impacted by drought near Gladewater, TX
Pine and hardwood trees impacted by drought near Palestine, TX
Unthinned and thinned pine plantations in East Texas were surveyed by TFS personnel in January 2012.

Plantations were 15-20 years old.

Thinned plantations were thinned in 2008, 2009 or 2010.

Live trees and trees that died in 2011 were counted (dominant and codominant trees).

Results were tallied by 4 East Texas regions – NE, Central, SE, and Western fringe.

A ½-acre plot was sampled in each plantation.

Let’s look at the results.
## East Texas Pine Plantation Survey

### Estimate of Drought Impact

<table>
<thead>
<tr>
<th>REGION</th>
<th>NUMBER</th>
<th>% MORTALITY</th>
<th>NUMBER</th>
<th>% MORTALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE</td>
<td>10</td>
<td>4.1%</td>
<td>10</td>
<td>0.5%</td>
</tr>
<tr>
<td>Central</td>
<td>8</td>
<td>6.4%</td>
<td>11</td>
<td>0.5%</td>
</tr>
<tr>
<td>SE</td>
<td>7</td>
<td>1.4%</td>
<td>8</td>
<td>0.3%</td>
</tr>
<tr>
<td>Western Fringe</td>
<td>17</td>
<td>3.9%</td>
<td>21</td>
<td>0.4%</td>
</tr>
<tr>
<td><strong>Total or Mean</strong></td>
<td><strong>41</strong></td>
<td><strong>3.9%</strong></td>
<td><strong>50</strong></td>
<td><strong>0.4%</strong></td>
</tr>
</tbody>
</table>

Greatest mortality was in an unthinned plantation in Houston County (24.9%). Unthinned plantations had over 9X more mortality than thinned plantations. Average for all plantations was only 2.2% mortality.
The drought has left many landowners and homeowners wondering if their trees are dead or alive.

- Many shade trees went into dormancy as early as August, dropping their leaves and branches in a desperate act of self-preservation.
- Many pine trees are topped with red, dead needles.
- Assessing trees damaged or killed by drought can be tricky.
- Not all trees that “appear” dead are actually dead.
- Winter leaf drop has complicated the diagnosis of hardwood trees.
- Group the trees into three different categories — **definitely dead**, **likely to live**, and **questionable**.
- Let’s look closer at these three categories.
Definitely Dead

Here are some things to look for
Once the needles on a pine tree have turned red, the tree is dead and will not recover. The same thing is true for cedar trees.

Pine engraver beetles (*Ips* beetles) often attack pine trees weakened from drought or construction damage.
When pine engraver beetles attack pine a tree, the tree often dies from the top down. This tree will not recover.

Look for “pitch tubes” on the trunk of pine trees as an indication of pine engraver beetle attacks.
DEFINITELY DEAD HARDWOOD TREES

When hypoxyylon canker appears on the trunk, the tree is dead and will not recover.
Don’t confuse hypoxylon and smooth patch

This is NOT hypoxylon canker. This is a fungus called smooth patch that forms white/gray sunken areas on the bark, mostly on post oak. It does not harm the tree.
DEFINITELY DEAD
HARDWOOD TREES

When the bark cracks and becomes loose, the tree is dead.
DEFINITELY DEAD HARDWOOD TREES

This dogwood tree is dead. It failed the scratch test and “twig snap” test.
Removing dead trees is of no value in protecting other live trees. Wood from dead hardwood trees is OK to use for firewood.
Likely To Live

Here are some things to look for
Likely To Live

All the leaves on this red oak tree turned brown in August and most of them fell from the tree. This tree should leaf out in the Spring of 2012.
This pine tree is not dying. The older needles are dropping from the tree early due to drought stress. Notice the needles at the tips of the branches are still green.

Likely To Live
This pine tree is not dying. In the fall and winter, it is common for small, scattered branches in the crown of a pine tree to die. This is natural and not a cause for concern.
Likely To Live

This oak tree is showing signs of drought stress, but is not dying. Notice that there are green leaves scattered throughout the crown.
Likely To Live

The scratch test shows the inner bark of this hickory tree to be green and alive even though all the leaves are brown. This tree also passed the “twig snap” test.
Likely To Live

The scratch test shows the inner bark of this blue beech (*Carpinus caroliana*) tree to be green and alive even though all the leaves are brown. This tree also passed the “twig snap” test.
Baldcypress is a conifer, but, unlike pines and cedars, this tree has foliage that turns red and drops from the tree in the fall or during periods of drought stress. Cypress trees will usually resprout in the spring.
Questionable

Trees that appear to fit between the *definitely dead* and *likely to live* categories

Here are some things to consider
All the leaves on this American elm tree have died and most have fallen from the tree. The fact that most of the mistletoe is also dead indicates this tree may have lost most of its crown and probably won’t recover.
Here is a rule-of-thumb to remember when evaluating whether a tree is dead or alive.

- If all the leaves turn brown and persist on the tree, it may be dead.
- If all the leaves turn brown and fall from the tree, it may be alive.
- Whether a tree retains or drops its leaves is not a guarantee of life or death.
- Use the “twig snap” and scratch test to help determine the condition of a tree.
Deciding whether to remove a questionable tree can be a tough decision for both property owners and professional tree care experts.

For questionable trees, waiting until spring to see if the tree leafs out may be the best course of action.

Waiting until spring to decide about removing questionable trees is especially true for trees that are valuable in a home landscape.

Removal should be considered if a severely drought-stressed tree is close to a house or other structure on which it might fall.

For more information on keeping trees healthy or assessing drought-stressed trees, check with a certified arborist, forester or other tree care professional.
The End