The Stand Manager

Technical Development, Planning, and Utilization Unit Newsletter
NC Division of Forest Resources—DENR

Tech Update

Ron Myers

In this Issue, we present a diversity of articles and updates that come from both the Forest Protection section and the Forest Management section. This variety or diversity of resource management tasks or requests that our personnel are called upon to assist with makes the Division a valuable organizational asset to the public and other organizations. I remember hearing a speaker say at a conference “Scarcity defines value” It is during these current economic conditions that we must remind the general public and ourselves the value of our service and the diversity of our expertise.

Featured in this issue are the Division of Forest Resources work with bringing back an important species of concern to more wetland sites and fire environment research to predict smoldering combustion limits of organic soils. Many organizations and agencies are looking for our expertise and participation to bring back the use of fire in more fire dependent communities. The Division of Forest Resources has a rich history of working collectively with other partnering agencies. This is particularly true with many of our research, insect & disease projects, and cooperative projects. A Statewide Forest Resource Assessment Project is currently underway to help provide a comprehensive overview of our natural resources, identify priority areas, and to develop a strategic plan for sustainable forestry.

Conifer Silviculture

Bill Pickens

AWC Research—Working to Bring Back an Important Species of Concern

Atlantic white cedar (AWC) is an important wetland species of North Carolina’s coastal plant community type. Exploitation without adequate regeneration has reduced the species to less than 10 percent of its original range. In the past 10-20 years, the Technical Development, Planning, and Utilization Unit has initiated several research studies and demonstration projects to increase our management knowledge and restoration of Atlantic White Cedar to our coastal landscapes.

In February of 2001, a study was established to examine the effect of planting density on AWC growth and future value. The study site is located on a Pantego soil series (site index 96 feet base age 50) in the Hofmann Forest. This replicated study will compare the growth benefits of 3 planting densities (6X4, 6X6, 6X12) with the economic costs of establishment for afforestation. The table to the right shows the average tree height and dbh after eight growing seasons for each planting density treatment.

With the help of Onslow County DFR field personnel, we just completed current tree height and diameter measurements. Field results will be analyzed and reported on in the future. Some of the early growth differences may be attributed to variable microsite influences across the site and drainage.

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<th>Planting Density</th>
<th>Avg. Tree Ht.</th>
<th>Avg. DBH</th>
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<td>6X12</td>
<td>15.99</td>
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<tr>
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Photo 1: ACR Brian Swanson taking AWC Ht. measurements
AWC Research Cont...

A companion study to the Hofmann planting density study was initiated in February 2008 at Bladen Lakes State Forest to examine the influence of stocking levels and the effect of fertilization at planting. DAP and TSP fertilizer was applied at planting. At the end of one growing season, height across all treatments averaged 2.5 feet with a survival rate at 94%. No significant differences in height due to the fertilizer treatments were measured from this early application.

In 2005 after harvesting an Atlantic White Cedar –Mixed Hardwood Stand, Bladen Lakes State Forest installed a restoration project with the objective of increasing the AWC component using natural regeneration methods. After the 2005 harvest, several smaller, unmerchantable residual AWC trees were left by the logger.

A significant number of AWC seedlings from natural regeneration were observed across the tract following an initial stocking count that was performed after the first growing season in 2006. At that time, severe competition from red maple, sweetgum, loblolly bay, and grasses threatened to overwhelm the AWC seedlings that were present.

A release treatment using 12.8 ounces/acre of Arsenal was applied in August 2006 to take advantage of a potential seed bank and to ensure any regeneration present would be fully released. Stocking counts were done in 2007 and 2009. Across all the plots the number of AWC seedlings increased after release by an average of 71% from 2006 to 2009. AWC seedling stocking numbers ranged from 400 TPA to over 10,000 TPA. The herbicide effectively killed the red maple and sweetgum competition, but just top-killed the loblolly bay.

On several plots, the number of loblolly pine seedlings also increased and are over-topping the AWC regeneration on the drier sections. Future pre-commercial thinning may be needed to reduce the pine component if the long-term, desired stand condition is to restore AWC to this site. A combination of both herbicide release and mechanical release may be need on these sites to ensure long-term restoration success.

In the early 1990’s, planting AWC for wetland and ecological restoration was increasing and bare-root seedlings were in short supply. Researchers wanted to examine if rooted cuttings could be grown and used as an alternative method for available planting stock. In 1990 a study was established by K.O. Summerville (retired DFR forester) on the Hoffman Forest in Onslow County. The objective of this study was to compare the early field performance and the long term growth & development of Atlantic White Cedar bare-root seedlings versus rooted cuttings.

This April 2009, after 20 years of growth, tree height and diameter measurements were completed for this study that was located on the Hoffman Forest in Onslow County. Tree height averaged 33.7 feet for the bare-root seedlings while the rooted cuttings averaged 29.3 feet.

Tree height differences were not significant after 20 years. Diameters also showed no significant differences at age 20 and averaged 5.7 inches for the bare-root seedlings and 4.9 inches for the rooted cuttings. Multiple stems were common for both types of planting stock used on this site. After 20 years, the data indicates that there was no clear difference in early field performance, growth, and stand development from using AWC bare-root seedlings or rooted cuttings as planting stock at establishment.

Upcoming NCSU FEOP Workshop
The Ecology and Management of Atlantic White Cedar Ecosystems
June 9-11, 2009 in Greenville, North Carolina

To register for workshop go to NCSU FEOP website at http://www.ces.ncsu.edu/nreos/forest/feop/AWC/registration
Smoldering Combustion Limits of Organic Soils in North Carolina

This is a cooperative study under a Joint Fire Sciences Grant. The principal investigators include James Reardon-USDA Forest Service, Roberta Bartlette-USDA Forest Service, and Gary Curcio- NC Division of Forest Resources.

Introduction
Wetland communities with deep organic soils and mineral soils with thick organic horizons present serious challenges to fire managers. One factor limiting the use of prescribed fire in these wetland communities and increased acceptance is the lack of knowledge about conditions leading to sustained organic soil consumption. At present, tools for evaluating the potential for ground fire in wetlands are limited. Better predictive models of smoldering combustion potential that is based on measurable soil properties could improve the effectiveness of burning programs and increase management options and opportunities.

This cooperative study is building on previous research conducted in North Carolina wetland communities and will improve our understanding of how moisture and mineral content affect the smoldering combustion limits of organic soil.

Methods
Root mat and muck soil samples from a number of sites in North Carolina’s coastal plain will be burned under laboratory conditions. The laboratory sample results will be used to model the probability of sustained combustion over a range of moisture and mineral contents. The model estimates will be compared with the results of planned, operational prescribed burning across a number of sites to help validate the model. On February 11th 2009, the Division of Forest Resources successfully conducted an operational burn in a pocosin forest type in the Green Swamp. This 618 acre prescribed burn was conducted in cooperation with The Nature Conservancy in Brunswick County. In the past, other small scale research burns had been conducted by other agencies. This was the first, large-scale operational burn conducted by DFR to introduce prescribed fire into a pocosin forest type for the purpose of reducing hazardous fuel buildup & to successfully bring fire back into a fire dependent plant community type.

Results
This operational burn applied current science and ongoing research to provide for a successful outcome. The duff / organic root mat moisture was never below 100%. The decision to burn or the “No go decision point” was set at ≤ 170%. The US Fish and Wildlife Service in eastern NC typically use a decision point of ≥ 180% moisture as their criteria to burn. High duff/organic root mat moisture percentages provide fuel bed conditions that limit sustained smoldering. You do not want ground fire and smoldering in these organic soils when planning for introducing prescribed fire back into these wetland community types. Pocosin fuels on this site were the heaviest observed by long time researchers Jim Reardon and Bob Mickler. Both have performed substantial research in North Carolina pocosin community types. They both have noted independently that the aerial fuels present for this operational burn represented the heaviest fuel loading that they had observed.
Fire Environment Research Continued...

Science and planning tools used during this burn included: VSMOKE (dispersion model), FEPS (fire emissions model), NFDRS (burning conditions assessments), NFDRS Point Forecasts, NWS Fire Weather and Spot Forecasts, RAWS equipment, Drying Fuel Ovens, E-fuel sticks, Organic Root Mat Sustained Smoldering Model, and Upper Air Soundings. Even with upper air soundings indicating the presence of a low level jet and Brovak Wind Profiles. These troublesome wind profiles were offset by a low Ignition Component, and favorable ERC and time-lag fuel moistures. This prescribed burn released enough energy briefly to generate a fair weather cumulus clouds as shown in photo to the right.

The results from monitoring fire and fuel conditions will help to validate any predictive model to estimate the smoldering combustion limits of organic soils in North Carolina. Any model that is based on measureable soil properties will help Fire Managers when burning in pocosins or wetland community types and during wildfire events in similar fuel types. Predictive models would help managers to conduct prescribed burning with confidence and with minimal or limited mop-up resources if they can predict the probability of sustained smoldering. It would also provide more cost-effective ordering of wildfire resources and mop-up equipment if the potential for ground fire can be predicted in advance.

This cooperative research will be ongoing and applied to more sites for operational burning and validation. The applied results will hope to demonstrate to state forestry personnel that they can be successful burning in wetland community types with limited risks of sustained smoldering if fuel bed conditions are properly measured & assessed and predictive models are used.

Forest Health News

Stream Sampling for Sudden Oak Death (SOD)

The Pest Control Branch of the NC Forest Service has been on the lookout for an invasive threat known as Sudden Oak Death. This disease has been killing trees in California since the mid1990’s. There are over 100 plant hosts where this fungus can grow and reproduce. However, it only causes damage to a select few species. Unfortunately, oaks are the most susceptible tree species that this disease can attack.

Because this fungus can grow on so many host plants, it has the potential to spread across large distances. The pathogen (Phytophthora ramorum) that causes Sudden Oak Death can easily become established on many different plants grown in nurseries throughout the west coast. When these plants are transported to other states, Sudden Oak Death could easily be transported with them. This actually occurred in North Carolina in 2005, when 69 nurseries across our state received potentially infected plants shipped from a large nursery company in California. There were nine nurseries at that time that had plants that actually tested positive for this disease. Some additional introductions of this pest have occurred since 2005, but fortunately they were on a much smaller scale. In all cases, the NC Department of Agriculture took action and destroyed the infected plant material. However, the fact remains that this disease has been introduced into the state of North Carolina.

Fortunately, the US Forest Service had started a national survey program for this disease in 2003. North Carolina was one of the first groups of states to be involved with this project. Therefore, the Pest Control Branch was already trained and able to respond to this introduced pest. Numerous surveys were conducted around these potential establishment points, and no sign of this fungus was found in the woodlands of North Carolina. However, it is still important that we continue to be pro-active and look for this potentially damaging invader. As part of an ongoing cooperative effort, the DFR will continue to survey for this pest each year.
Since the spores of the fungus responsible for Sudden Oak Death can be found in waterways, we survey for this disease using stream-baiting techniques. Each year, 10 watersheds throughout North Carolina are selected for the survey. The baits that are used consist of four rhododendron leaves placed in custom-made mesh bags.

Two bags are placed in each of the 10 streams. These watersheds are bailed 6 times throughout the year. The ideal time to do this work is in the spring and fall, when stream temperatures are less than 22°C, and while there is broadleaf foliage present throughout the forests. Once the baits have been exposed to the water source for 1 to 3 weeks, they are carefully packaged and shipped overnight to two separate laboratories for DNA analysis. Unfortunately, DNA analysis is the only way to positively and accurately identify this disease.

A rhododendron leaf bait deployed in December 2008 in a Gadsden County, FL stream (outside a previously confirmed positive retail nursery) has been found culture positive. The nursery had most recently been confirmed positive in February, 2008 from soil and water samples. A follow-up survey of the nursery and surrounding environment was conducted on March 11, 2009. Diagnostic results on vegetation, water, and soil samples collected inside and outside the nursery are pending.

We are fortunate that Sudden Oak Death is still not known to have become established in the state of North Carolina. **All of the sample leaves that have been analyzed have tested negative for Phytophthora ramorum.** However, we need to continue to be diligent in our efforts to make sure that this does not change. In North Carolina, production of nursery plants is big business and the DFR Pest Control Branch will be conducting periodic stream sampling for the early detection of SOD.


### NPS Water News

**NPS Unit Helps to Promote Stream Restoration in North Carolina**

Tom A. Gerow

Why is our Division of Forest Resources involved in stream restoration? Let’s look at the DFR’s mission statement:

“To develop, protect, and manage the multiple resources of North Carolina’s forests through professional stewardship, enhancing the quality of life for our citizens while ensuring the continuity of these vital resources.”

Managing forests is more than just the trees: it includes the diversity of natural resources that our Division is charged with managing, including the water resources. As a historical perspective, the National Forest system was created 100+ years ago largely for two purposes: a sustainable supply of timber and protection of watersheds; so having “forestry” involved with water resource protection is nothing new.

Since 2004, the Forestry Nonpoint Source (NPS) Branch of the FM/FD Section has sought after and obtained grant funds from federal and state agencies to conduct water resource restoration on lands managed by the DFR.

**Some Stream Restoration Fast Facts:**

⇒ The DFR is only doing stream restoration on lands that are managed by the Division. We will not conduct any restoration work on private lands or other agency-owned lands. There are other programs that fund, coordinate, and oversee stream/wetland restoration on private lands. These programs include: NC Division of Soil & Water Conservation; NC Ecosystem Enhancement Program; NC Clean Water Management Trust Fund; and NRCS-Wetlands Reserve Program. Many private conservation organizations have also become involved with restorations.
⇒ All of the DFR’s stream restoration work is funded by competitive grants obtained by the Forestry NPS staff. No state-appropriated DFR funds are used for this work, aside from the occasional supporting work (known as “In-Kind Match” for the grant award) provided by BRIDGE or one of the ESF/SF facilities. Usually, the grant programs that fund stream restorations have very specific guidelines about the type of work that is eligible for funding, and require a high level of record keeping and documentation. The grants also have a deadline of when the funds are available for each project.

⇒ The DFR does not get any ‘exemption’ from the federal and state permit requirements for water quality or land disturbing activities. We have to obtain and comply with the same rules and regulations as anybody else when conducting a stream restoration. Permits usually include US Army Corps of Engineers Section-404 permit; NC-DWQ Section 401-Certification; and NC-DLR Sediment & Erosion Control permit and associated stormwater permit. Plus, if the work is conducted in a trout-listed county, the NC Wildlife Resources Commission must approve of any stream restoration work.

⇒ Stream restoration is a very unique discipline, in both the engineering of the work and the actual construction / equipment work. Engineering for a restoration job requires a Professional Engineer who has experience with natural ecosystems, and is far different from other types of civil engineering. And, because there has been so much grant funding available in recent years, it seems that every guy who has a backhoe and dump truck calls himself a ‘stream restoration contractor.’ That simply is not the case. Operating heavy equipment within or around streams and wetlands requires delicate tractor work and precise grading that can only come from years of experience.

Stream Projects accomplished to-date by the DFR NPS Unit include:

**Little River near Hooker Falls at DuPont State Forest; 600 linear feet—May 2007**

Stream restoration work focused on river bank stabilization and restoration to reduce sedimentation into the Little River, which is a stocked trout water in western NC. This work also improved public access to the water falls and provided flood control measures.

**Purleat Creek at Rendezvous Mountain ESF; 2,600 linear feet—August 2006 & 2007**

Stream restoration work on this multi-phased watershed restoration project is ongoing and has brought together many partnering agencies. The achievements thus far include:

Removal of excessive, silt and sediment from existing upstream sections of Purleat Creek by DFR-DOC BRIDGE crews, using a combination pressure washer/vacuum system called the “Sand Wand” purchased by the Forestry NPS Branch with grant funds.

Phase 1 work included the re-location and restoration of a tributary to Purleat Creek (about 700 linear feet) and creation of about 2 acres of wetlands. Phase 2 work included the restoration and enhancement of the main section of Purleat Creek (about 1,900 linear feet) and re-establishment of a riparian forest corridor along both sides, in a former pasture.

In April 2009, the third phase of Purleat Creek restoration was started. This phase will restore and re-locate about 1,600 linear feet of Purleat Creek away from a severely eroding NCDOT road embankment and a roadside ditch. For all of the Purleat Creek restoration, the DFR has been partnering with the NCSU Department of Biological & Agricultural Engineering to handle the technical aspects of restoration.

**Education & Outreach**

Including stream restoration at an ESF can greatly enhance the diversity of program delivery and opportunities to host structured tours, classes and workshops that may attract new visitors. During this project, several workshops and field tours have already been hosted on the site by NCSU and its sub-contractor, as an outdoor teaching lab for up & coming students learning the science behind stream restoration.
NPS Water News Cont...

The Forestry NPS staff has also identified potential opportunities to improve the aquatic conditions of streams that are located on other ESF and SF properties, and we are working with those Forest Supervisors to develop long term plans.

Recent changes in federal laws could make stream restoration a possible source of revenue if the work is conducted on DFR-managed lands. How this potential source of revenue could benefit the DFR is being investigated by Forestry NPS staff.

Additional stream restoration accomplishments and photos are provided in our annual water quality and nonpoint source “Year In Review” flyers, available on the DFR’s Web site:

http://dfr.nc.gov/water_quality/year_in_review.htm

Field Notes and Special Projects

The Division of Forest Resources Begins Statewide Forest Resource Assessment

The N.C. Division of Forest Resources is teaming up with other natural resource agencies, conservation organizations, private citizens, and other stakeholders to undertake a comprehensive assessment of the status and future of North Carolina’s forests.

The 2008 federal Farm Bill challenged state forestry agencies, such as the N.C. Division of Forest Resources, to draft an assessment to plan for a sustainable forestry future. This assessment will be updated every five years to reflect changes that affect the forest resources across the state. The assessment will be a forestry roadmap to help the N.C. Division of Forest Resources and its partners plan and provide economic and environmental benefits to all North Carolinians.

To help in the development of this roadmap, six working groups made up of scientists, policymakers, landowner advocacy groups, and other stakeholders will work to delineate and prioritize rural and urban forest landscapes and ultimately recommend strategies to address opportunities, risks, etc., related to North Carolina forests.

The assessment will focus on the condition of North Carolina forests, significant trends, risks and threats to the state’s forest resources. Population increases and urban sprawl along with other factors such as climate change, invasive species, insects and diseases, storm events and the long term markets for forestry products are a few of the forestry related issues that will be studied.

The assessment will also focus on existing industries including traditional wood products, and emerging markets such as bio-fuel and carbon sequestration, as well as the trends affecting the future of forestry and landowners in North Carolina. The assessment will be a key tool in conserving and protecting the forests throughout the state and increasing the benefits of these lands for all North Carolinians.

Once the assessment is completed in October, 2009, focus will shift toward developing a comprehensive coordinated strategy for investing state, federal, and leveraged partner resources to address the key management and priority landscape objectives identified in the assessment.

This strategic plan, scheduled to be completed in June 2010, will outline specific goals and actions associated with three broad forest sustainability objectives: conserve working forest lands; protect forests from harm; and enhance public benefits from trees and forests.

For more information check the North Carolina forest assessment website: http://www.ncforestassessment.com/overview.htm