

Forest Resiliency:

Managing for Health & Vigor in the Face of Pervasive Change

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Improving Lives. Improving Texas.

Forest Resiliency

Management Priorities



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What is the Priority Goal



Keep in mind

- ◆ Lower precipitation
- ◆ Less soil moisture
- ◆ Increased competition for water
- ◆ Increased frequency of extreme weather events
- ◆ Elevated temperature
 - Changes in maximums and minimums
 - Changes in growing season length
- ◆ Increase frequency of fire
- ◆ Increased variability and uncertainty
- ◆ Increased introduction of new species
- ◆ Anticipate BIG surprises

What is the Priority Goal



Timber Management?

Conservation

Resiliency

Recreation

Wildlife

Resiliency



- ◆ Ecological – the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly
- ◆ Silvicultural – emphasizing practices that increase the ecosystem's ability to quickly recover from likely and unexpected change in future conditions
- ◆ Drought, wind, fire, flooding, insect, disease, temperatures
- ◆ May lower total fiber production potential
- ◆ BUT...helps to ensure that there will be fiber to harvest
- ◆ Extreme weather events (not average) determine effort

Options



- ◆ New Stands
 - Site quality scrutiny
 - Species selection
 - Site preparation
 - Planting season / stock / densities
 - Soil moisture
 - Future conditions
- ◆ Existing Stands
 - Competition control / Invasives
 - Stand density
 - Fuel reduction
 - Prescribed fire
 - Diversity
 - monitoring

To Plant or Not: A Check List



- ✓ Professional Assistance
 - Qualified forester/crew
 - Proven track record
 - Site preparation
 - Pest control
 - Competition control
 - Take the time to plant seedlings correctly
 - Handling
 - Appropriate weather conditions
- ✓ Site Quality
 - Highly suitable for production
 - Not limited by moisture (too much? Too little?)
 - No compaction
 - Good soil nutrition
 - Location

To Plant or Not: A Check List



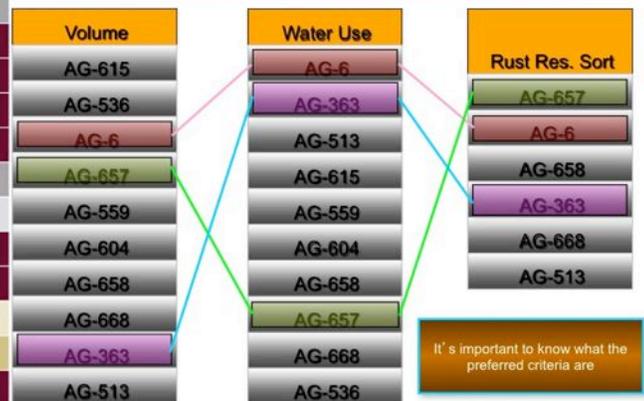
- ✓ Site Preparation
 - Ordered the appropriate stock for site – trait considerations
 - Cost share applications submitted and approved
 - Performed necessary activities well before planting
 - Minimize competition
 - Regeneration pest
 - Soil improvements

Seedling Selection



- ◆ Genes matter!
- ◆ Loblolly pine, in general, acts like other populations with a wide natural range
- ◆ There is a lot of variation within the species
- ◆ These differences can be exploited
 - Elite OP - top-of-the-line volume producers. The very best of the OP families for growth, independent of generation
 - MCPs - full-sibling families where both parents have been selected for growth and other traits. They provide the most value for the landowner
 - Varietal

There Are Family Differences



Bryant and Dougherty - ArborGen

To Plant or Not: A Check List



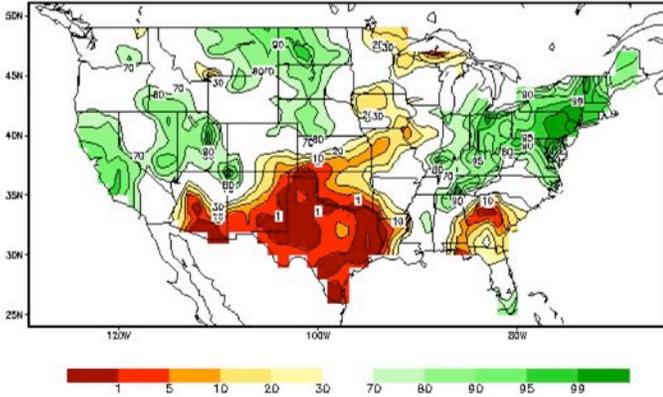
- ✓ Planting
 - Fall planting – low risk (mid-Oct through Nov.)
 - Time to establish roots
 - Containerized seedlings
 - Winter planting – moderate risk (Dec through mid-Feb)
 - Spring planting – high risk (late-Feb – April)
 - Little time for root growth

To Plant or Not: A Check List

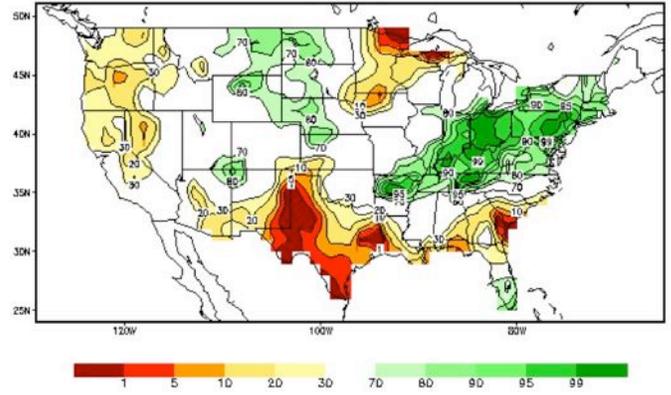


- ✓ Soil Moisture
 - Site has sufficient soil moisture at time of planting
 - Historically mid-October
 - Droughty summers may limit moisture even if rain occurs during fall
 - Check out Monthly Soil Moisture Percentile map at National Weather Service (<http://www.cpc.ncep.noaa.gov>)
 - Should be above 30% (at least)
 - Inadequate in fall – delay until winter
 - Inadequate in winter – delay until next fall

Calculated Soil Moisture Ranking Percentile
OCT, 2011



Calculated Soil Moisture Ranking Percentile
DEC, 2011



To Plant or Not: A Check List



✓ Precipitation Outlook

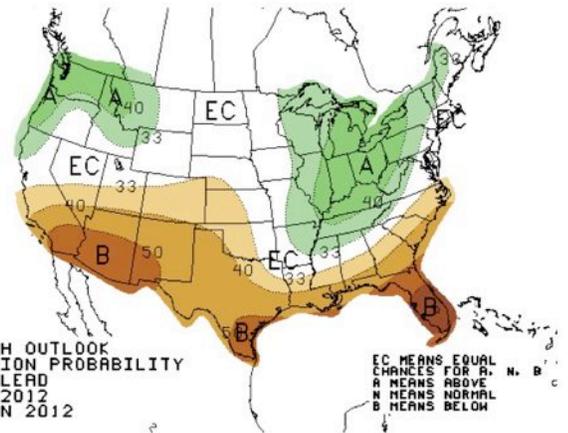
- Forecasts call for sufficient rain – next few months
- Check out 3 month precipitation outlook at <http://www.cpc.ncep.noaa.gov/index.php>
- Increased risk if > 25% chance of below average rainfall
- Risk worsened if rain deficits during previous summer

✓ Temperature Outlook

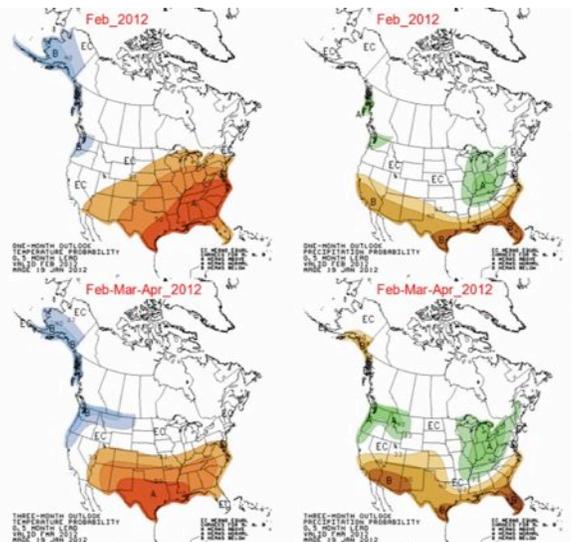
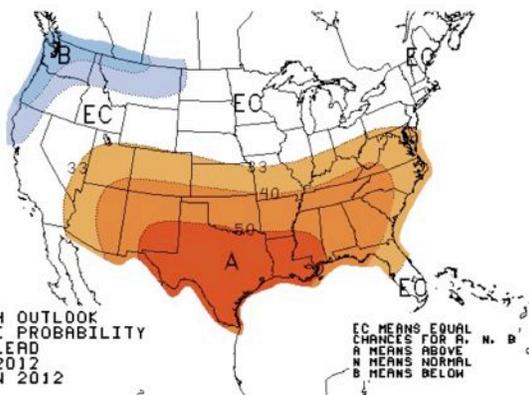
- Too Warm? Too Cold?
- Difficult to coordinate planting
- Increases risk of loss



3-Month Precipitation

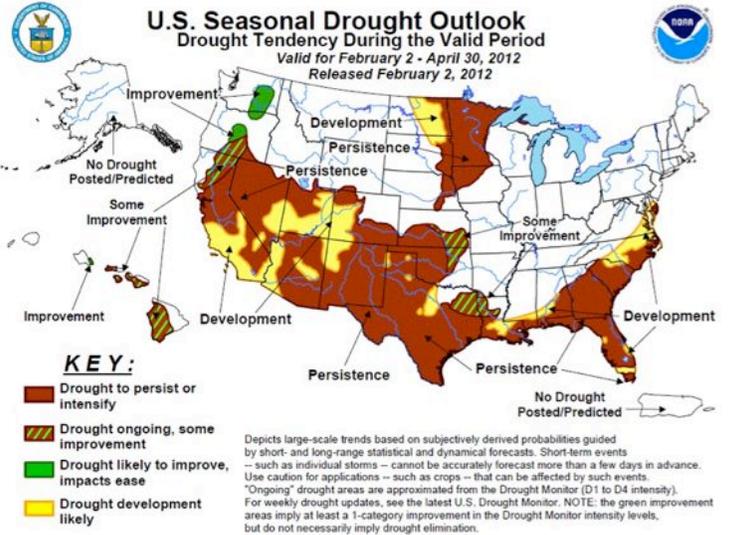
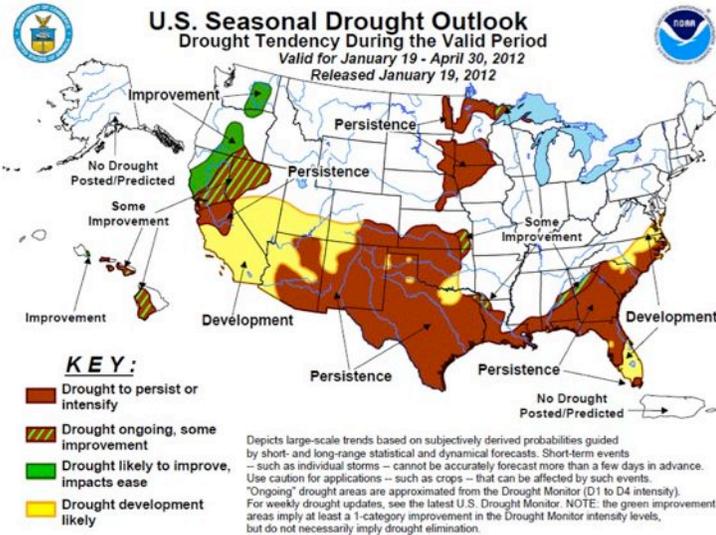
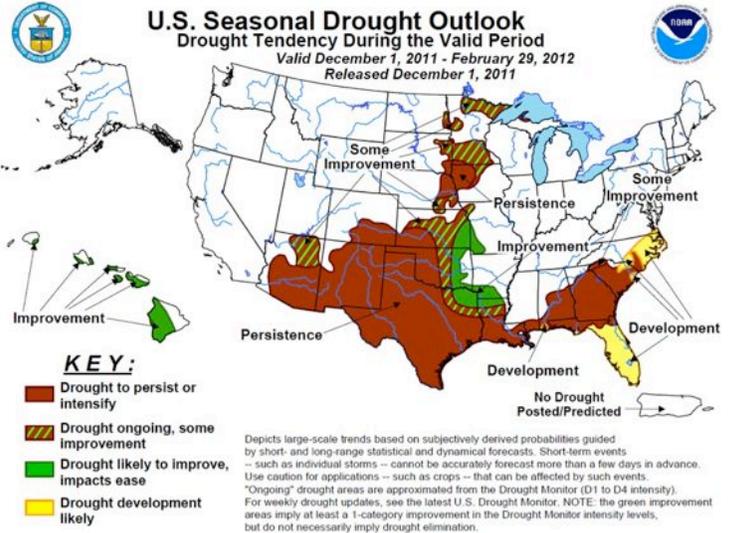


3-Month Temperature



To Plant or Not: A Check List

- ✓ Long-term Drought Potential
 - Stand establishment – 3 years
 - Weather conditions dictate survival & productivity
 - Unable to predict with certainty
 - US Drought Assessment - <http://www.cpc.ncep.noaa.gov/index.php>
 - Palmer Drought Severity Index (PDSI) used in the following prediction equation by Zwolinski et al. (1994)
- $$\% \text{ survival} = 60.74 + 3.49 (\text{PDSI})$$
- Example: Say that the average PDSI for October - December was -4. So, % Survival = 60.74 + 3.49 (-4) = 46.8 % chance that seedlings will survive the first summer following planting



Options

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 - Future conditions
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 - Stand density
 - Fuel reduction
 - Prescribed fire
 - Diversity
 - monitoring

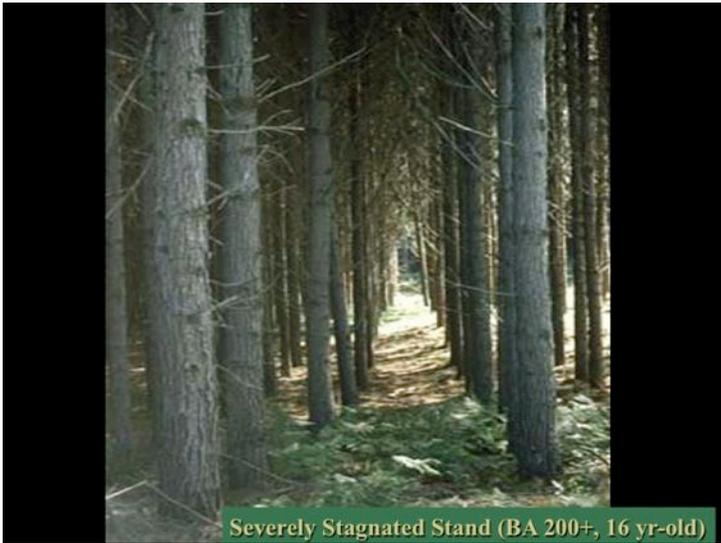
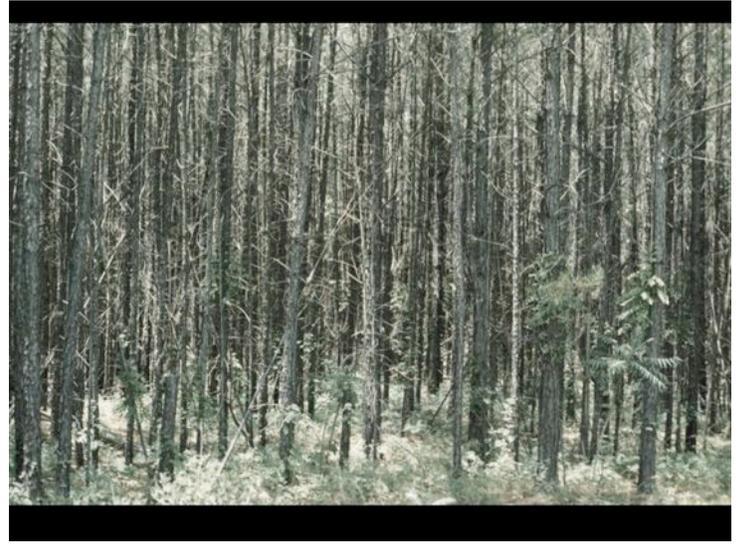


Forest Resiliency

Stand Density



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Severely Stagnated Stand (BA 200+, 16 yr-old)



20+ Yr-Old Stand Never Thinned



13 Yr-Old Stand, (BA 120+)



15 Yr-Old (BA 180+)



15 Year-Old Stand – BA 150



AgriLIFE EXTENSION
Texas A&M System
TEXAS FOREST SERVICE
The Texas A&M University System

Diversity



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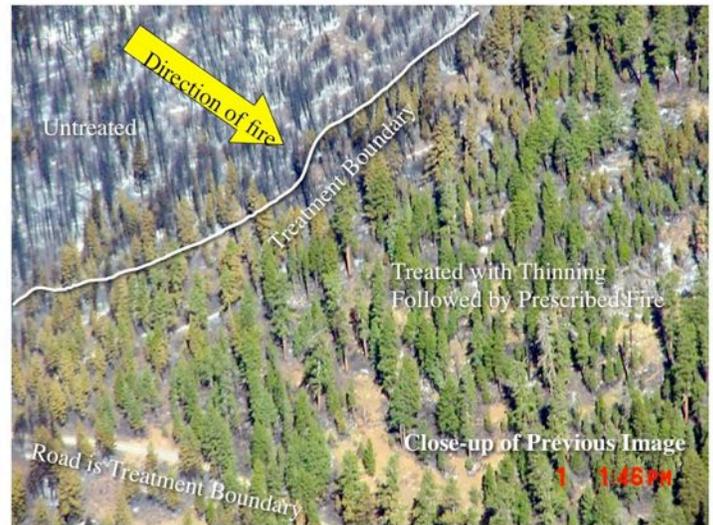
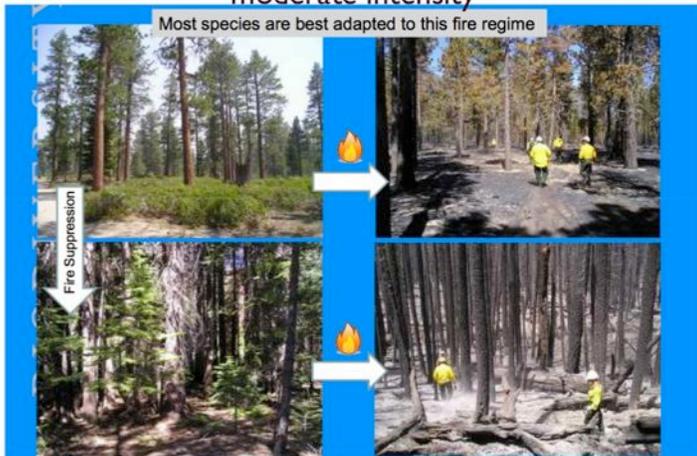


Fuel Reduction



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Pine forests are adapted to frequent fires of low to moderate intensity



Stand Density

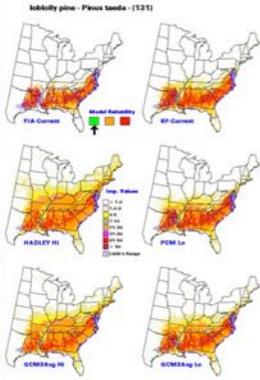


- ◆ Lower Basal Area
- ◆ Resistant to insects, disease, fire
- ◆ Resilient to insects, disease, fire
- ◆ Some issues with ice, wind if overly dense
- ◆ Greater expense (or less profit) to landowner
- ◆ Reduction in risk has value

- ◆ Changing conditions – no historical data for establishing a silvicultural model

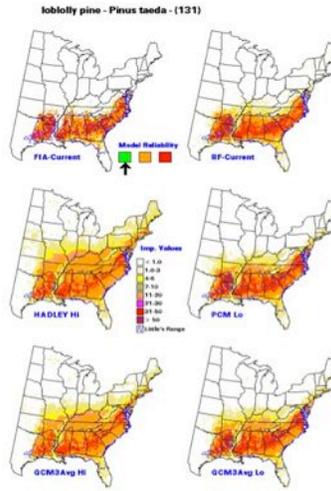


Range Shifts?



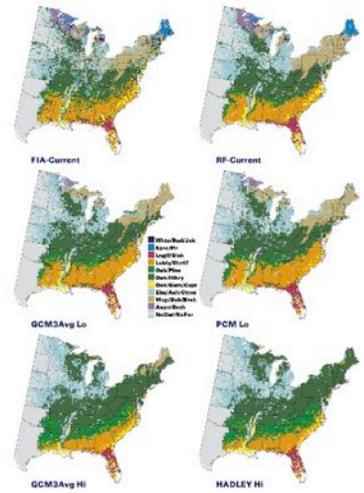
- ◆ USFS has predicted range shifts for many species based on climate scenarios and species autecology
- ◆ Results controversial but provide "food for thought"
- ◆ Important to remember that in the past, species have tended to move independently with changing climate
- ◆ Species composition may change

Prasad et al., 2007-ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. <http://www.nrs.fs.fed.us/atlas/tree>. Northern Research Station, USDA Forest Service, Delaware, Ohio.



L.R. Iverson et al. / Forest Ecology and Management 254 (2008) 390-406

Forest Type Maps



TEXAS FOREST SERVICE AgriLIFE EXTENSION

To Plant or Not To Plant: New Timber Stand Drought Risk Assessment

Texas has experienced some tough environmental conditions over the last decade. These conditions have led many to ask the very relevant question, to plant or not to plant. Review the CHECK LIST below to determine if YOU are ready to plant this season. If yes, then make sure you visit with a natural resource professional to discuss planting strategies, specific to your site, that will promote success and productivity. Note: The ability to predict individual weather conditions with any accuracy is very limited. The soil helps provide soil moisture. The decision to plant or not should be based on ALL past land history and ultimately according to your risk tolerance to live under various weather conditions. There are no guarantees!

- PROFESSIONAL ASSISTANCE: I am working with a qualified forester that uses reputable crews with a proven track record with site preparation, pest control, competition control, seedling care at all times, AND will take the time to plant seedlings correctly.
- SITE QUALITY: Site is highly suitable for tree production and is not limited by soil type, slope, moisture (too much or too little), soil compaction, or soil nutrients. Poorer sites cause greater stress on newly planted seedlings even in periods of adequate rainfall. Drought and heat can easily decrease seedlings on poor sites. Poor sites offer little, if any chance of providing financial gain.
- SITE PREPARATION: I have ordered the appropriate seedlings for my site and goals. The necessary site preparation activities to minimize competition, control aggressive plants, and improve site conditions have been done or will soon be done. Cost share applications, if available, have been submitted and approved. Due to the financial investment involved, the site should be well-prepared and all planting done well before planting to provide the best chance of success. If you have not adequately prepared the site, do so next summer prior to planting or consider allowing site to naturally regenerate.
- PLANTING: The season of planting may influence seedling survival.
 - Fall Planting (Lowest risk of loss) Fall planting takes place mid-October through November. Properly planted seedlings have adequate time to establish a substantial root system before droughty summer conditions minimize soil moisture. Containerized seedlings are required which cost more than bare root seedlings but fewer seedlings per acre are needed.
 - Winter Planting (Moderate risk of loss) Winter planting is done from December to mid-February. Although a good season to plant in areas of adequate rainfall, winter planting provides less time for seedlings to establish root system and acclimate to the site than fall planted seedlings thus increase risk of loss. Easier bare root or containerized seedlings may be used.
 - Spring Planting (Highest risk of loss) Spring planting ranges from late February to April. Seedlings may not have time to grow the root system required to acquire moisture at greater depths in the soil before the droughty summer months limit soil moisture.
- SOIL MOISTURE: The site has sufficient soil moisture at the time of planting to prevent seedlings from desiccating. Often soil moisture is adequate for fall and winter planting starting mid-October. Droughty conditions during the previous summer may limit soil moisture even if some rain occurs during the fall and winter months. The soil moisture and seedling survival relationship will require more research. However, the Monthly Soil Moisture Percentile map provided in the following link provides a snapshot of current conditions. For example the percentile for November 2011 (image right) was 1 - 10% of

